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PARTICIPATORY LAND PLANNING IN THE REGION OF MADRID (SPAIN): AN INTEGRATIVE PERSPECTIVE

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ABSTRACT

The landscape and institutional changes in the region of Madrid over the last three decades have shaped current decision-making process in the planning system. Madrid is characterised by the intensive use of land and a range of stakeholders related to the stratified administrative structure, which generates social & environmental conflicts.

This research links different themes such as territorial planning and governance, using an integrative perspective to search for sustainable strategies. The *appreciative systems* approach, based on conceptual modelling, is used to understand the complex processes involved. The modelling process provides a valuable tool of simplifying the complexity. The development of the conceptual model is divided into two processes; the first model exercise is an abstraction of the decision-making process in land planning. Attributes of the planning and governance systems in Madrid are taken into account. Later, this conceptualization is complemented with quantitative data from the 1950's. This thesis harmonises the quantitative method with the discursive model to understand the complexity of the emergent conflicts in regional land planning and management. Notions such as *collaborative planning*, *adaptive management* and *multi-level governance*, which have recently become fashionable, provide the theoretical discussion.

A stakeholder engagement exercise was carried out to encourage the participation of stakeholders in the policy-making process. This thesis suggests a set of future scenarios, alternative policy options, under a common framework of sustainability. The seven policy interventions are detailed in a booklet written in Spanish and English: *"Towards sustainable land planning in the Autonomous Community of Madrid: Guidelines and Recommendations"*. A simulation model - decision support tool – was used to explore these scenarios and enhance stakeholder participation. This research was instrumental in helping stakeholder's communities to adapt to emerging circumstances and changes in the regional planning process.

RESUMEN

Los cambios del paisaje e institucionales en la región de Madrid durante las últimas tres décadas han dado forma a lo que actualmente es el proceso de toma de decisiones en el ámbito de la planificación territorial. La Comunidad Autónoma de Madrid se caracteriza por el uso intensivo de su suelo y por el gran número de actores presentes en el proceso, lo que conlleva la aparición de conflictos sociales y medioambientales. En el marco del proyecto TiGrESS, esta investigación pretende establecer lazos entre la planificación territorial y la gobernanza a través de una perspectiva integradora y en busca de estrategias sostenibles. La teoría de *appreciative systems* (apreciación), basado en modelos conceptuales, se utiliza para comprender la complejidad de estos procesos. Los modelos conceptuales son una herramienta muy útil para simplificar los procesos complicados. El desarrollo de este modelo conceptual consta de dos fases: El primer ejercicio consiste en llegar a una abstracción del proceso de la toma de decisiones en la planificación territorial, teniendo en cuenta las características del territorio y las instituciones de la región de Madrid. Posteriormente, un segundo ejercicio pretende completar esta conceptualización con datos cuantitativos desde los años 50. Ésta tesis conjuga el método cuantitativo y el discursivo con el objeto de entender los emergentes conflictos en la planificación y gestión territorial a nivel regional. Los conceptos teóricos giran en torno a nociones actuales como *planificación participativa, gestión integrada* y *gobiernos descentralizados.*

La contribución de los actores se estimulo a través de una técnica de participación en elaboración de políticas. Ésta tesis propone una serie de posibles escenarios futuros y políticas alternativas a la luz de un marco común de sostenibilidad. Las siete propuestas de intervención se detallan en la publicación *Hacia una planificación territorial sostenible en la Comunidad de Madrid: Principios y Recomendaciones,* editada en español y en inglés. La exploración de los distintos escenarios y la promoción de la participación de los distintos actores se llevó a cabo utilizando un modelo de simulación denominado -*herramienta de apoyo a la toma de decisiones*-. Ésta investigación ha servido como instrumento de apoyo a las poblaciones en el proceso de adaptación a los cambios y a las nuevas situaciones en que han derivado los procesos de planificación territorial.

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N.B. The photographs of landscape were taken by the TiGrESS research team during fieldwork in 2004 and 2005 (Madrid)

CHAPTER I

ESTABLISHING THE TRAJECTORY OF THIS RESEARCH

This dissertation aims to search for new ways of stakeholder involvement in land planning issues in the region of Madrid (Spain). The research aim is to encourage harmonisation between social and natural science and deals with sustainable development. The principal objective is to help local and regional stakeholders[1] to move to a more participatory system in which 'power' and 'government' give way to 'sustainability' and 'governance'. This research has been undertaken as part of a multi-disciplinary project, "Time-Geographical approaches to Emergence and Sustainable Societies" (hereafter referred as TiGrESS)[2]. "Land planning and pathways to sustainable agriculture in Madrid" is one of the practical case studies of TiGrESS, involving agronomy, ecology and landscape specialists and modellers. The project takes 'integrative research' and 'appreciative systems' approach as core issues and this research also adheres to these core issues.

'Integrative research' is defined as the process of creating knowledge across the boundaries of epistemic communities (Winder 2003; Tress *et al.* 2004; Winder Ed. 2006). 'Appreciative systems' approach (Vickers 1965) refers to the process by which judgments are formalised with a view to developing norms. The set of *reality judgments* (which processes and products exist), *value judgments* (why they exist), and *operational judgments* (what actions are consistent with those values), formed the 'appreciative system' of an individual or a community. Vickers also considers to the receptiveness of a community to new ways of thinking as the 'appreciative setting' of that community.

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[1] Please note that the term 'stakeholder' refers to a wide range of agents involved in planning.
[2] The European Union's Framework V Programme "Energy, Environment and Sustainable Development" funded it.
See http://ec.europa.eu/research/environment/newsanddoc/article_2697_en.htm
See http://www.tigress.ac/

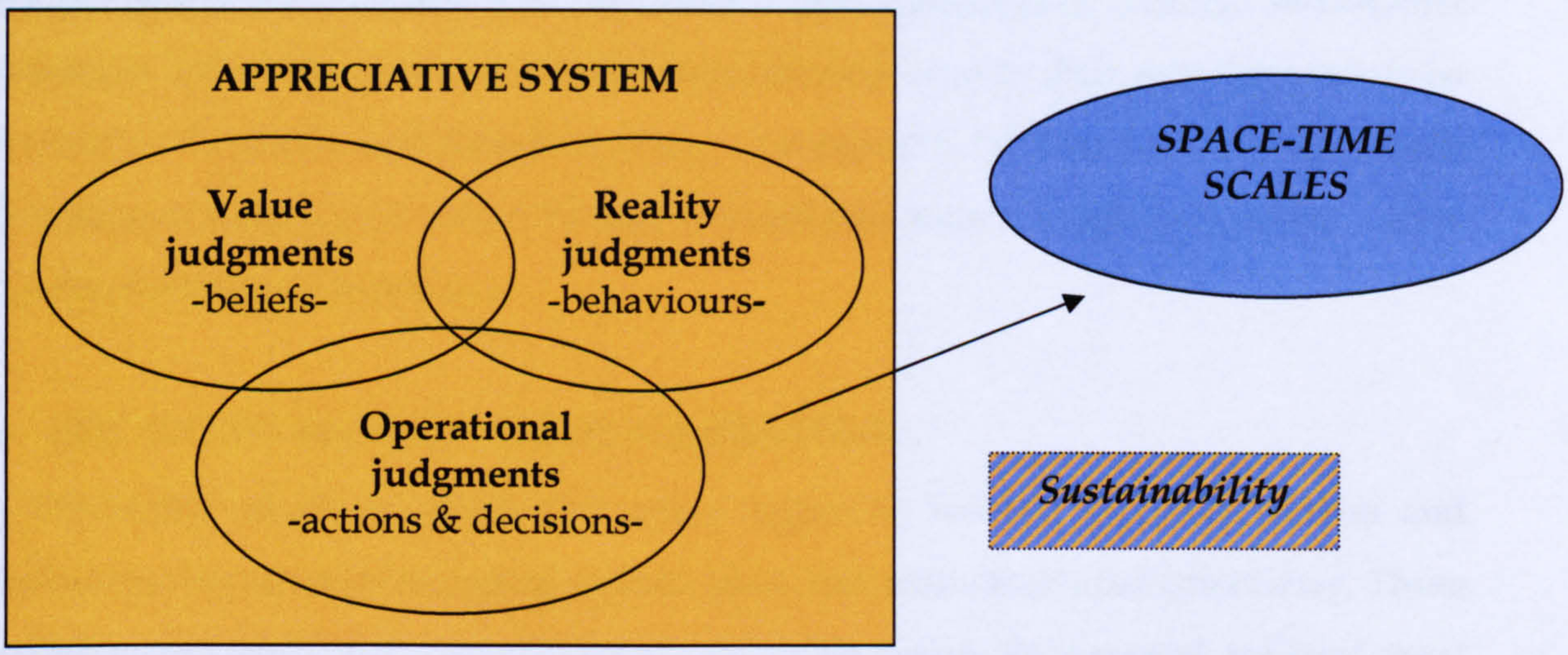
The integrative perspective of this thesis attempts to bring diverse knowledge communities together, and to change the appreciative settings of stakeholders by making new knowledge available and new relationships feasible. As we move down through the governance hierarchy, from supra national to local level, the probability that a policy implemented in respect of that knowledge or those relationships will solve the problem at hand is increased. The use of Vickers' approach as a discursive method to negotiate the agreement between stakeholders operating on different scales provides a valuable way of managing conflict among them. Thus, it seems a promising way of influencing the decision-making process in regional planning.

In addition to the integrative and appreciative focus of this thesis, 'sustainability' is also a primary objective. Sustainability was understood in the late 1980's and 1990's as *"...meeting the needs of today without compromising the ability of future generations to meet their own needs..."* after Bruntland's (1987) report. However, Winder's (2005a) work on appreciative systems proposed a revision, shifting emphases from 'needs' to 'aspirations'. In this appreciative framework, talking about sustainability means talking about processes instead of products. This change also implies an evolution in the perceptions and understanding of a system. The appreciative settings of a system define the cultural and embedded knowledge of communities and institutions, which reduce (or increase) their 'adaptive potential' -the capacity to respond and interact. The major problem of sustainability is that it is often impossible to reconcile cultural and natural constraints. Cultural constraints are tacit beliefs or values of a community, whilst natural constraints are external and exogenous. Adaptive potential may be used as a valuable indicator of sustainability (Holling 1978; Berkes and Folke 1998; Winder, McIntosh and Jeffrey 2005). The relationship between adaptive potential and constraints of any system must be understood in order to influence the appreciative settings and facilitate 'innovation'. Although humankind is continuously changing, there are tight cultural constraints which are maintained. These constraints prevent innovation making communities un-sustainable in the long-term (Winder 2005b; Winder, McIntosh and Jeffrey 2005).

This research, therefore, explores the hypotheses developed in TiGrESS (Winder Ed. 2006) that cultural constraints are related to space-time scales. Thus, linkages between

stakeholders from supranational politicians to local mayors would facilitate management of the governance system. The figure below (I.1) illustrates the relationship (represented by the arrow) that this dissertation establishes between the elements of the appreciative system of a community (or an individual) and the different space-time scales where the community or the individual operate. It attempts to show how difficult it is to achieve sustainability due to the problems of harmonising cultural and natural constraints at different scales.

Figure I.1. Searching for sustainability



I.1. RESEARCH QUESTIONS

The following questions emerged from the original statement of search for innovative modes of sustainable planning in the region of Madrid. Some of these questions are specific to the research in the Madrid case study, others refer to the general methodological issues, while the remainder refer to the role of individual stakeholders (including the writer) in the planning process.

- **Who are the stakeholders involved in the decision-making process in the regional land planning system?**
- **What role did they have? What role do they play now? and what role could they play in the future?**

- **How could the scientific community involve the executive stakeholders in land planning and management?**
- **Does integrative socio-natural science have a role to play in the region of Madrid? If so, what is that role?**
- **How should this project be organised to fulfil that role?**
- **How could both roles, researcher and practitioner in the participative process, be combined into an evolving and reflective whole?**

This dissertation will present evidence that integrative science does indeed have a role to play. Building bridges between the qualitative domain of stakeholder engagement and the quantitative demands of auditable impact assessments requires stakeholder consensus. Moreover, it seems that the most effective way to deal with the work is by alternating discursive and analytical phases, because it is felt that social change affects all aspects of society and cannot be fully investigated from a single perspective. I have organised my thesis as follows.

I.2. THE 'ROAD MAP' OF THE DISSERTATION

A **Discursive phase** in which the writer began to identify the stakeholders and institutions involved by mapping stakeholders and semi-structured interviews. These methods produced some *reality judgments* about the region; the national, regional, local and other policies. Then, exploring the context of TiGrESS and governance, the writer formulated the *value judgment* on which this case study rested, in order to find 'whether the patterns of communication we observe among stakeholders correspond to what we would expect from a well-structured network'.

An **Analytical phase** was carried out through a data-intensive exploration of the region and the construction of a conceptual model that characterised a number of *reality and value judgments* about the landscape, land use types, protected areas, and so on (Encinas *et al.* 2006).

Then, in another **Discursive phase**, the *operational judgments* were identified by interviewing stakeholders to discuss how it would be possible to intervene. The principal result of this process was a booklet of recommendations, which provided the

basis for further discussion. The writer also realised from this that the flows of communication observed among stakeholders did not correspond to that which we would expect from a well defined network. In fact, and an intermediary level above the municipality was missing. On this basis a further intervention was suggested, to see whether this research could facilitate these information flows.

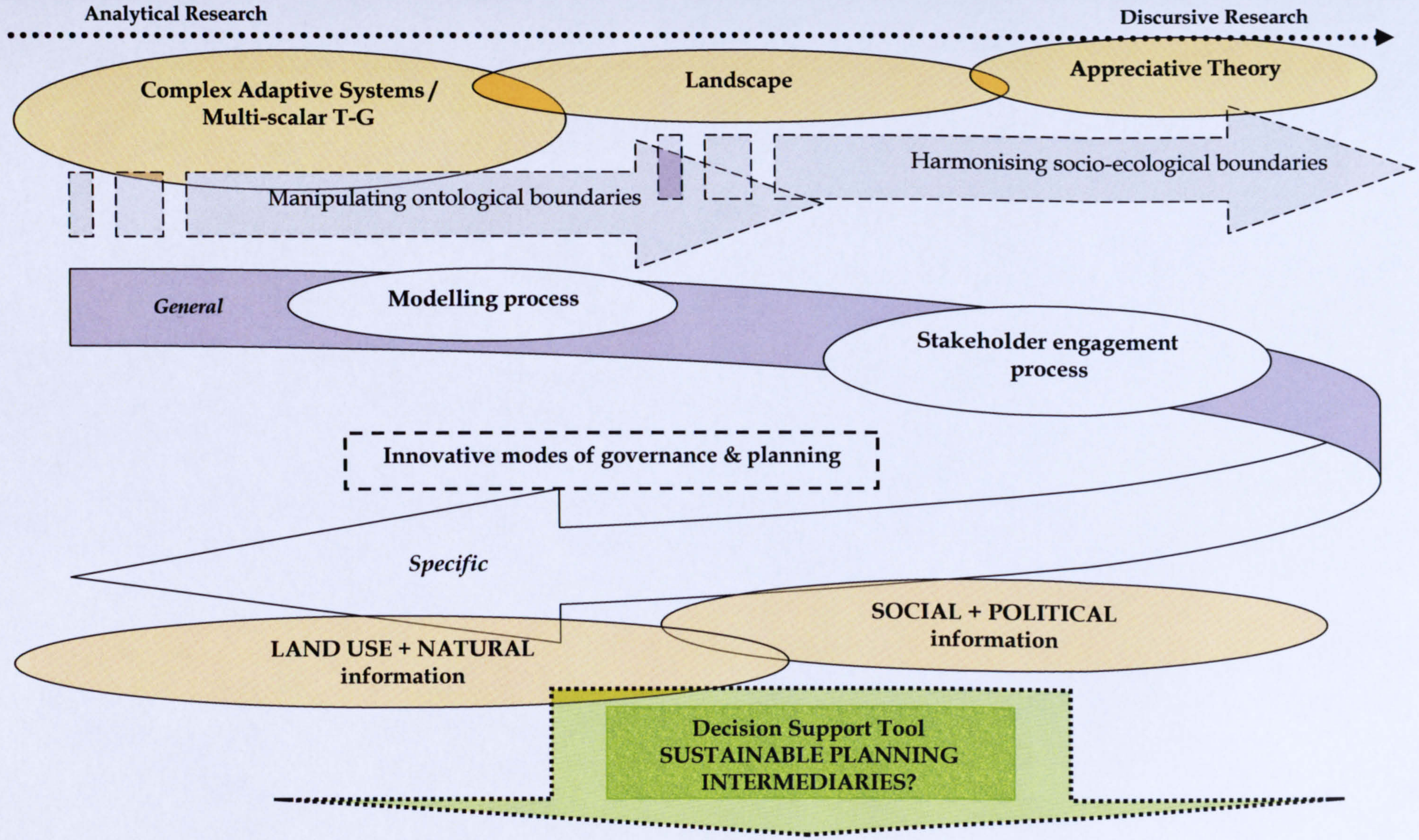
A simulation model was developed in a new **Analytical phase** by Carlos Hernández Medina and RIKS (TiGrESS team), and the writer used it to explore the likely impact of various policy scenarios. The outcomes of these 'simulation experiments' (Hernández and Winder 2006) would provide the user, stakeholders who could be either a planner or a manager, dynamic maps and graphics which were intuitive and easily understandable (high-resolution outcomes). This is supplemented by the ability to produce useful statistical and data summaries that can be used to obtain quantitative outputs. Although much more work is needed to understand the uncertainties and sensitivities of the model, this stage marks the end of the research described in my thesis. It seems the writer has moved towards a 'problem specification' that the analytical scientists can work with.

Future Discursive phases could share these results with the stakeholder community for critical evaluation and revision. This process would be helped by the fact that stakeholders would be more strongly motivated to harmonise regional planning and make agreements for efficient participatory networks because they were involved in developing the tools. The acquired knowledge of decision-making systems and stakeholder linkages makes it possible to claim that the meso-level or intermediary level is the most appropriate state to manage the conflicts between local and national level. Stakeholders located across the different scales of governance will be most flexible to provide linkages between different levels and would be the best placed to use the decision support tool to fulfil the agreements reached for the regional government.

The flow diagram (Figure I.2.) summarises the trajectory of this thesis. It is structured as follows:

Reading the flow diagram from left to the right, the arrow takes the reader from the first exercises of conceptual modelling towards the stakeholder engagement process (from analytical research to discursive research). It is at this stage in which the boundaries of the appreciative systems of the stakeholders' community have been harmonised. Moving down in the flow diagram, following the arrow, it changes direction into analytical research. This flow diagram represents an attempt to provide a decision support tool for sustainable planning which could be used for certain key stakeholders.

Figure I.2. The journey of this thesis



CHAPTER II

THE RESEARCH STRATEGY

The research strategy of this dissertation integrates different approaches to science employed by the TiGrESS project in which this work is embedded. In the 'hard systems methodology' quantitative methods are used to consolidate the research, while the 'soft systems methodology' use qualitative methods that spin from each phase of the research. The three nuclei of the TiGrESS project are 'integrative research' (IR), 'appreciative systems' (AS) approach and 'time-geography' (T-G) theory, though the research on this thesis emphasizes IR and AS approaches. This dissertation takes a reflective path, describing research that has attempted to mediate between quantitative and discursive research. The writer also acts as a communication channel between external stakeholders and the research team.

The integrative focus of the project imposed explicit ethical constraints on each TiGrESS case study[1]. Integrative researchers often act as participants and as mediators. However, integrative research is usually undertaken by and for professionals and so can assume a level of motivation and competence that cannot be taken for granted in outreach projects or public participation. Integrative projects often involve antagonised stakeholder groups with very diverse values and beliefs about reality. Thus, it is imperative that tensions within research teams do not destabilise external stakeholders in the wider community it serves. In contrast, 'inter-disciplinary research' only involves professionals and a higher level of discipline is required.

TiGrESS explored the interaction among social & natural systems and the emergence of new behaviours in an integrative framework. It specifically addressed the potential applications of Hägerstrand's (1985) T-G theory. T-G was developed in the 1960's to permit geographers to investigate human behaviour in a geographical landscape. The

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[1] EUROSIM, INFRAPLAN and Land planning in MADRID. For further information on the TiGrESS case studies, see figure (pp.10) in Appendix 1.

TiGrESS project intended to see whether: *"...Time-Geographical (TG) concepts [Hägerstrand 1962, 1970, 1985; Pred & Törnqvist 1981] could help explain spatio-temporal constraints on individual behaviour and show how innovation (...) is facilitated or blocked."* (Winder 2006a: 2). The pure research function of the project, and also a constraint for this research, was to assess T-G methodologies and tools for the formulation of sustainable development policies. *"The TiGrESS project will evaluate the usefulness of Time-Geographical methods for understanding the relationships between environmental change and social-economic driving factors. (...) We will use the TIGRESS system to undertake three case studies to produce policy-relevant information and to identify potential pathways to sustainable development through the examination of a range of relevant multi-sectoral and strategic issues affecting the study areas"* (Quoted from Appendix 1: 2). TiGrESS seeks to embed T-G theory in the general structure of integrative research. In this way a conceptual model of the impact of perception modes on landscape processes can be developed.

The appreciative approach is a discursive method used to formulate a coherent problem-definition. It takes into account the perspectives and values, and defines the action to take. It is a useful method useful for dealing with social complexities or ill-structured problems and aims for social inclusion and participation. Qualitative research has a relevant role in improving the understanding of perception and related behaviour in social-natural environments (Lemon 2007). Vickers' appreciative approach takes into account the cultural constraints, whilst T-G theory describes only space-time constraints. Qualitative research makes possible the observation of unexplored and empirical processes (Lawrence Neuman 1997). These techniques present an opportunity to explore cultural and administrative constraints, and thus simplify understanding of the land planning system in Madrid.

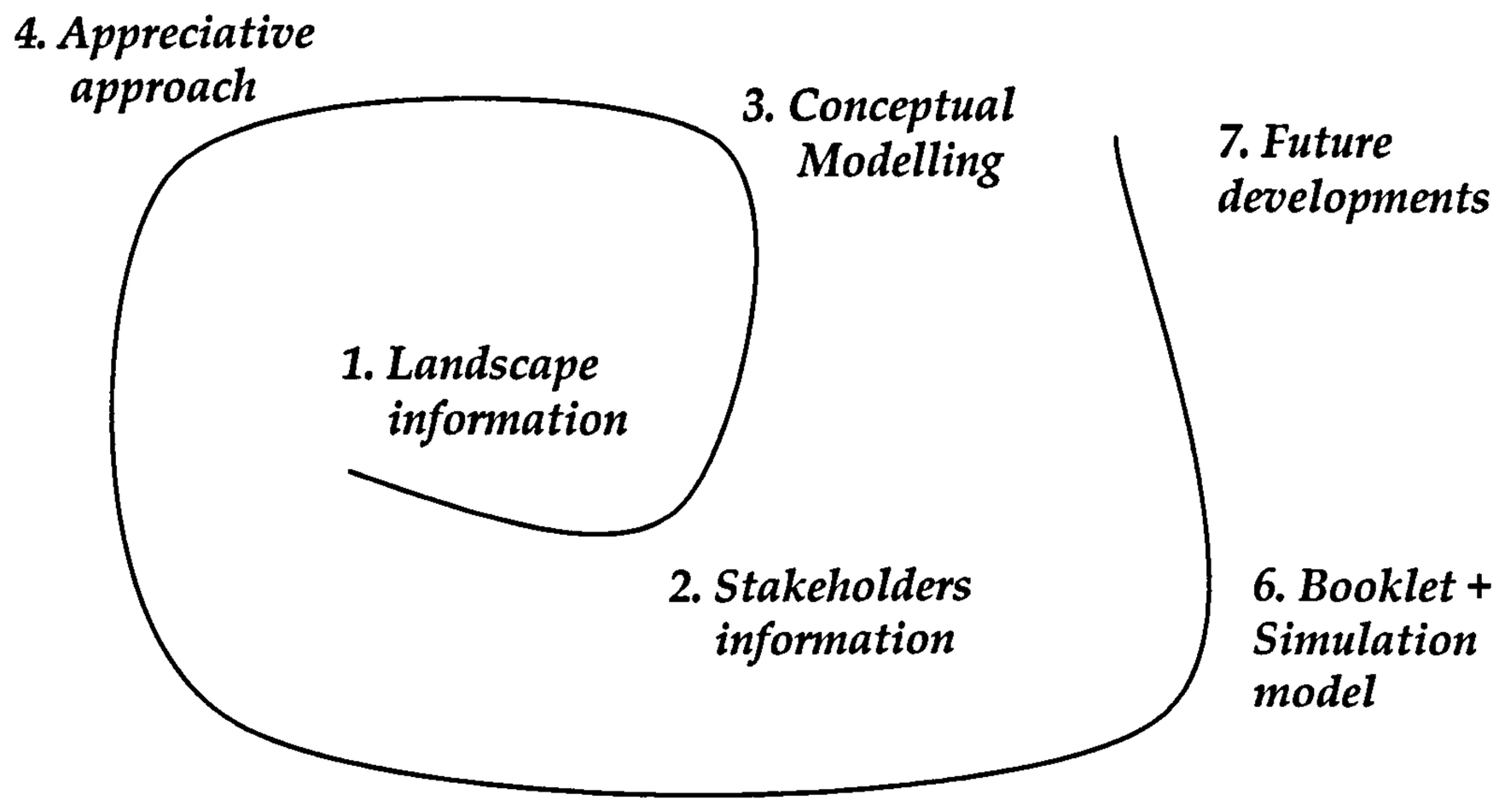
'Hard science', in this context, is research that deals with problems that appear ontologically stable and quantifiable; whilst 'soft science' deals with problems that are impossible to reduce to a computational model because conceptual models are fluid and changeable (Rosenhead and Mingers 2001; Winder 2005a). Checkland (1991) identified other differences: hard systems tackle well-defined problems, whereas the soft approach is more suitable for ill defined or messy problems. Consensus is less

hard to find within pure hard science than in soft science. The essential *attributes* of a hard (quantitative) system cannot change in the course of a research project, but *judgments* and *appreciative settings* can. Checkland, after Vickers (see also Blunden and Dando 1995) understood the soft approach as a *learning system* in which models are used to solve a problematic situation. A socio-political analysis is undertaken and, eventually, an action to improve the situation that emerges. In the late 70's, Ackoff (1978) had already noted the need for learning and adaptation, as the life of solutions to many critical social and organizational problems is shorter than the time required to balance them. There is, therefore a greater need for decision-making systems that can rapidly learn and efficiently adapt to changing situations.

II.1. RESEARCH APPROACHES AND TECHNIQUES

While this research was underway, developments in the wider context of the TiGrESS project were incorporated into the Madrid case study. The chart below (Figure II.1) represents the different stages of the research, some of them pivotal stages in the trajectory of this thesis.

Figure II.1. Research diagram



In the earlier phases of the research, a hard science dataset of ecological and physical characteristics and land use classification was built (phase 1). This stage was followed by empirical research on stakeholders and institutions, informed by literature review and mapping of the qualitative data (phase 2). The soft method of conceptual modelling (phase 3) brings together the phases 1 and 2, creating a conceptual model. The modelling process bridges spatial and temporal scales and identifies the stakeholders' choice and the (social, economical & political) driving forces. The appreciative systems approach (phase 4) provides an explanation of how changes occurred over time. This incorporates another soft approach into the former phase, in an attempt to search for common interests or values among the community of stakeholders to purpose policy initiatives. Phase 4 also marks a pivotal stage in the writer's own reflective process during the dissertation. Phase 5 is likewise part of this reflective process within the research. The stakeholder engagement process (phase 5) augments and refines the insights obtained in phase 2. It is carried out using a combination of inductive and deductive strategies, questionnaires, semi-structures interviews, rich pictures and the logical framework approach, to move from 'messy' data to the operationalisation of the actions. In the appreciative phase, phase 6, a guideline of policy actions is used as a research tool in the shift of emphasis from conflict to cooperation. The stakeholders have reflective opportunities at this stage. The simulation model also serves as a planning or policy tool to explore future scenarios. The last stage of my research (phase 7) coincides with a pivotal decision-making stage. At this point it is necessary to decide whether the reiterative process of combining discursive and analytical research has worked well (achieving the aim of a common framework of discussion between different communities of stakeholders) or in the contrary, whether it should continued.

CHAPTER III

THEORETICAL BACKGROUND

Chapter III will provide theoretical support to the active research of this thesis. It links literature related to the Madrid case study work within the context of the TiGrESS project to that on integrative research and appreciation theory. These tools will be used to search for alternatives to the current policy actions. Chapter III gathers the necessary elements to facilitate change in planning and government. It also presents a review of literature on collaborative ways of planning and new modes of government that will be used to study the Madrid region more thoroughly.

III.1. PARALLEL DEVELOPMENTS IN TiGrESS AND MADRID CASE STUDY

The aim of the Madrid case study team was to identify pivotal regions of space-time where relatively minor adjustments to planning regulations and economic incentives facilitate environmental, social and economic sustainability. TiGrESS provides a time-geography (T-G) approach to develop a conceptual model, which would take into account discursive methods such as appreciative systems (AS) to assist in understanding the social and ecological complexity in the region of Madrid.

Hägerstrand conceived T-G in part as a response to the general systems approach to social science of the 1960's and 1970's. He doubted about the applicability of systems methods (as conceived then) to social research. With Hägerstrand's approval, TiGrESS was to look at developments in the mainstream of systems research to see whether there had been enough convergence to make links between T-G and systems methods. In particular, the researchers speculated that there might now be links between recent developments in complex adaptive systems, non-equilibrium thermodynamics and T-G.

TiGrESS was required to explore Hägerstrand's theory as a possible tool for environmental management. A T-G land use planning tool was to be developed by integrating a T-G database. This database would include a complete GIS summary of spatial, ecological, physical and political data from the 1970's. Although it was possible to build simulation model, the TiGrESS team was aware that quantitative modelling has limitations. The T-G land use planning tool TiGrESS was committed to building could either be qualitative (a conceptual model based on empirical and social studies) or quantitative (a simulation model). In either case, it would address changes in the land planning regulations and help stakeholders to assess how these changes would search for sustainable development. The following table (see Table III.1) shows the T-G elements related to the policy problems in the Madrid case study as set out by Oxley *et al.* (2003).

Table III.1. T-G elements related to the policy problems in the Madrid case study

focus	*populations*	*stations - pockets of local order*	*constraints*	*projects - purposes*	*conflicts*
land use planning habitat fragmentation sustainable agricultural practices	farmers municipalities	population centres farms regional parks	land planning soil health environmental fragmentation	sustainable farming build houses making profit	land-use planning sustainable development

Source: Oxley, McIntosh and Winder (2003)

TiGrESS came to see 'classical' T-G as a subset of a multi-scalar approach that allows the researchers *"...to mesh several organizational levels and forge links between T-G ontology, Complex Adaptive Systems [Gell-Mann 1994; Railsback 2001], resilience research [Holling 1973], demographic studies, human ecology, environmental economics and management science."* (Winder 2006a: 3).

In this way, it forged much clearer links between T-G and recent work on 'complex adaptive systems' (CAS). Gell-Mann gives some examples of complex adaptive systems: *"...a human child learning his or her native language, an artist getting a creative idea, a society adopting new customs, bacteria developing resistance..."* (*ibid* 1994:9). These that undergo processes, like learning and biological evolution, are distinguished from dynamic systems, which are non-adaptive, such as galaxies and stars. Societies appear to be stuck with 'maladaptive schemata' (Gell-Mann 1994). The persistence of maladaptive schemata may be related to the choice of criteria for defining a system as adaptive. 'Fitness' -the capacity of society to appear adaptive- is a characteristic that arises through time, but also depends on other pressures. Gell-Mann stated *"...rather than change our way of thinking, we tend to cling tenaciously to our schemata and even twist new information to conform to them..."* (*ibid* 1994: 303). The research described in this dissertation explores complex adaptive system (CAS) theory and synergetic concepts. These theories apply to bounded collections of individual agents, each of which has an adaptive potential. The adaptive potential of a complex system would be considered high if the system itself is weakly regulated and its behaviour is determined by unconstrained actions. The individual agents are capable of responding and interacting with each other and with their social and ecological environment in a flexible and unpredictable way. However, their synergetic interaction with each other creates constraints that can reduce adaptive potential and make the behaviour of the system as a whole locally predictable but globally unpredictable.

T-G included an explicit theory of 'space-time constraints'. These are now seen as a subset of a wider network of constraints including such socially constructed constraints as peer-pressure and conflict. It is possible (if we consider space-time explicitly) to take account differences of perception on a range of spatial, temporal and organizational scales. This approach can be used to develop individual-based models and cellular automata models (the basis of the modelling process used in the TiGrESS project).

The TiGrESS project has developed a model of innovation, which has been placed in the context of appreciative research to develop an approach to manage innovative change (Winder 2006). Winder (2005a) explained 'this model distinguishes top-down

regulation (a constraint) from management (an adaptive response)'. Boundary is synonym of problem definition. Regulation is normative and it is defined by the boundary conditions of a system – indicators of compliance and system health. These indicators are pre-agreed by the stakeholders. When boundary conditions are satisfied, then the work is normative and analytical. However, if boundary conditions are violated, an effort to re-negotiate them is required and there is a movement into a new conceptual modelling stage. Boundary conditions act as a switch, shifting influence from regulators to managers and other stakeholder as needed.

III.2. MADRID CASE STUDY AND MY RESEARCH

Like T-G, AS theory was an innovative approach to socio-natural complexity from the 1960s. Just as T-G no longer reflected the state of the art in quantitative systems research, so AS theory was no longer in touch with the state of art in discursive research. Vickers (1965) emphasised 'appreciation' - the process by which *judgments* are formalised with a view to developing policies. *Policy* is a set of norms that constrain a system by regulating executive actions. Vickers is unusual among early systems thinkers in his emphasis on beliefs and the role of judgment. The set of *judgments* (*reality, value* and *operational*) formed by a person or community can be thought of a conceptual model. Value judgments associate human values to a particular product or process. The most useful value judgments are those that assign value to a process, however not all value judgments have ethical implications. Their effect implies the purpose of policy initiatives. Different communities often have different conceptual models and tend to operate on different spatial and temporal scales (Winder 2006a). Conflict management that supposes a disagreement over some policy issue among communities invariably requires some adjustments of appreciative setting to increase receptiveness to new ideas - *judgments*.

Vickers (1965) considered that the major threat at every level of the society is the lack of an appreciative system sufficiently widely shared to mediate communication, sufficiently apt to guide action and sufficiently acceptable to make personal experience bearable. The stability of the society, through change not un-changeability, depends on whether its tendency to generate conflict is or is not balanced by its ability to resolve conflicts. There are, of course, associations and persons that generate more conflict

than others, and all may change over time to generate more or less conflict. Vickers (1973) advocated for 'the end of the invidualism' (even though, all creative innovation comes from individual people) saying 'it seems inescapable that the future should require institutions even larger and more powerful than today's'. Societies will have to commit to support collective action on the necessary scale, without losing the critical capacity which they will also need to keep the institutions under control.

Although TiGrESS establishes T-G theory as one of its positioning statements on the quantitative side of its work, the emphasis in cultural and administrative constraints forges the AS theory as the foundations of the work described here. See Table III.2.

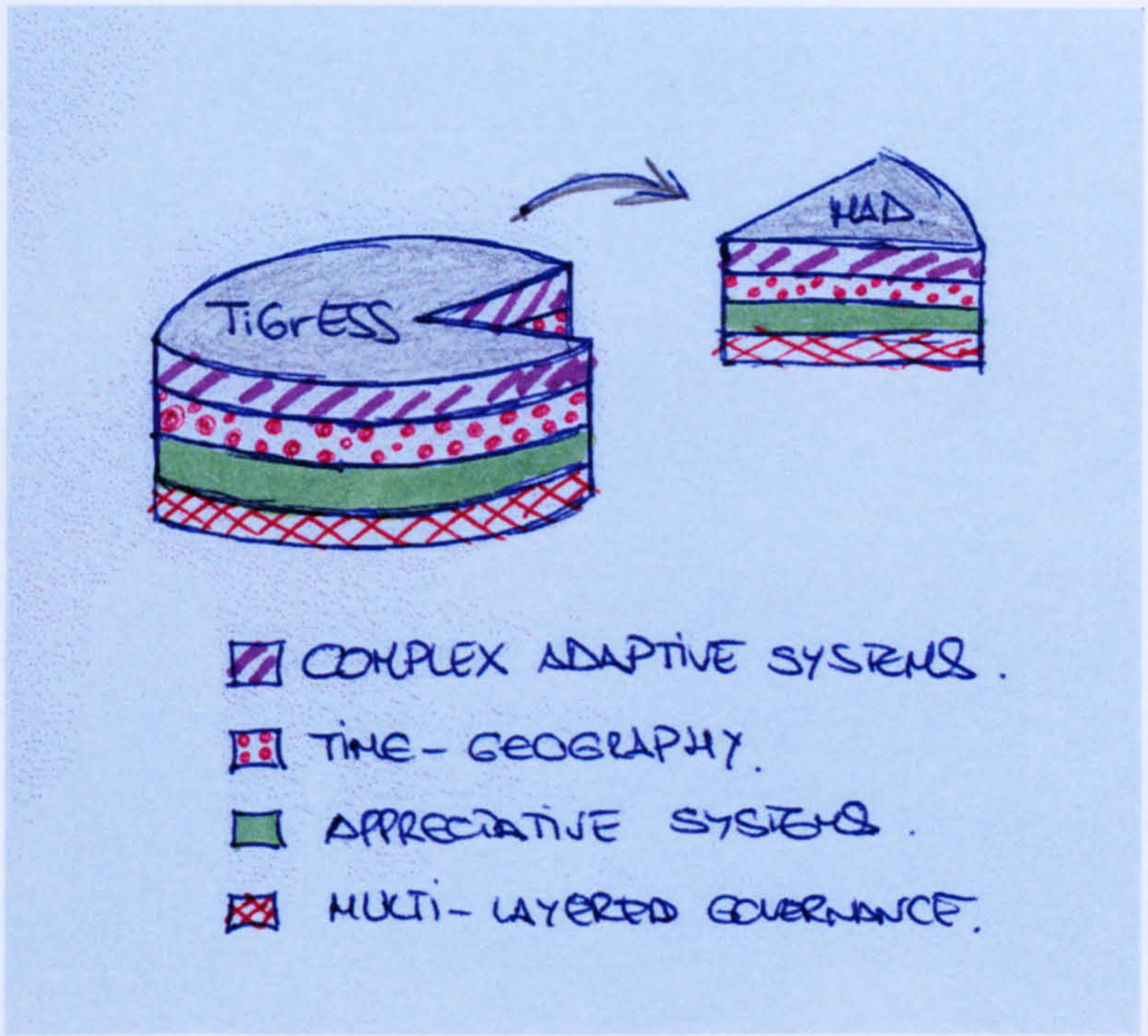
Table III.2. Differences between AS and T-G approaches

Appreciative System	*Time–Geography*
Conceptual Modelling	Complex Adaptive System
Definition of problems	Solving problems
Bottom-up approach which negotiates boundaries	Top-down approach which assumes boundaries are fixed
Discursive process	Analytical process
Participatory	Executive
Managerial and responsive	Regulatory and Normative
Ethically proactive	Ethically reactive

Source: Own work based on TiGrESS project.

The Madrid case study team within TiGrESS built a conceptual model, which is reflexive, realistic and is embedded in the landscape. It is based on the learning process from the past. The 'modelling process' is not objective, as it has the specific purpose to provide stakeholders with quality information about policy-making to encourage sustainable actions in the development of Madrid. Thus, to recapitulate, the figure below (Figure III.1) shows how TiGrESS produced its conceptual structure to support the different case studies: Madrid case study – "*Land planning and pathways to sustainable agriculture in Madrid*".

Figure III.1. Madrid case study, a *'slice'* of the TiGrESS *'cake'*



MAD (in the figure above) is the abbreviation of Madrid case study

Source: Own work

Actually, with the AS approach, Vickers hoped to encourage a fresh start in refinement of the democratization of policy-making, which could be strengthened through a critical dialogue. The writer used the appreciation concept to enable societies to manage the future differently. Forester (1995) explains *"…when Vickers suggests that the role of planners and policy advisors is to inform decision makers and the affected public regarding policy choices, we know full well that means that advisors must not only communicate facts but refine and educate the public's and decision makers' evaluations as well, to cultivate their appreciation of the situations and possibilities they face."* (*ibid* 1995:69). So, this notion of appreciation facilitates the encompassing not just the relevant facts of policy options, but also, of the organizational process of planning and policy-making itself (Bryson & Crosby 1993; Healey 1993).

In many respects, Vickers anticipated later developments in governance theory, when he wrote about innovation in policy-making (1965, 1968), like Hägerstrand anticipated developments in complex adaptive systems and agent-based modelling. The process of changing the condition of ordered rules referred to a new process of governing, which would introduce the principle of hierarchies of power (devolution or decentralisation) and the horizontal and vertical networking (layered governance). That is why, the writer decided to make connections to recent work on multi-level governance (Rhodes 1996; Healey *et al.* 1997; Hajer and Wagennar 2003; Bache and Flinders 2004; Pike, Rodriguez-Pose and Tomaney 2006).

III.3. INNOVATION: PUTTING IT ALL TOGETHER

As Winder (2005a) explains, the challenge for integrative researches and policy makers is to develop models able to represent cultural eco-dynamics as individuals and communities actually experience them. It seems intuitively obvious that one approach to integration would be to explore ways of modifying appreciative settings (helping people consider unfamiliar ideas and ways of thinking) and developing appreciative systems (institutional structures and networks) within which stakeholders (researchers or outsiders) can explore policy initiatives. Ideally, the writer wants to facilitate innovation, but not simply the conventional view of innovation as a change in business practices that leads to economic growth. TiGrESS sees innovation as a change of beliefs leading to a change of behaviour. The individuals and communities will innovate because they will perceive opportunities or threats that actually change the way they behave and so change micro-scale dynamics. Researchers within the TiGrESS project have become more interested in a wider social model of innovation: Winder Ed. (2006), Sanders *et al.* (2006) and Dürrwächter (2007). This thesis also explores innovation in the Madrid context.

The role of innovation in governance is an emergent issue and a current subject of the contemporary research (Healey *et al.* 1997; Morgan 2005; Gonzalez and Healey 2005; Morgan 2006) and this research aims to contribute to that discourse. It attempts to integrate a regional vision into the complex land planning system and that is why the writer discusses the need for alternative modes of local governance and the stakeholders' role to innovate in the governance institutions. The principal intention of

this chapter, from now on, is to find the linkages between planning and governance in a devolved and globalised time.

Planning establishes (or imposes) constraints as it is normative and regulates; conversely governance delegates power and relaxes constraints; helping bottom-up actions happen (e.g. regionalism). The process of combining both, alternating rules and liberating constraints, demands a new approach to empowerment in policy-making (Stoker 1988; Bryson and Crosby 1993; Healey 1993). The writer uses this approach along the thesis to explore the possibility of using the model of innovation in the Madrid region.

To begin with, a literature review in both topics is undertaken. The issue of local governance unfolds from a general background in global planning, investigating the Spanish situation more thoroughly, including upwards to the European Union sphere and, downwards, to the region of Madrid.

III.4. GLOBAL PLANNING

"Globalization, for one, is bringing about major changes in the institutional structure, processes, influence, and scope of planning." (Friedmann 2005:184)

Globalisation and regional development are the two faces of an ongoing process that tie local realities into a global network of information and markets (Scott 2001). The key link between globalisation and devolution is the future role of regions and cities in the international context. The expansion of planning scales has caused unprecedented changes of governance and planning in the region. The term 'city-regions' (Scott 2001) refers to large territorial platforms that deal with the new multiple scale. The function of the regions has been emphasised to respond to the emerging effects such as local labour markets, global corporations, social segmentation, expansion of the urban fringe, cross-border pressures and so on. The devolved governments use their bottom-up policies to tailor policy in order to favour regions and cities (OECD 2001). New frameworks of regional governance, flexible and adaptive institutions, would promote undoubtedly innovative ways of achieving integrative and cooperative regional

development within the global context (Keating 1988; Healey 1997a; Healey *et al.* 1997; Keating 1998; Hajer and Wagenaar 2003; Jessop 2004).

The growing network of global communications has shaped the main differences in the ways that planning is conceived, institutionalised and carried out. This diversity is shown by the fact that society is often developed in local worlds, and thus citizens react differently to the multiple driving forces.

Healey (1997b) sets the framework of spatial planning as the *"...principles to guide the location of development and physical infrastructure..."* (*ibid* 1997b:2). Spatial planning consists of a set of projects, plans, strategies and policies approved by the government to regulate development. The socio-economic tendencies shape these planning practices creating demands of land use that are mediated by local, regional and national political systems. Planning practices are, nevertheless, not only responses but also active forces through actions such as investment decisions and regulations for land use change that generate constraints and opportunities and shape the regional dynamics. They involve multiple stakeholders, 'each of whom brings knowledge to the table' (Friedmann 2005) from the regional or local government as well as from social movements and the private sector.

Friedmann (2005) compiled a selection of planning cultures which reveal the enormous variety of existing institutional, cultural and political sceneries. Differences between countries concerning the institutional settings (unitary states, federal states, states that belong to the European Union and states in constitutional transition) influence planners' decision-making (what and how they can do it). Urban growth, and consequently agricultural abandonment, is another criterion tightly linked to the different level of economic development achieved. The flows of rural migration to cities in the poorer countries provoke a rapid urbanization. Meanwhile, in the richer countries, which have more mature urbanization processes, the flows of migration have inter-urban and foreign origins. However marked differences in political culture are significant, especially the autonomy of local governments, the degree of transparency of the political process, the number of existing political parties, whether the organized civil society is an active participant in public decisions or not, and so on.

The last aspect considered in respect of this diversity of planning cultures is the differential role of the civil society in regional planning. Local stakeholders pass from being absent from the governmental hierarchy to belonging to an empowered civil society, which is engaged in lobbying and plays a significant opposition role in the municipal decision-making sphere.

Given this variety of world planning cultures and a new 'institutionalist' perspective in public policy and social change (Morgan 1995; Healey 1997a; Keating 1998; Fun and Wright 2003), trends of planning are emerging. A strategic planning effort evolves from the 1980's as a new growing influence of lobby groups and civil social organizations (mainly related to environmental issues) on local policies. Planning is moving from a traditional discipline based on restraining (e.g. zoning legislation) towards a current trend that seeks to facilitate development through markets (Friedmann 2005) and governance (Keating 2001).

The most important institutional changes are being set up in Russia, South-Africa, China and Japan. Meanwhile, the discussion about 'which planning powers belong to each level of governance' continues in Western countries. Some indicators of this perspective of change involve novel partnerships between state and devolved governments at regional level (OECD 2001), including asymmetrical devolution of competences and the inclusion of the European Union into local initiatives.

"Global planning principles are needed (...) but cannot be applied directly. They must be worked into existing ways of planning, into the local traditions." (Friedmann 2005: 213). These institutional changes over the last decade with a simultaneous internationalization and decentralization of political and economical issues have set up the *"...shift from government to governance..."* (Swyngedouw, Moulaert and Rodríguez 2003: 21)

III.4.1. European Planning

In 1999, the fifteen European Union Member States committed themselves to adopting the "European Spatial Development Perspective (ESDP): Towards a Balanced and Sustainable Development of the Territory of the European Union". The incorporation

to the Union of up to twelve states from Central, Eastern, and Southern Europe was on the horizon. ESDP is the policy framework for making planning decisions and, although each country has its own responsibilities, there are some main guidelines proposed. It advocates multi-sectoral guidelines for promoting communication concepts that integrate cities and regions, which leads to a multi-scale planning approach. City-regions are supported as dynamic centres of economic growth. The European Commission proposes networks such as inter-city networks for their potential role in regional development, in an attempt to devolve decision-making to the lowest possible level. Conservation of the natural and cultural heritage is another relevant issue which contributes to the maintenance of regional diversity (European Commission 2003c).

A growing gap between cities and countryside is recognised both inside the European Union (Economic European Community 1996) and in the academic world (Llobera 2000; Naredo 2000; Altieri and Moreno 2001). Antrop (2004) noted that land planning is focused on satisfying the society's growing needs, industrial development, recreational issues, including tourism and housing needs. Transport infrastructures, urbanization and tourism are strongly linked to the gap that has deeply influenced the land planning processes all over Europe. Therefore, unless the capacity of government to change (See *'Adaptive Governance'* in pp. 29) into a new management of regional governance is investigated, the new partnerships will not succeed.

III.5. GOVERNANCE AS A NEW FORM OF GOVERNMENT?

Accompanying the global transformations, the use of the term governance became popular, not as a synonym for government, but rather *"...signifies a change in the meaning of government, referring to a new process of governing; or a changed condition of ordered rule; or the new method by which society is governed."* (Rhodes 1996: 652-653)

Stoker (1991) explained that the profound European political changes have emphasized the efficiency and viability of local governments, introducing new trends of local government. At one time, local government systems were placed as a solution to financial problems, but the challenge of local governance goes further. The new

wave of thinking was *"...to find more responsive and effective organisational forms..."* (Stoker 1991:3).

To understand the distinction between government and governance, it is useful to explore the nature of the European Union (hereafter referred as EU). The EU is clearly not a government in the sense that national governments are in the nation-state system. What has emerged is a complex set of overlapping and nested systems of governance involving European, national, regional and local actors, groups and networks (Loughlin 2001: 20).

Government reform is a very popular topic worldwide; at supra-national institutions (e.g. the OECD -Organisation for Economic Co-operation and Development-, World Bank and the EU), within local governments and civil society organisations, in the academic world where its study is filling the libraries, and it is shaping the new programmes of international cooperation for developing countries. Governance might lead to an empowerment of the citizens in the community, by releasing the rigid bureaucratic mechanisms. These emergent bottom-up approaches of local and regional development would tackle the failed centralization and the challenges of globalization (Pike, Rodriguez-Pose and Tomaney 2006).

According to the World Bank (1992), the meaning of governance is 'the exercise of political power to manage a nation's affairs'. Young (1992) defined it as 'the structures and processes by which societies share power, shapes individual and collective actions'. Rhodes (1996) added a contribution to analyse the change of the government 'governance refers to self-organizing, inter-organizational networks'. Stoker (1998) defined by governance 'creating the conditions for ordered rule and collective action'. The OECD combined several definitions to provide its own: *"Local governance is in constant evolution as government, business and civil society experiment to find the optimum methods for them to address issues of common interest jointly. (...) By concentrating an endogenous development, regional strategic platforms, partnerships, open governments and other agents of change have succeeded in releasing the potential of their area thanks to better co-ordination, adaptation to local conditions and participation."* (OECD 2004: 9). Whilst, more recently, Lebel *et al.* (2006) understand governance as the structures and processes by

which people in societies make decisions and share power: *"... (Governance) can be formally institutionalized or expressed through subtle norms of interaction or even more indirectly by influencing the agendas and shaping the contexts in which actors contest decisions and determine access to resources."* (Lebel, Anderies, Campbell, Folke, Hatfield-Dodds, Hughes and Wilson 2006:2). To sum up, new meanings of governance evolve from the wide variety of uses of the term.

'Endogenous development' -local development from within- seeks for endurable regions and cities, reinforcing the regional autonomy through public investment (education, housing, health care and other neglected sectors) for a long-term ability to enable local areas to compete globally. The achievement of this inner development is a political issue. So far, the parties in the government have also been involved in fostering the formation of partnerships and networks that enable the mobilization of the civil society. Herrschel and Newman (2002) identified this phenomenon when the Labour government, in 1997, set out its new administrative reform in the United Kingdom, favouring a new approach to regional development: *"...build up the voice of the region..."* (Herrschel and Newman 2002:123)

The role of the civil society organisations (so-called CSO)[1] or the 'power of the local' has always been considered a key issue by politicians and planners at both the regional and national levels. These community-based organizations, according to Ward (2002), helped to build democracy and promoted internationalist social movements at the intersection of ecology and human rights, facing a direct challenge to the globalisation era. Healey perceives, during her research, the difficulties of politicians and planners in grasping the citizens' demands, despite being aware of their electoral power (Healey *personal communication* in Friedmann 2005). Therefore, essential steps ahead are the development of regional development agencies and reducing central policy-making.

Among the values needed in open governments is the fact of recognising an attitude of planning with differences, and creating partnerships between civil society

[1] CSO include social and political movements, environmental organisations, trade unions, citizens' organizations, non-governmental organisations (NGO) and so on.

organisations, local and national governments. Pike, Rodriguez-Pose and Tomaney (2006) consider partnerships as a tool by which the governments manage their new competences. These partnerships represent the real difficulties in the networks of governance. Conflicts between groups will exist, but violent confrontations should always be avoided. The city of Porto Alegre is a pioneer in the use of a participatory budgeting system, as an example of such partnerships. Porto Alegre is well-known as the capital of the state of Rio Grande do Sul where the Workers' Party gained political control from the 1990's (Rodriguez-Pose and Tomaney 1999). *"...the participatory budget is a small policy with small objectives - bringing ordinary people into the discussion of how to distribute basic investments among their neighbourhoods..."* (Abers 1998:63)

III.6. SEARCHING FOR THE LINKAGE BETWEEN PLANNING AND GOVERNANCE

Planning is embedded in local governance as the governmental institutions and the civil society organisations work on this level to embrace their collective concerns. Thus, politicians, planners and associations' leaders have a close relationship or consensus process or active participation among them, depending on the country.

The role of national governments in management is being weakened while that of regional and local governments is being strengthened in an important effort to create new institutions (Hooghe 1995; Keating 2001; Jessop 2004; Friedmann 2005). However, despite this growing decentralization, the EU and national policies still affect regulations in the local planning systems. Since the mid-1980's public institutions have made significant moves towards spatial strategy development. Strategic planning emerges in different ways depending on the roles of the governments in different countries. The fact that many of the planning systems have three layers of policy plans (national, regional and local) is also relevant. Spain, in particular, is one of the countries with significant devolution of responsibilities from central government towards the regions and municipalities. The devolution -transfer of power- and reorganization of government responsibilities began in the early 1980's, after the end of Franco's dictatorship. This process is known as 'asymmetric devolution' in the Spanish regionalised state (OECD 2001). The institutions have re-adjusted, concurring

with the innovation of strategic planning in Spain (For further information on *Regionalism,* see pp. 37).

III.6.1. The need of Innovation in Planning

"Planning needs to become more innovative, less regulatory and more entrepreneurial..." (Friedmann 2005: 228)

In the decade of the 1960's, Vickers debated the legitimacy of planners and policy-makers in their responsibility for policy-making as he wrote about innovation in policy-making: *"Innovations occur in the appreciative field and spread from their originators to others. Potentialities, formerly ignored, are noticed and become potent as norms; and often the proximate cause can be traced to the individual who first saw what might be and prized it as what should be, and cried, Look! and caused his fellows to see and to value, and in time to realize, what he first saw."* (Vickers 1965: 112). Later, Habermas' work (1984) helped to characterise the boundaries of communication between public and private institutions. More recently other contemporary researchers (Forester 1995; Morgan 1995; Healey 1997a; Morgan 2006; Gunderson *et al.* 2006; Westley 2006) have agreed with the need for considering land planning for communities, and, consequently in a broader context, the need for innovative practices in regional planning. These experiences of discovering new institutional arrangements should be understood as part of a social and political learning process that will require the critical assessment of the different agents involved.

Strategic planning has become known more recently as 'dynamic action planning', as part of this innovative focus. It opens a dialogue that brings together all the relevant stakeholders (from local administration, corporate sector and organized civil society to even the multi-national level) in an interactive process that facilitates collaborative planning. The collaboration occurs because none of the actors alone has the ability to plan what they want to do without the voluntary collaboration of the others. Ward (2002) has studied some examples in the United States of America: where planning is a local responsibility mainly motivated by private interest; and city builders, organized civil society and the judicial system have more influence than the mayors do.

The new forms of governance have brought institutions at different geographical scales, non-governmental organizations (NGO) and other agencies involved in planning, to participate in planning development. The decision-making procedures have been transferred to the private sector in a partial privatization of the government system. Local development as a model for planning requires the implementation of policies at the lower territorial scale. Earlier research sponsored by the EU (Winder and van der Leeuw 1997) has shown that such kind of initiatives often result in conflicts of interest and social exclusion, particularly in small and rural communities. Swyngedouw, Moulaert and Rodriguez (2003) claimed *"...the proliferation of governing bodies has diminished the transparency of the decision-making process and renders it more difficult to disentangle and articulate the power geometries that shape the decision-making outcomes."* (*ibid* 2003:22). The result is a new scalar form of governance, characterized by a multi-scaled articulation of institutions and agents with varying degrees of power and authority. The challenge is to find ways of managing these processes without destabilising the intermediary or small-scale systems they are intended to support.

III.6.2. Complex Adaptive Systems as a perspective to improve regional development

Globalisation brings economic growth and environmental protection into a zero-sum conflict. These conflicts are often tackled at supranational levels but the situation is aggravated at local level where accidents of history and cultural norms make it hard to achieve compliance.

However, environmentalists and economists are increasingly interested in knowing about innovative views. The approach of complex systems is an extension to systems theory found in physics and computer science, as well as in biological and ecological contexts (Nicolis and Prigogine 1989). Dietz (2003) claimed *"...the systems examined by the social and environmental sciences are complex, adaptive and fraught with indeterminacies."* (ibid 2003:1). Winder (2006a) argued for 'a level of *coarse-graining* (see also Gell-Mann 1994) or middle ground where useful models can be built somewhere between the specific that has no meaning and the general that has no content (Boulding 1978)'. A complex adaptive system is a bounded collection of interacting components some of which are systems themselves. It has a purpose and flexible responses (adaptive

potential). Any changes introduced into the system may generate unexpected effects and the capacity for adaptive changes depends on the learning process between the individual interactions within the system.

Innes and Booher (2006) claim that the complex adaptive systems thinking brings an alternative approach to sustainability (and to regional development too) because the world is considered a self-organising system, in constant change where the components are constantly changing in response to inner and outer conditions. A sustainable complex system is in continuous adaptation or alteration, which implies that sustainability is about process. Complex adaptive system *"(...) provides planners with ways to understand the interrelationships of economics, public finance, and the environment (...) part of this new thinking involves accepting the surprising idea that control is neither possible nor desirable, but that giving up the goal of control does not mean giving up."* (Innes and Booher 2006: 240). The systems involve networks of relationships between many components, which interact in both competitive and collaborative ways, so that they co-evolve and mutually adapt themselves to each other.

III.7. COLLABORATIVE PLANNING AND ADAPTIVE GOVERNANCE

III.7.1. Collaborative Planning and Consensus Building

'Collaborative planning' (Healey 1997a) is understood as an alternative mode of governance in response to the need for consensus building among stakeholders, and the challenges for designing new institutional mechanisms. It is an emergent policy making technique. It addresses the way to build an alternative to strengthen public planning (policy driven and with many conflicting interests) as the main force that shapes the territory instead of the market. The transparency of this process is ensured by the public audit and control systems. This maintains the tendency to guide towards sustainable planning. The achievement of a collaborative policy-making demands professional skills and special training, as Dietz (2003) said 'all good decision processes are learning processes'. Habermas (1984) described the prerequisites for an authentic dialogue in the 1980's. Fairness, a democratic principle that is widely accepted, vanishes when there are a large number of people involved and, thus, controversies and conflicts emerge. However, collaboration will not succeed in spite of the fact of authentic dialogue. Diversity and interdependence are also required from

the stakeholders to enable responding with creativity and creating an adaptive system. The inclusion of the stakeholders involved in any way in the process of policy-making is essential to avoid excluding stakeholders who, either powerful or weak, could compromise the endurability of any agreements reached. The absence of stakeholders, even if they were not powerful enough, would mean the difference between effective and ineffective strategy. Two major changes of the system 'sharing meanings and sharing identities' would increase stakeholders' will to seek voluntary collaborative processes in the long-term, and consequently construct a more adaptive system (Innes and Booher 2006).

Healey (1997a) refers to 'shared-power' worlds, a term introduced by Bryson and Crosby (1992), as a new mode of empowering stakeholders at the level of community (i.e. regions, neighbourhoods or municipalities) where they actually live, co-exist under the same rules and thus are sometimes in conflict. A major adaptation of the system is the development of new processes of learning from past experiences based on local knowledge. Eventually the collaborative policy-making that emerges is genuinely innovative, not only in theory, but also in new practices and bodies in which the institutionalised arrangements are social constructions rather than real limitations. Experiments of collaborative dialogues at the local level are bringing agencies together to deal with local planning issues. The creation of Local Development Agencies at the intermediary level (between *comarcas* -an administrative level between region and municipality- and municipalities) is a key role in adapting policies to the local reality in Spain, as the EU programmes are encouraging.

Consensus, though difficult, is at least possible because we are no longer playing a zero-sum game in which we can find situations such as 'I win, you lose'. Although, collaborative planning is time-consuming, it might be the more flexible approach to solve the institutional challenges (Healey 1997a; Winder 2004, Winder 2005b).

III.7.2. Adaptive Governance of Social-Ecological Systems

'The reason boundaries exist where they do is that they are tested periodically' (Holling 1978). 'Adaptive management' is an approach more used to dealing with the ecosystem complexity than management itself (Folke *et al.* 2005). Lee (1993) applies the

concept to the design and the implementation of natural resources and environmental policies. The adaptive approach is highly advantageous when policy-makers face uncertainty and, when the policies become hypotheses to test, there is active adaptive management (e.g. see Table III.3.)

Table III.3. Institutional conditions favouring adaptive management on the Columbia basin program

Allocation of unprecedented funding to the rehabilitation of a river drainage
There is a mandate to take action in the face of uncertainty.
Decision makers are aware that they are experimenting anyway.
Decision makers care about improving outcomes over biological time scales.
Resources are sufficient to measure ecosystem-scale behaviour.
Preservation of pristine environments is no longer an option, and human intervention cannot produce desired outcomes predictably.
Theory, modes and field methods are available to estimate and infer ecosystem-scale behaviour.
Hypotheses can be formulated
Organizational culture encourages learning from experience.
There is sufficient stability to measure long-term outcomes, institutional patience is essential.

Source: Lee (1993: 63)

Institutional collaboration and sharing knowledge are tested as part of the dynamic and self-organized process of learning by doing, in 'adaptive co-management' (Walters 1986; Folke *et al.* 2002). The sharing of management power and responsibility (Olsson *et al.* 2004) involves multiple institutional links among governmental and non-governmental stakeholders.

Uncertainties and constant changes are characteristics associated with local social-ecological systems. The sustainability of these systems is determined by the capacity to cope with alteration and innovation, which is represented by 'resilience' and

'transformation' itself. On the one hand, resilience (Holling 1973: 14) means the capacity of the system to absorb change and reorganise itself. By eroding the resilience of a specific system, it means maximising yields. On the other hand, transformation refers to changing the previous state of the system. A transformational change involves evolution to a new system (Lebel *et al.* 2006). The regional or local system yields an administrative hierarchy, a mixture of social groups, a complex ecosystem in the landscape, all with their own set of stakeholders. *"Interventions in social-ecological systems with the aim of altering resilience immediately confront issues of governance"* (Lebel, Anderies, Campbell, Folke, Hatfield-Dodds, Hughes and Wilson 2006:1)

In searching for the features (or functions) that governance has to encourage the capacity to manage resilience or transformation, some of those to be considered are participation, empowerment, deliberation and multi-layered organization. Deliberation and participation of particular groups of stakeholders, and society in general, leads to sharing understanding between the different levels of the multilayered institutions, improving the response of the different groups of the society (Dryzek 1999). The existence of different points of view demonstrates that participation neither makes agreements easier nor reduces bureaucracy practices (van der Leeuw 1994). There is a common argument which says that the multi-layered actions have unsuccessful results due to overlapping agreements. Nevertheless, these kinds of institutions provide a vertical exchange of information and accountability between levels (Young 1992; Berkes 2002). However, beyond these characteristics, the society's ability to deal with adaptive management, adaptive behaviour and adaptive cycle (Holling 1986; Folke *et al.* 2003; Olsson *et al.* 2004) is the only condition to making a transitional change. The possible management interventions of the authorities at the regional (or local) scale are minimal if compared with the full effect on the social-ecological system if all the potential stakeholders are involved.

The approach of adaptive governance requires a social-political and ecological adaptation. *"Adaptive governance involves devolution of management rights and power sharing that promotes participation."* (Folke, Hahn, Olsson and Norberg 2005: 449). Dietz *et al.* (2003) used this notion to enlarge the social context of the ecosystems. It is based primarily on building knowledge, networking and leadership, as every political

change has been preceded by a new approach to networking - scientific community, management groups or new political arenas (Olsson *et al.* 2006). Rapid change and ecological crises can provide windows of opportunity that trigger the emergence of networks and promote new forms of governance (Folke, Hahn, Olsson and Norberg 2005). For instance, within the region of Madrid, initial conflicts on environmental issues turned into political and organizational consensus (See *'Governance System in Madrid'* in pp.40)

The Resilience Alliance (see http://www.resalliance.org), looking for the ability of different local experiences to improve resilience in a long-term sustainability, explores case studies in Australia, the USA, Sweden, Indonesia, Thailand and Canada. Public authority, flexible stakeholder networks, empowered municipal-level social organizations (with higher knowledge of the communities) are part of the governance arrangements observed. An adaptive institutional form can be achieved including a cooperative, networked community sector, mediation agencies, collaborative neighbourhood community policing and self-organizing local and regional collaborative planning processes, bringing businesses and social and environmental interests together with community leadership to develop plans through dialogue. The need to empower the capacity of society to explore the sustainability of regional and local complex systems is critical, as is the stakeholders' role in it.

III.8. MULTI-LEVEL GOVERNANCE AND NETWORKS

Society, institutions and authorities play on different spatial, temporal, jurisdictional and social scales, and so they constrain shifting levels to serve their own interests. The concept of scale is considered from the 1980's (Lefebvre 1976; Harvey 1981). Scale emerges from the socio-spatial character of the perpetual transformation of places; it refers not only to geographic scales but also to social and political terms. Temporal and spatial relations always become the embodiments of social relationships of empowerments and dispowerments. Giddens' theory of structuration (1984) emphasised the powerful forces between culturally shaped structures and individuals. The capacity to make use of scale typically varies greatly among stakeholders (Swyngedouw 1997 a,b; Swyngedouw, Moulaert and Rodriguez 2003). *"Scale is shaped by the understanding of actors, and is likely to be an on-going, dynamic, economic and political*

process..." (Lebel, Garden and Imamura 2005:1). The knowledge of every stakeholders' interests in each scale would provide information of the multi-level system of interests. The empowerment of the stakeholders needs to work across different jurisdictional and administrative levels, improving the abilities of the less relevant players in the decision-making process. However, the scale at which a problem is discussed may not correspond to the scale of the decision-making level. As Lefebvre (1976) argued, the state or whatever scale of government -local, regional, national or international- is always spatially organized because its interventions are spatial strategies that regulate social and physical relations. The scale of governance, then, becomes an integral part of the tactics and strategies to mediate and control tension and social conflict.

Without new mechanisms of governance, the complexity of crossing-level dynamics as well as the scale-dependent governance challenges will be unavoidable (Young 1992). There is a new scale of governance. New political forms have added to the term of governance some new features: multi-level, multi-layered, multi-tiered, polycentric and so on (Marks and Hooghe 2004). Multi-level governance creates possibilities for moderating vertical and horizontal interactions among institutions at various territorial levels. It involves the institutionalization of self-organization among multiple stakeholders across several scales of territorial organization (Jessop 2004). This is crucial in the regional system, because it is a scale subject to external influences (e.g. regulations, the environment) and to overlapping of coordination and responsibilities (Berkes 2002). Bache and Flinders (2004) seek an appropriate multi-level governance by encouraging the building of 'vertical networks' that are understood as sectoral strategies, and 'horizontal networks' that are identified as spatial strategies. Innovative dialogues bring diverse stakeholders from different levels to share their knowledge in local spaces of deliberation (Dryzek 1999). The promotion of alliances and coalitions including a large number of stakeholders is a good strategy for the weak lower levels as they can claim legitimacy through the weight of numbers to shift the level of planning and coordination upwards or downwards (Lebel, Garden and Imamura 2005).

In order to understand the need to strengthen the multi-scale networks, it is necessary to recognize them as the real exchange of information (flows of relationships, competition, negotiations and conflicts) between scales, places and positions. These exchanges between spaces extend the spatial context of decisions where stakeholders have their relationships. The interactions between places refer to the power relations among stakeholders who interact at the same levels, while the relationships between positions describe the connections among linked locations (Healey 1997a). These multiple exchanges of information between stakeholders are the basis to build networks. This process will change networks already established and new conflicts will emerge as well as building up institutional capacity.

In mathematics, a network is a set of nodes and connections. Nodes and connections are assumed ontologically fixed and robust. The mathematical theory of networks is called *graph* theory and provides a valuable set of analytical tools for cybernetics. Cybernetics is an approach to the study of information flows (e.g. it is important in computer and communications networks). In cybernetics, nodes are assumed to be robust but connections can be weakened and strengthened. Examples include a telephone network or a road network, both of which can be modellised using cybernetic methods, which are an analytical approach to communication systems (Winder 2005a).

In social network theory, however, both the connections and the nodes are socially constructed. Nodes can be institutions, self-organized groups or individuals. The creation of new modes and patterns of interaction is a form of innovation. In political network theory these innovations are sometimes described in terms of 're-scaling' the state (Swyngedouw 2000). The 're-scaling' concept explains the emergence of 'glocal' forms of governance. It takes place, on one hand, through the formation of new elite coalitions, and on the other hand by the systematic exclusion of politically and economically weaker social groups. Re-scaling (re) defines and (re) works in the power relationships between society and state. Swyngedouw (2000) claims, such homogenization of regional spaces erode diversity and difference in highly oppressive ways.

The writer is exploring ways of connecting discursive and analytical systems, so it is important to understand how discursive practitioners deal with networks (particularly in the planning and governance literature). Castells (1996) explores networks in terms of dynamic players predisposed to innovating within the current globalisation time (he also calls it 'information age'). The 'network society', Castells (1998) says, is the successor of the industrial age, as the local level becomes absorbed by the global one: *"the space of flows...dominates the space of people's cultures* (space of places)" (*ibid.* 1998: 349; Friedmann 2000).

The OECD (2001) defines networking as the connection that happens through channels that require the building of trust to increase flexibility and innovation among all the partners. The European Commission adopted this model of networking, through the implementation of the 'White Paper on Governance' (OECD 2001). Romano Prodi (the president of the European Commission) addressed European Parliament as follows: *"we have to stop thinking in terms of hierarchical layers of competence separated by the subsidiarity principle and start thinking, instead, of a networking arrangement with all levels of governance shaping, proposing, implementing and monitoring policy together."* (OECD 2001:52).

Innes and Booher (2003) recognised a 'well networked system' when the networked relationships give each stakeholder enough feedback to allow the system to 'act more intelligently'. Jessop (2004) referring to Castells (1998) argues that the European Union combines the control of decision-making by national governments and the management of European justice and business, as a 'network state'; while Healey (1997a) brings collaborative planning as a governance activity to improve the consensus between different stakeholders.

Most of these examples seem to be *value judgments.* They are based on the assumption that the EU (or some other political institution) would work better if it was a 'well defined network'. It has become almost an axiom of governance theory that enhanced information flows between stakeholders and regulators will improve the management of cultural and natural resources. However, this is not self-evidently true; these are *value judgments.* Although, not all the examples are making a *value judgment.* Jessop

(2004) appears to believe that EU really is a complex set of intersecting networks and that the 'network state' is a new form of social organization. However, it is far from clear that this is true, as Jessop himself admits, referring to the network metaphor as 'overworked' (*ibid.* 2004: 58).

In the 1960's Bertalanffy (1968) advocated what he described as general system theory, arguing that institutions really are systems comparable in some respects to biological organisms and that analytical methods can be generalized to these social systems. It is now clear that there are actually rather fewer social systems *out there* than Bertalanffy would have imagined (Winder 2005a). It is quite possible that we will soon discover that the network metaphor is nothing more than the general systems metaphor in disguise and that there are actually rather fewer social networks *out there* than network theorists claim. Pike, Rodriguez-Pose and Tomaney (2006) are clearly sceptical and suggests that some of these network-based theories are untested, *"...a matter for empirical verification..."* (*ibid.* 2006: 129) and that these new forms may contain *"... new difficulties rather than simple solutions to problems of representation and governance."* (*ibid.* 2006: 129).

Bear in mind that the conceptual modelling approach of this project is based on appreciative theory, which requires connection between *reality judgments* – which processes and products exist, *value judgments* – why they exist, and *operational judgment* –what actions are consistent with those values. There appear to be few *operational judgments* in the above statements beyond Healey's statement that collaborative planning (a discursive approach to networks) may help improve knowledge transfer between stakeholders at different levels. This seems to represent a more coherent perspective because it allows us to discuss whether the patterns of communication we observe among stakeholders correspond to what we would expect from a well-structured network.

The writer will attempt to extend this approach and has borrowed a range of discursive tools as needed to see whether we can operationalise robust networks for land use planning in the region of Madrid. With this in mind, the writer now moves to the topic of regionalism, which is clearly relevant to the Madrid case study.

III.9. REGIONALISM

The role of the regions as essential spaces and as actors in national and global politics marked the last period of the twentieth century (Scott 2001; Keating 2001). Concurrent with that, globalisation is the other side of the coin (see pp. 19). The reinvention of the forms of territorial management was the emergent element in the political life in the 1960's, after the first territorial politics in post-war Europe (Keating 1988). Regional government emerged when it was apparent that there were distinct priorities and needs of planning (i.e. urbanization, industrialization, mobilization and so on). Regionalization indicates an important issue, the involvement of local governments in the process of globalization (Castells 1996). Territorial identity has acquired an important role in the links between global developments and individual experiences. Local and regional governments have served to enhance the importance of the territory. Culture adds another element also to the reinvention of the territory, social movements (i.e. environmentalist groups) have raised the importance of territory in politics (Keating 1996). However, the truly driving force of regional development (decentralisation) has been the economic competition that depends not only on effective policy but also on the importance of place (Keating 2001; Herrschel and Newman 2002). The new regionalism found opportunities for regional and local authorities after the new political environment within the EU (at the end of the decade of the 1990's), where principles of subsidiarity and partnership – *"regional cooperation and regional scale planning"* (Herschel and Newman 2002:206) have been reinforced as part of the strengthening of political action (Loughlin 2001).

III.9.1. Regional Governance in the Spanish context

The regional development policies during the Franco regime were pushed through entirely from the centre. The regime combined state subsidies with private enterprises to promote an industry force; *"on the contrary, the attempt to reduce everything domestically evaded the strategic choices which are the essence of planning"* (Keating 1988:148). Centralism and authoritarianism were the most relevant features of the Spanish state until the 1978 Constitution (Aja 2001). In the mid-1960's, Catalonia, the Basque Country and Madrid started to suffer problems of internal migration, and inadequate social and physical infrastructures. Territorial planning could no longer be

avoided and Spain was pushed to the idea of regional planning and restructuring territorial government (Keating 1988). After voting in favour of the constitution, a spirit of consensus to tackle the problems of the public administration reform was of special importance in establishing the territorial power for the self-governing regions, the future autonomous communities. The decentralisation[2] process was encouraged and, by 1983, the autonomous communities emerged. However, different levels of autonomy were adopted as the competences depended on the different arrangements or pacts between region and the state (Morata and Muñoz 1996; Aja 2001; McLaughlin *et al.* 2002). The differentiating factors (Aja 2001) between the regions are language, civil law, special funding arrangements, intermediate institutions and autonomous police force. Spain is divided into regions, called autonomous communities (*Comunidades Autónomas* in Spanish), which are subdivided into provinces and municipalities, which constitute the local level. Stewart and Stoker (1989) associated the concept of local government with an agency for the delivery of services, but this assumption was substituted by the notion of community government, based on the needs faced by local communities. The Spanish Constitution recognized about 8,000 municipalities, which guaranteed administrative autonomy. In terms of creating territorial politics or management, it represented a difficult attempt to create sectorial policies strongly decentralised based on local administration (Morata and Muñoz 1996; Aja 2001)

The devolution of power took place in three tiers of responsibilities shared between the two main layers of administration: a) Government structure, territorial organisation, regional planning, agriculture, tourism, culture, education, and so on are responsibilities of each of the seventeen autonomous communities. b) Environmental and employment policies as well as labour legislation are shared responsibilities between the regional and central governments. c) Monetary policy, foreign affairs and defence are powers exclusive to the central government.

In contemporary Spain, the concept of a 'shared-power' world dominates the Spanish governance context. Both the central government and the regional authorities are

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[2] The terms 'decentralisation' and 'devolution' (called in Spanish *'descentralización'*) are used interchangeable throughout the text.

exercising responsibility to strengthen local stakeholders, searching for a horizontal cooperation between the overlapping jurisdictions (municipalities, *comarcas*, provinces and autonomous communities) and integrating the partnerships for the modernisation of local governance (OECD 2004). The sharing of responsibilities could produce a certain ambiguity between the roles of the central and regional administrations. Meanwhile the central government has not pushed for the application of a national programme of local development, maybe because territorial issues are an exclusive power of the regions. Moreover, regional legislation is adopted differently in the seventeen autonomous communities. Nevertheless, the regional concerns were only integrated in national decision-making through the reform of the European structural funds, the EU Cohesion Policy. By the early 1990's, regional authorities took part in planning functions and coordinating interventions with the central ministries (Morata and Muñoz 1996; Aja 2001) but neither local governments nor social and private partners.

Beyond these issues, the asymmetrical devolution process is ongoing and some regions are acquiring substantial powers in contrast to others. At the end of the 1980's, Keating (1988) already argued that the territorial politics and management in Spain would take some years before stabilising whilst regions like Catalonia and the Basque Country kept pressing for more power. As of 2001, the OECD recommendations 'Local Partnerships for Better Governance' (OECD 2001) call for better-coordinated strategies and approaches within a complex governance framework. The regional strategic platforms, partnerships and new forms of democracy are emerging as robust trends to promote local governance. Only some cases of local partnerships in the country are relevant in the role of restructuring the state. Experiments with local teams seeking to stimulate popular involvement through participatory consultation bodies and area-based partnerships are very well-known cases in Catalonia, obtaining a genuine commitment from social partners to enhance communication and implement employment strategies. See more case studies in Aja (2001:251) and OECD (2004: 19-33).

The sphere of the Autonomous Community of Madrid limits the research in this dissertation, thus the writer deals now with the region more specifically.

III.9.2. The Governance system of the Autonomous Community of Madrid

Castells (1996) describes Madrid as a region 'suffering' the trend of frenzied development after the incorporation of Spain to the EU, in terms of foreign investment, market estate and transformation of the city and surroundings. The fact that Madrid is a leading region in the country, together with Catalonia, Valencian Community and the Basque Country (INE 2004), decentralized and particularly small, approximately 8,000 square kilometres, does not guarantee an even coordination between the administrative structures of the territory.

The approach of planning in Madrid was technocratic, a technical approach but linked to what politicians wanted, and thus demands of either population or economical agents were not consulted. Although, the regional systems of planning and provision of services, what Castells (1997) called collective consumption, became a particular focus of attention for local business interests (Healey *et al.* 1997; While *et al.* 2004). Neuman (1995: 2) described how 'institution' is understood in Madrid as "... *the inter-related set of administrative structures, processes and their content (whether the latter be a policy, strategy, plan; or ideology, philosophy, or set of values) that embody the repeated behaviours and actions that make up an institution.*" Eventually, institutions in the region of Madrid have re-adjusted, concurring with the innovation of strategic planning in Spain (Healey *et al.* 1997). Later, Keating (2001) provides an analysis of the institutional structure of the regions: degree of consolidation as a window of opportunity for the citizens, functional fragmentation having different outcomes from those produced by elected governments, public-private relationships and the intergovernmental relations.

The regional planning guidelines (in Madrid region) establish an institutional context for consultation and collaboration, strongly biased in favour of top-down policy-making, therefore leaving very little competence for locally defined policies (Neuman 1995). Municipalities take their own decisions about the trends of urban development and the accountability on the basis of these guidelines. Local networking and collaboration is necessary for planning major infrastructures, often of common use, and as well as for tackling environmental problems. The broad scope of the institutional multi-layered structure expands to include vital stakeholders, reflecting

the reality in the region. It is not just the executive branch of regional government, but also includes all the national, regional and local agencies involved in land and regional planning. There are, in addition, essential stakeholders such as universities, associations, trade unions and the real developer of the community, the building companies. The situation in Madrid is changing to a more 'bottom-up' decision-making system. This is not merely due to modifications in the planning approaches, which are becoming more regulatory and entrepreneurial. It responds to the current debate about the need for horizontal planning tools in a multi-scalar governance system that enables consensus building (called *concertación* in Spanish) to take place (Neuman 1997; Alguacil and Denche 2002; García Delgado 2003). Healey (1997a) defines as 'clientelism' one of the types of governance found in Italy and Spain where the 'clientelistic' practices seem to reach the structure of government in the distribution of resources either by taxation or through regional programmes. 'Clientelism' refers to relationships characterized by powerful agents providing benefits to powerless ones, in exchange for votes and other forms. Throughout the TiGrESS project, 'clientelism' was observed between political parties and house-builders in Madrid. The media also noticed this.

An analysis of the Madrid governance structure is carried out during the fieldwork (see Chapter VI). However, at this stage, the writer does merely intend to discuss the main features of the evolution of governance in the region. Neumann (1995) chooses innovative methods to deal with urban planning in the metropolitan area of Madrid. The writer has followed the use of consensus and agreements (*concertación* and *convenios* respectively, in Spanish) in spatial planning to analyse different cases of urban planning in the Madrid region. Consensus is used as a primary tool to reach agreements between the different stakeholders involved in multi-scalar and multi-year programmes. This is an enormous step forward in the evolution of planning and in the relationship between the different stakeholders. Since these concepts of planning were implemented in the mid-1990's, a wide range of strategic plans and regulations strengthening the informal processes has been developed. The Director at that time for Regional Planning of Madrid's regional Government, Eduardo Mangada, devised an integrative political strategy in 1987, which was adopted as a centrepiece of the left wing party (Socialist party - PSOE). The overall and strategic vision established the

basis of a new regional development that incorporated approaches of political consensus between local and regional government, and focused on zonal strategies to foster different policies (land use, environment, housing and so on) under the same development project. The outcome was the '*Plan Regional de Estrategia Territorial - PRET*' (Madrid Regional Government 1996; Fundicot 1997). The main goal was to revolutionise the political approaches to be more sectoral, integrative and consider multi-levels. During this decade, a world benchmark event took place, the World Conference on Environment and Development – Rio Summit (United Nations 1992). On this basis, in addition to the Regional Planning Directorate, planners and technicians in the Environmental Agency developed a document in 1993 to debate the environmental policy in the region, called '*Madrid 21*'. Both strategies were developed under the government of the Socialist party (PSOE). However, almost 15 years later, none of these documents has ever been implemented. The achievements and fulfilment of agreements are therefore still in doubt. Otherwise, what has happened since Neuman studied the Madrid case in 1992 is that the reality of the region has changed in parameters such as population growth, the distribution of the citizens provoking major landscape changes and the uncontrolled expansion of the urban land (Alguacil and Denche 2002). Above all, these processes are strongly linked to the duration of political terms, thus it could be said that narrow mandates are likely to deliver success merely in the short term (OECD 2004).

III.10. DISCUSSION AND WAY FORWARD

Institutionalised arrangements work as social constructors representing a challenge to the regulations that create adaptive governance and allow the systems to move to higher levels of performance. The complex adaptive systems approach provides a new understanding of conflicts between antagonized stakeholders. The new governmental relationships will probably lead to an empowerment of intermediaries stakeholders. These would represent a figure that could facilitate the reduction of bureaucracy in the new modes of governance, and also the phases of transformation in the adaptive cycle, creating links between individuals and networks, between state and society, and bridging organizations and political spaces (Olsson *et al.* 2006).

This doctoral dissertation attempts to find out about intermediaries and identify the importance of emergent leaderships: Who are the intermediaries between the different levels of the multi-hierarchy organizational system? Have these intermediaries the capacity (either role or responsibility) to manage resilience and repair the governance structure?. If the region of Madrid does not have a feeling of state or nation (Keating 1986; Morata and Muñoz 1996; Neuman 1997; Aja 2001), does that mean it is more difficult to bring together the different stakeholders within new modes of governance? Does this make a difference to how a Government adapts to a changeable situation? Solidarity actions between neighbourhood municipalities will search for an adequate governance system, as a response to the need for innovative practices in decision-making and management.

The next chapter (Chapter IV), focuses on the Madrid context, dealing with physical, environmental and institutional factors involved in the regional land planning system in Madrid. That chapter will take the approach of collaborative planning and consensus building (Healey 1997a) as the method of choice for the Madrid case study. It is a valuable approach to the emerging conflicts in a 'shared-power' world, and provides an innovative framework for reaching agreement between stakeholders on different scales and levels. The devolved structures of the government described above will provide key advantages for flexibility and innovation in development policies, supporting this process of collaboration. This is, again, a response to the increasingly complex nature of economic development problems in a globalizing economy. Other new modes of governance such as institutional capacity building (Healey *et al.* 2003) and new public management (McLaughlin *et al.* 2002), all are collaborative efforts and all aim to build understanding by deliberative processes across cultural networks. As such they can all be located under the general umbrella provided by collaborative planning.

The theoretical background as presented above suggests that this research could usefully combine appreciative theory with the quantitative analysis of landscape data to develop a coherent framework for participatory planning.

CHAPTER IV

THE MADRID CONTEXT

Chapter IV describes the historical, political and geographical characteristics of the region of Madrid. This information is a pre-requisite of problem exploration and definition and so will form the foundation of the landscape modelling exercise described later in Chapter V.

IV.1. A PREFACE TO THE REGION OF MADRID – How the Spanish society has acquired its environmental awareness in the last two decades.

The Brundtland report "Our Common Future" (1987) refocused the political interest into a holistic development defined as sustainable[1], as a new global challenge. The concept of sustainable development added a wide approach to the social, environmental and economical aspects that concern society. During the World Conference on Environment and Development, the so-called "Earth Summit" (Rio de Janeiro – Brazil in 1992), agreements on biodiversity and climate change were reached. The principles of Agenda 21 were also established. This strategy promotes the bottom-top approach in local planning and creates links among population, local government and regional politicians. Ten years later, in the World Summit on Sustainable Development (Johannesburg –South Africa in 2002), the governments regretted the loss of commitment on these issues both at national and municipal level, despite the international agreements reached.

Focusing on the discussion in Spain, the period of the dictatorship from the beginning of the 1940's to the end of the 1970's brought a step-back on socio-economic and environmental issues compared to the rest of Europe, as is widely known (Keating 1988; Quercus 1990; Keating 1996; Castells 1997; Aja 2001, Gómez Benito and Jesus González 2002). The intra-national rural migration from the 1960's to the late 1970's

[1] The definition of sustainability in Brundtland report: Meeting the needs of today without compromising the needs of tomorrow

coincided with a period of strong economic growth. Those trends changed the traditional farming systems and the countryside lost population. While the challenging Brundtland report was being published, Spain entered the European Community (1988), ten years after the establishment of democracy. During this decade, Felix Rodriguez de la Fuente (along with other ecologist associations prohibited during the dictatorship) aroused the Spanish society's environmental interest through his television programmes (*Quercus* Journal Collection 1990). Meanwhile, agriculture followed the new economic policies and as a consequence the traditional farming systems were abandoned. In 1996, through the Rural Development Programme, the European Union promoted the need to maintain the peri-urban (the surroundings of the urban areas) and rural areas as an exceptional answer to the new population's interests such as tourism, quality of natural resources, health products and others.

IV.2. AN INTRODUCTION TO THE PROBLEMATIC SITUATION IN THE REGION

The Autonomous Community of Madrid (hereafter CAM[2]) like many urban and peri-urban areas in Europe has changed dramatically over the last years through immigration, changing agricultural practices, and, industrial and infrastructural development. These processes are driven on spatial and temporal scales beyond the control of regional agencies, which must understand these drivers and, where possible, mitigate their undesirable consequences, but cannot direct them. Moreover, agencies can only predict future trends within a very wide envelope of uncertainty. Any attempt to extrapolate observable trends can be vitiated by inherently unpredictable changes in the socio-economic climate, by legislation at national and supra-national levels or by unforeseen conflicts of interest at local levels. Particularly, the region of Madrid has rapidly gone from having no land planning controls to having a tight planning system over the last three decades. However, the land planning regulations were never focused on the needs of the community or on the natural resources. The unbalanced development has damaged the environmental and socio-economical fabric in the region.

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[2] CAM comes from the official name of the region, in Spanish: *Comunidad Autónoma de Madrid.*

The need for reconciliation between nature conservation, urban growth, land planning and sustainable agriculture, motivated the writer's interest. The approach advocated in TiGrESS is different from the traditional intervention on the landscape. Sustainable agriculture and nature conservation are not facilities that planners can locate in the spaces not needed for houses and roads, but spatio-temporal processes incorporated into the fabric of a living landscape. Farmers need access to markets and many are pluriactive – perhaps engaging in low density tourism. The location of the farm in space-time is economically and ecologically significant. Nature reserves need wildlife corridors so animals and plants can colonize and move from one region to another. These corridors need not be nature reserves themselves (they could have recreational or agricultural functions) but will have seasonal cycles of use by both humans and non-human species. A genuine congruence of interests that meets the aspirations of stakeholders while sustaining bio-diversity must be sought.

The region of Madrid is problematic regarding convergence on environmental issues and sustainable development. Jimenez Herrero (2006), director of the Spanish Observatory for Sustainability (OSE), recently claimed that Madrid is the Spanish region in which the difference between urban growth and housing demand is highest. Furthermore, the management of natural resources in the region of Madrid has developed into a socio-political confrontation. Formal complaints from political parties and civil society had reached the European Commission due to low and poor compliance with supra-national agreements in terms of strategic environmental assessment and social participation policies (El PAIS- Science and Environment Section, December 2004; El PAIS – Madrid Section, February 2006; El PAIS – Urbanism Section, February 2006). There is a real need, therefore, to revisit the EU policies to prevent similar failures in future regional development. Meanwhile, there is a more immediate need for innovation in the regional decision-making processes that will create new forms of governance and enhance performance regarding sustainable development. Some of the newspapers cuttings referred to before are attached below to show the political concern that the Spanish society has and the large impact of this conflict on the national media. The first cutting (Figure IV.1) is titled *"El suelo urbanizado se dispara un 25% y el bosque pierde 240.000 hectáreas en una década"* (El PAIS – Urbanism Section, February 2006) which can be translated as 'Urban land use reaches

of 25% and forest coverage has decreased 240,000 hectares in a decade'. The second cutting (Figure IV.2) is titled *"El suelo edificado aumenta un 50%"* (El PAIS – Urbanism Section, February 2006) which can be translated as 'Building land increases by nearly 50%'. Both assist the reader in understanding the problematical case of regional policy-making.

Figure IV.1. 'Urban land use reaches 25 % and forest coverage has decreased 240,000 hectares in a decade'

CARTOGRAFÍA DEL SUELO

Es la explosión del ladrillo. Entre 1990 y 2000, las zonas urbanizadas aumentaron un 25% en España mientras que la superficie de bosque perdió 240.000 hectáreas (el equivalente a la provincia de Álava). Así lo revela un detallado estudio del Instituto Geográfico Nacional realizado con satélite de alta resolución y que ofrece la más detallada fotografía del cambio de usos del suelo en España. El mapa destapa un aumento espectacular de la construcción en el litoral Mediterráneo (en algunas zonas, el primer kilómetro de costa está urbanizado en un 50%) y en Madrid, cuya superficie construida o en obras ha aumentado en 30 000 hectáreas. Frente a este avance del cemento, todas las comunidades, salvo Navarra, pierden terreno forestal.

El suelo urbanizado se dispara un 25% y el bosque pierde 240.000 hectáreas en una década

Un estudio europeo realizado con satélite de alta precisión destapa miles de obras irregulares ignoradas por las estadísticas

Madrid, Valencia, Murcia y Navarra, con subidas del 50% del suelo urbanizado, lideran la explosión de la construcción

España pierde en 10 años zona forestal equivalente a la provincia de Álava, mientras la superficie agrícola se estanca

RAFAEL MÉNDEZ. Madrid

España se llena de cemento. Entre 1990 y 2000, el suelo urbanizado aumentó en 170 384 hectáreas. O lo que es lo mismo: entre 1990 y 2000 se urbanizó un 24,45% de lo construido por el hombre en toda su historia. O visto de otra forma: en una década se ha edificado íntegramente una superficie como la provincia de Guipúzcoa. En ese periodo, el país perdió 239.248 hectáreas de zonas forestales (superficie algo inferior a la de Álava).

Las cifras proceden del proyecto europeo Corine Land Cover, que cartografió la superficie europea por satélite en 2000 y la comparó con los datos de 1990. En España, el *censo* del suelo lo ha coordinado el Instituto Geográfico Nacional (Ministerio de Fomento). Pronto los centenares de imágenes por satélite, con una resolución de 25 hectáreas, ha llevado tiempo. El análisis acaba de concluir.

Domingo Jiménez Beltrán, ex director de la Agencia Europea del Medio Ambiente e impulsor del Corine, asegura que el aumento de la urbanización era esperable, aunque no de forma tan abrupta: "Crece mucho la urbanización en España, pero especialmente en la costa Mediterránea y en Madrid, donde se observa un desarrollo brutal, incontrolado e insostenible".

> "En Madrid y la costa mediterránea hay un desarrollo incontrolado e insostenible"

Uno de los datos que más ha interesado a la UE es la urbanización en el primer kilómetro de costa. En la península oscila entre el 8,58% de Lugo al 50,82% de Málaga. En el Mediterráneo, las zonas con menos urbanización son Almería y Murcia, con un 13% de costa cementada y donde actualmente se construye a un ritmo frenético.

Valencia, Murcia, Madrid y Navarra duplican la media nacional de urbanización. Se ha urbanizado un 50% de lo construido en toda la historia. La comparación con Europa demuestra el enorme crecimiento en España. En Europa, la superficie edificada aumentó la mitad en el doble de tiempo, un 20% entre 1980 y 2000.

Jiménez Beltrán, actualmente asesor de Medio Ambiente de José Luis Rodríguez Zapatero, afirma que las cifras de ayuntamientos, comunidades, ministerio, catastro y registros sobre uso del suelo eran incomparables y, a veces, contradictorias. El satélite acaba con las discrepancias. "Si el satélite ve una casa, la hay", explica Guillermo Villa, ingeniero y miembro del grupo de teledetección del Instituto Geográfico Nacional.

El Corine distingue 85 usos del suelo. En las imágenes, los expertos diferenciaban un campo de regadío de uno de secano. Cuando surgía una duda, una fotografía aérea o una persona en el terreno la disipaba. Villa explica que el satélite Landsat 7, gracias a su finalidad, ha sacado a la luz urbanizaciones irregulares. Jiménez Beltrán coincide: "Cuando terminemos la comparación con las cifras oficiales, aparecerán divergencias importantes". Entre 1990 y 2000, el número de viviendas aumentó un 21%, según el Instituto Nacional de Estadística. El satélite da un aumento de la zona urbanizada cuatro puntos superior.

El secretario general de Ordenación del Territorio del Ministerio de Medio Ambiente, Antonio Serrano, asegura que el urbanismo es una de las mayores amenazas medioambientales. "Vendemos el suelo y destrozamos el entorno. Lo más triste es que lo vendemos sin sacar nada a cambio". Serrano es catedrático de Ordenación del Territorio y pionero de la teledetección en España. Fue subdirector del Instituto Geográfico Nacional. Junto a la costa Mediterránea, Serrano destaca "el crecimiento desordenado de Madrid".

> Las imágenes del satélite acaban con la diferencia entre las cifras de distintos organismos

La explosión del ladrillo ha supuesto la pérdida de zonas forestales. Todas las comunidades autónomas salvo Navarra han perdido hectáreas de bosque. En total 239 248 hectáreas, un 0,99% de toda la superficie forestal. Es mucho en número y poco en porcentaje porque España es uno de los países europeos con menos zonas urbanizadas. La superficie agrícola, un 50,37% del territorio, registró un leve aumento (del 0,13%).

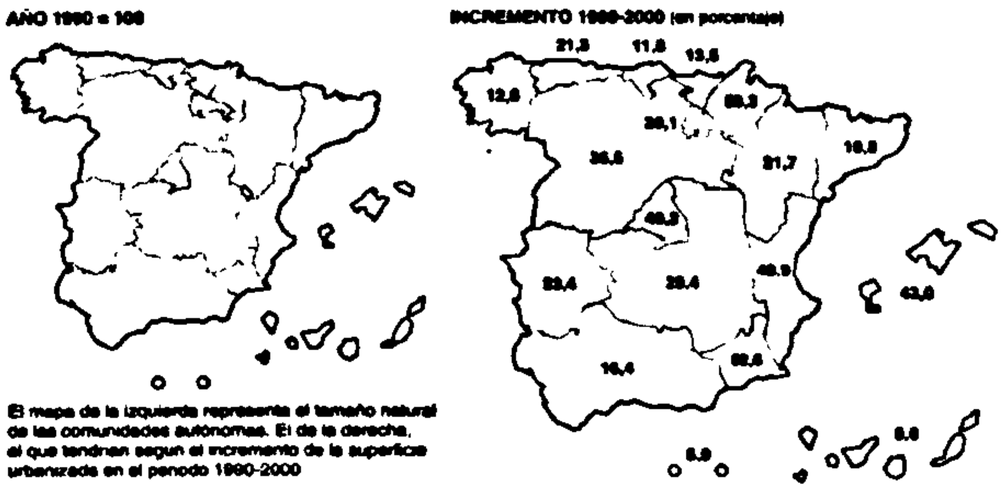
Serrano y Jiménez Beltrán admiten que la responsabilidad es compartida. "La principal vía de financiación de los alcaldes es el suelo, porque tienen pocos ingresos. Eso produce una competencia entre municipios que les empuja a urbanizar más y más. A las comunidades también les gusta el desarrollismo. No es lógico que España consuma el doble de cemento que Alemania. Muchos dicen que hay que construir el litoral virgen. Olvidan que la virginidad sólo se pierde una vez", concluye Jiménez Beltrán.

La explosión del ladrillo

CRECIMIENTO DE LA SUPERFICIE URBANIZADA

AÑO 1990 = 100

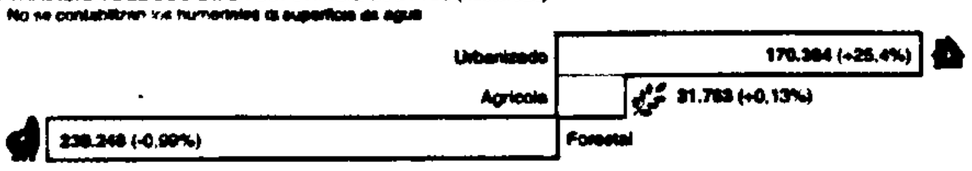
INCREMENTO 1990-2000 (en porcentaje)



El mapa de la izquierda representa el tamaño natural de las comunidades autónomas. El de la derecha, el que tendrían según el incremento de la superficie urbanizada en el periodo 1990-2000

VARIACIÓN DEL USO DE LA SUPERFICIE DEL PAÍS (hectareas)

No se contabilizan los incrementos de superficie de agua



CRECIMIENTO DE POBLACIÓN Y EL URBANISTICO

1990-2000 (en %)	Población	Urbanístico
Andalucía	8,0	18,4
Aragón	1,3	21,7
Asturias	-2,8	21,3
Baleares	16,6	43,0
Canarias	13,4	8,8
Cantabria	1,4	11,8
Castilla y León	-3,5	36,5
Castilla-La Mancha	6,1	29,4
Cataluña	4,8	10,8
C. Valenciana	7,9	46,9
Extremadura	-0,3	23,4
Galicia	-1,3	12,8
Madrid	9,8	46,2
Murcia	14,9	52,8
Navarra	7,0	50,3
País Vasco	-1,8	13,5
La Rioja	4,9	20,1
Ceuta y Melilla	11,0	5,0
Total	5,0	25,4

PARQUE DE VIVIENDAS

1981	14.728.124
1991	17.208.363
2001	20.823.398

VIVIENDAS TERMINADAS

1990	281.238
1991	273.846
1992	220.929
1993	223.584
1994	238.307
1995	221.252
1996	274.299
1997	299.068
1998	298.818
1999	356.366
2000	415.783

Fuente: INE, Instituto Geográfico Nacional. EL PAÍS

> "Datos inapelables e independientes"

El proyecto Corine Land Cover es "un pequeño milagro", según el ex director de la Agencia Europea de Medio Ambiente, Domingo Jiménez Beltrán. Uno de los responsables del proyecto en España, Guillermo Villa, afirma que "a la Comisión Europea le va a ser muy útil". "A la hora de plantearse las ayudas al olivar, por ejemplo, tendrá sus datos sobre cuántos olivos hay. Sus datos son inapelables e independientes". Jiménez Beltrán afirma que el proyecto levantó recelos porque es "como si Hacienda cruzase los datos con los de la Seguridad Social".

La ventaja es que se evitan duplicidades. Hasta ahora, Agricultura realizaba sus mapas, Medio Ambiente los suyos para ver el estado del bosque, las autonomías tenían sus datos y los ayuntamientos sus estimaciones. Al final, varios satélites y aviones cartografiaban la misma zona, pero los datos no eran comparables porque el que buscaba pinos no miraba si había cemento y viceversa.

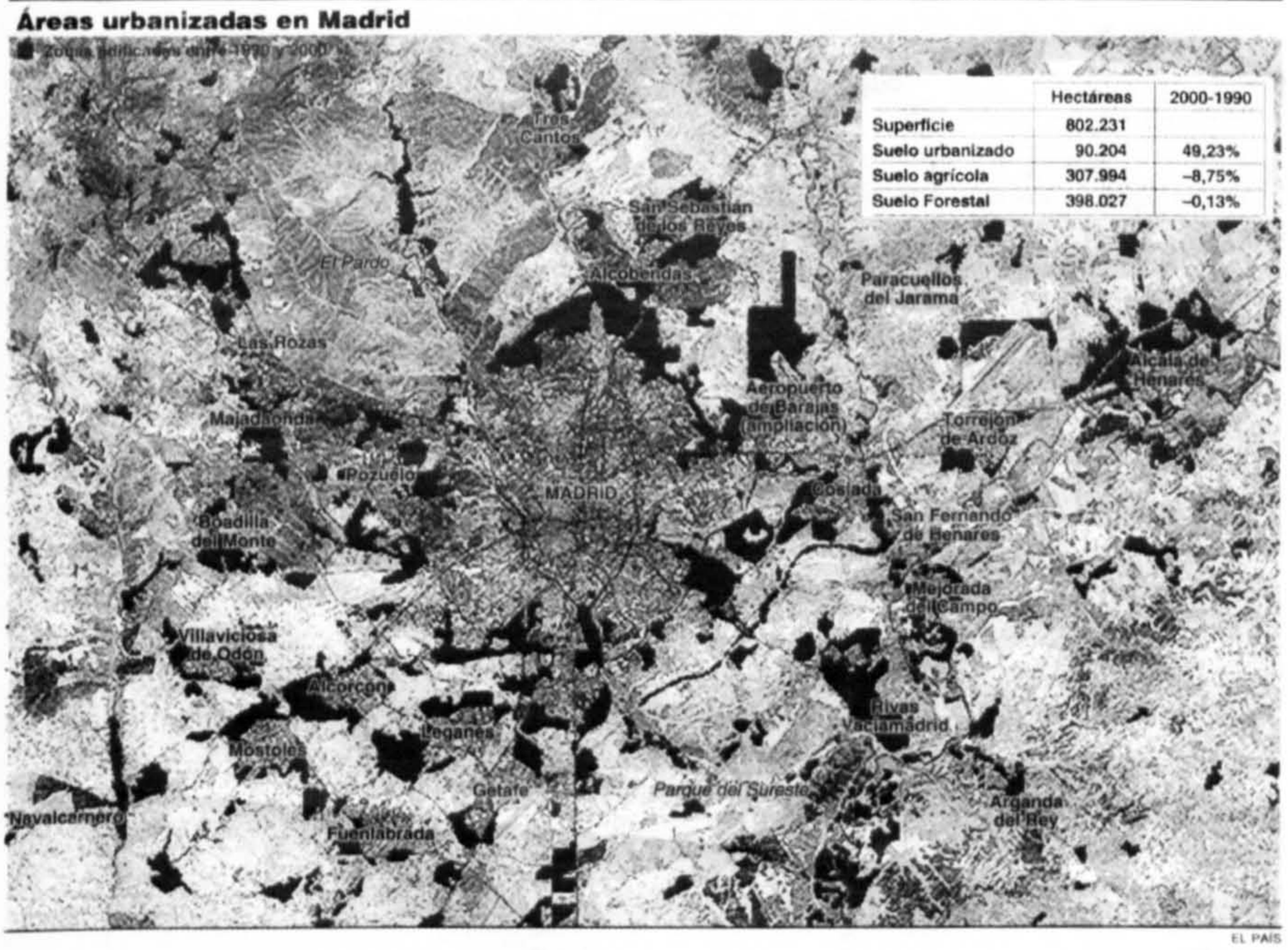
La UE ha adelantado el próximo censo de 2010 a 2005 después del éxito. Tendrá el doble de resolución que el actual. Los responsables españoles estudian cómo colgar los resultados en Internet. Las imágenes, sin explicaciones, se pueden ver ya en la *web* http://image2000.jrc.it/

Source: 'El PAIS', Urbanism Section, February 2006

Figure IV.2. 'Building land increases by nearly 50 %'

EL PAÍS, lunes 27 de diciembre de 2004

CARTOGRAFÍA DEL SUELO



MADRID

El suelo edificado aumenta un 50%

R. M. **Madrid**

La Comunidad de Madrid aumentó sus zonas urbanizadas un **49,23% entre 1990 y 2000, uno** de los mayores incrementos de España. El dato es más llamativo aún si se tiene en cuenta que ya en 1990 Madrid era la comunidad más urbanizada.

La prueba de que Madrid es diferente es que, a vista de satélite, ya se observa el aumento del suelo urbanizado. Cuando Ana Porcuna, del departamento de teledetección del Instituto Geográfico Nacional, superpone en la pantalla del ordenador la imagen de satélite de la Comunidaden 1990 y en 2000 se observa una gran diferencia. En el resto de España, hay que colorear la superficie urbanizada para distinguir el aumento de lo construido.

En Madrid se observan localidades del cinturón, como Leganés, Alcorcón o Getafe, que han duplicado su extensión. Se detecta cómo la capital crece hacia el norte, el corredor del Henares y el sur. Destaca Rivas-Vaciamadrid, que entre 1981 y 2001 pasó de 653 habitantes a 35.742.

La capital de España tiene "un crecimiento disperso" que obliga a usar el coche

La capital también crece. El Plan General de Ordenación Urbana, aprobado en 1997 por el Ayuntamiento, preveía levantar con "urgencia" al menos 200.000 nuevas viviendas en los límites de Madrid. El crecimiento es muy distinto del de Barcelona, "más ordenado y limitado geográficamente", según el secretario general de Ordenación del Territorio del Ministerio de Medio Ambiente, Antonio Serrano.

Serrano afirma que la mancha dispersa que da el satélite demuestra que "Madrid es una especie de ameba con un crecimiento disperso e incontrolado. Algo que necesariamente obliga al uso del coche y a construir infraestructuras, algunas de las cuales sólo se usan unas pocas horas al día". Es la ciudad dispersa, que se extiende por la comunidad. Madrid es la autonomía que más suelo agrícola pierde, un 8,75%. Serrano explica que el cambio lleva de una ciudad compacta mediterránea hacia una ciudad anglosajona, "muy extendida y en la que los ciudadanos ganan en individualidad pero pierden sociabilidad". "Son ciudades con casas grandes, muy extendidas pero sin gente ni comercios en las calles. El centro de reunión es el centro comercial. Y en lo medioambiental son poco sostenibles, porque obligan al uso del coche".

El ex director de la Agencia Europea de Medio Ambiente, Domingo Jiménez Beltrán, señala: "No faltan viviendas. Falta acceso a ellas, porque están en un mercado especulador". La comunidad se está convirtiendo en "una gran región funcional urbana", según Serrano. En la película *La escopeta nacional*, de Luis García Berlanga, un constructor lamenta que no se pueda urbanizar la Casa de Campo. Pero advierte: "Ya la tenemos rodeada". Era 1978.

"Los resultados de 2005 serán brutales"

R. M. **Madrid**

Una de las cosas que más ha sorprendido a los responsables del proyecto Corine Land Cover es el aumento de la urbanización en una década en la que el ritmo de construcción fue mucho menor que el actual. Se esperaba, aunque no de forma tan espectacular. En 1990 se terminaron 281.239 viviendas. La cifra descendió hasta las 221.252 de 1995 y ascendió hasta las 415.793 de 2000. Como desde ese año la construcción ha seguido subiendo, los responsables del proyecto prevén resultados "brutales" para el Corine que se realizará en 2005. Inicialmente estaba previsto para 2010, pero la UE ha decidido adelantarlo. En 2002 se terminaron 519.686 viviendas, casi el doble que en 1990.

El secretario general de Ordenación del Territorio, Antonio Serrano, asegura que los próximos resultados serán aún más preocupantes: "Hay zonas que en 2000 se mantenían razonablemente al margen del desarrollo urbanístico pero que actualmente soportan una presión enorme. En Almería hay actualmente una explosión inmobiliaria que llega del norte y que en 2000 sólo estaba comenzando". La costa del levante almeriense, Vera, Garrucha, Mojácar o Palomares son ahora pasto de las grúas.

"El urbanismo en España tuvo una fase expansiva muy fuerte en la década de los setenta, se desaceleró a principios de los años ochenta, volvió a crecer entre 1986 y 1990; decreció y desde 1998 vive su aumento más espectacular. Sabemos que el urbanismo casi siempre va parejo a la destrucción del entorno", explica Serrano, que es catedrático de Ordenación del Territorio.

Otra de los resultados esperables es el desplazamiento de la urbanización desde la costa hacia el interior, como explica Jiménez Beltrán: "Hay pueblos bastante alejados de la costa con un patrimonio natural impresionante donde se están construyendo miles de viviendas para dar lo que llaman el *ingletazo*, vender los pisos a un inglés por mucho dinero. No se dan cuenta de que, una vez vendido, eso encarece el pueblo y la gente de allí tendrá que pagar mucho más por todo".

Source: 'El PAIS', Urbanism Section, February 2006

IV.2.1.Why was the region of Madrid chosen as the case study?

Madrid, along with Catalonia and the Basque Country, has always complied successfully with the economic and legal convergence criteria of the European Union (European Commission 2004a), and thus, Spain's performance has been especially good too. However, since the Treaty of Adhesion in 1985, established by the core of the former European Community, and latterly, the Treaty of Maastricht in 1992 and the single European currency in 2002, set by the renewed European Union, there has not been a substantial convergence among Spanish regions (European Commission 2004a). Disparity in economic performance between regions has increased. National dynamics turned to a strategy of regional 'catch-up', though the asymmetries between EU regions have, if anything, become more noticeable.

The recent enlargement of the EU and Cohesion Policies for the period 2007-2013 considered convergence (economic and legal) and regional competitiveness to be the two main objectives, but the current regional classifications (data available in Eurostat, 2005) do not respond to the socio-economical diversity (or disparity) of and within the European regions (Campo, Monteiro and Oliveira 2006).

Regionalisation became fashionable within the changing structure of the EU governance in the 1990's (Giordano and Roller 2004) and sub-national authorities became more powerful in a rise of multi-level (or multi-layered) governance in the EU (Hooghe 1995; Jeffrey 2000; Jessop 2004). However, according to Rodriguez-Pose (2000), economic divergence rather than convergence is the characteristic of Spain's current regional panorama, where three axes represent the wealthiest regions: Madrid and the Islands, the Mediterranean coast and the Northeastern region.

The region of Madrid is highly relevant to development nationally, as its natural resources are very valuable, but under threat. This was the other fundamental reason for choosing the region as a case study. The landscapes of the region with an eminently Mediterranean and rural character, have suffered important changes in the last few decades when being fragmented. Fragmentation is the process by which extensive stretches of land are divided into mosaic areas. Together with the loss of natural habitats it is considered at present as one of the main problems in the

conservation of the different species, as well as the loss of diversity in Spain (Andren 1997; Rosell *et al.* 2003).

The development of network roads has increased considerably in the last few years because of the high demand for the improvement of infrastructures. Consequently, and together with the increase of housing prices in the city, an inner trend of migration towards the outlying areas of the city centre has provoked a movement of the population (Encinas and Martínez 2006). This situation is especially shocking in the surroundings of the main road networks that link with the city centre (See the press cuttings showed above in pp. 48 and 49). Land demand is linked with this urban expansion and it generates a land use conflict in the territory as agriculture use is a dominant characteristic in the southern region, and forest and other uses related to natural conservation are features of the northern region.

The agrarian activity of the CAM is a minor contribution to the regional gross domestic product (GDP) and is on the decline during the last decade, especially in recent years. This is due to several factors such as the ageing trend in the farming sector, changes driven by European policies, the low crop productivity and the inadequate infrastructures. Besides pressure put on the peri-urban areas and rural regions where farming took place previous to urban expansion (Romero-Calcerrada and Perry 2004). According to the agrarian census, the land used for agriculture had been reduced by 13% from 1989 to 1999. For example, in 1989 68% of land in the region of Madrid was used for agriculture, whereas in 2002 only 29% of the land in the whole region was used for this purpose (MAPA 1989). This area covers approximately 228,428 hectares.

The development of agro-ecology in the region, as well as in the rest of Spain, has increased considerably in the recent years. However, the pressure from developers to build more urban areas, industrial estates and transport networks has contributed to a great loss of farmland, including some of the best quality (Martínez Falero 2002). At the same time, this development is also related to the increase of fragmentation and direct destruction of the habitats due to land use conflicts and to specific farming and forestry practices. An estimated 30% of the proposed areas within the future Natura

2000 network (92/43 EEC Directive) will be affected by an intensification of farming practices (Heath and Rayment 2001).

IV.3. DESCRIPTION OF THE TERRITORY OF MADRID

The region of Madrid is one of the most densely populated in the EU (European Commission 2004a). The study area is a triangular region centred on the capital of Spain; the City of Madrid. See Figure IV.3. The territory covers approximately 8,025 square kilometres (802,5 hectares). Four of the almost six million inhabitants in the region live in seven of the 179 municipalities (INE 2006), all close to the capital. See Figure IV.4.

Figure IV.3 and Figure IV.4

Figure IV.3. Madrid in the National context.
Infrastructure networks and main urban centres are also represented

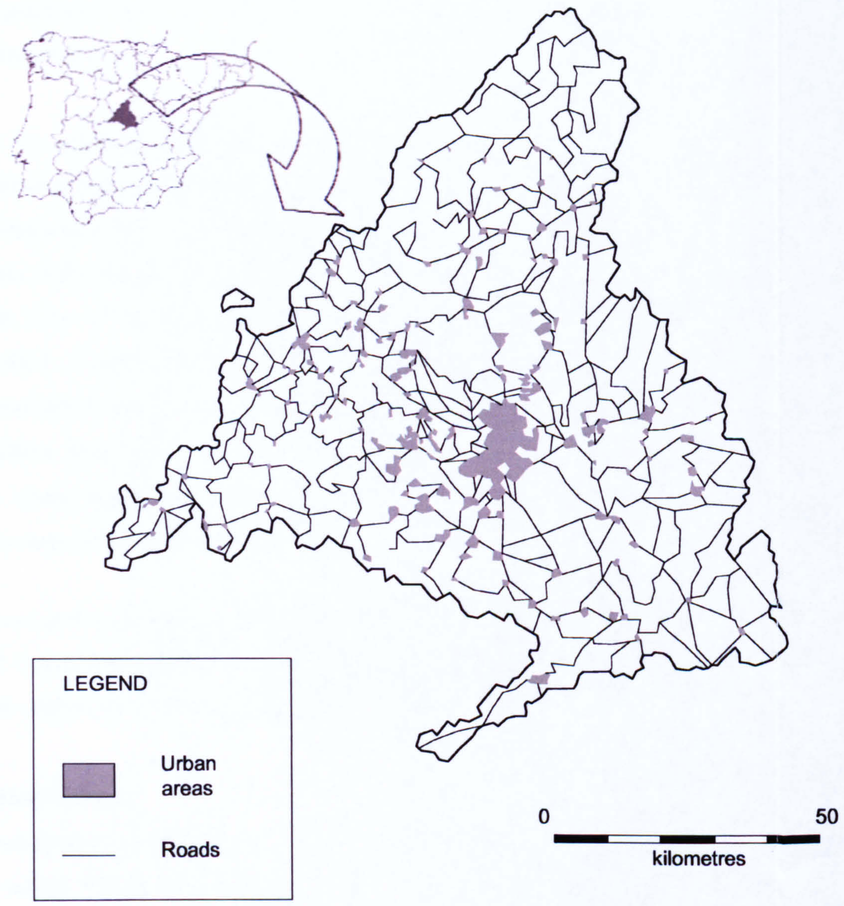
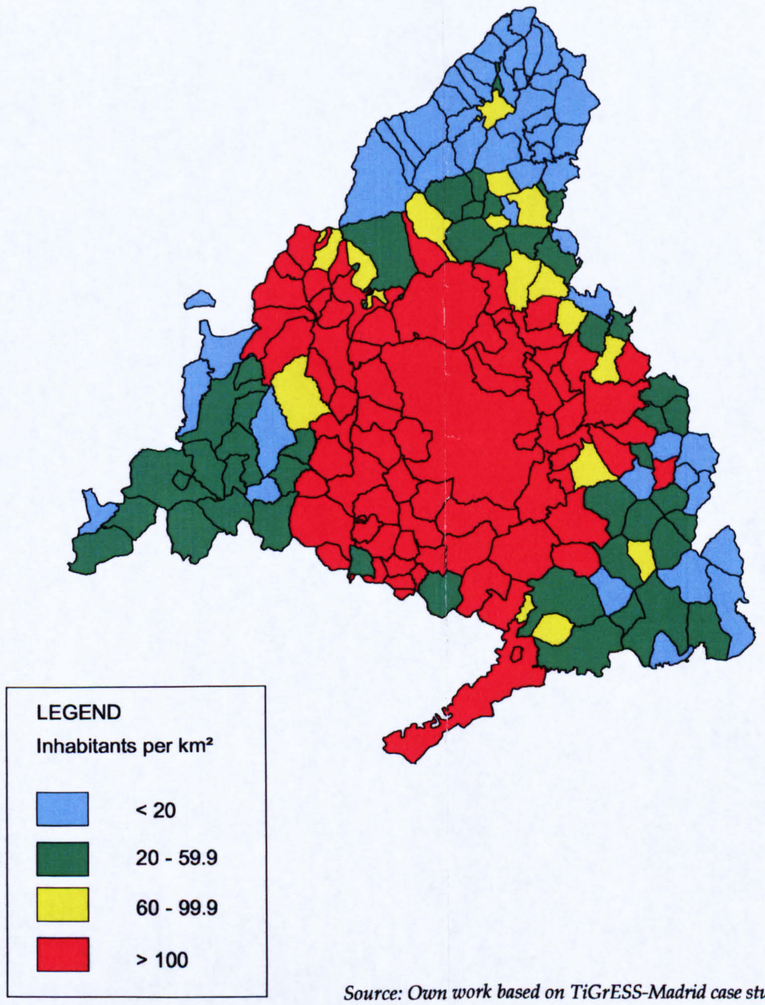


Figure IV.4. Density of population in Madrid (2003)
(number of inhabitants/square kilometre)



Source: Own work based on TiGrESS-Madrid case study data

Madrid is characterized by its inter-regional diversity with a striking imbalance between different areas, and a strong dependence on the urban centre. It includes high-density urban development from the urban centre to peri-urban areas; sparsely populated mountain regions in the north, however highly threatened because of regional tourism development; natural protected areas spread all over the region, with different categories of outstanding environmental significance. It also includes a mix of intensive & new, and extensive & traditional agricultural practices, mainly located in the south of the region and the peri-urban areas in the west and east. Marginal areas, where transport networks are considerably limited, industrial processes are deteriorated and structures of production are below technological standards, are also identified in the southern quarters of the City of Madrid and in specific rural areas in the south and the north of the region.

Three principal dynamics or patterns are distinguished in the region of Madrid (Encinas *et al.* 2006). The mountainous area, located in the north of the region, has a special interest in tourism and also has few marginal rural areas. Secondly, the plateau in the south of Madrid is one of the areas undergoing recent development. Thirdly, the peri-urban areas near the City of Madrid are experiencing deep changes as a consequence of uncontrolled urbanization processes and activities related to infrastructural and industrial development. The pattern of landscape development in the peri-urban regions differs from those in the mountainous forest and in the southern area. The urban centre appears to have followed an urban development pattern along the principal roads (See above Figure IV.3)

The writer takes into account *geomorphology & geology, climate, ecosystems,* and *natural resources* (Madrid Regional Government 2004a) for the physical characterization of the territory. These are the basic elements for the modelling process.

IV.3.1. Geomorphology and Geology

The region of Madrid is located in the centre of the country, between the mountainous chain or mountain range called "Sierra de Guadarrama" in the north and a plateau known as "La Meseta Central" in the south. Its geomorphology is also characterized by the rivers across the territory. Three main areas describe the region:

- *La Sierra* or Mountain Range is the mountainous area in the north strip of the region which bounds with another autonomous community, Castilla-Leon. The landscape is a sequence of hills and mountains that reach to an altitude between 1,200 and 2,500 metres.
- *La Depresión o Fosa del Tajo* is the lowest area in the region. The basin of the river Tajo shows the minimum altitude in the region, approximately 500 metres. The landscape is a mix of plain, sedimentary hills and terraces. The latter are characterized by erosion processes that provoke abrupt changes in shape.
- *La Rampa* is the natural join between both the previous areas. Slopes characterize this intermediary area, which is built from mountainous components and quaternary sediments, and create a peculiar shape based on calcium *Rañas*.

Seven geological categories are defined: Quaternary Sediments, Detritic Tertiary Sediments, Weathered Tertiary Sediments, Granite Rocks, Metamorphic Rocks, Mesozoic Sediments, and Paleogenic Tertiary Sediments. Granite Rocks and Metamorphic Rocks are the base in the mountainous area, also called *La Sierra*. In the basin of the river Tajo, known as *La Depresion del Tajo*, sedimentary materials, such as Quaternary and Tertiary Sediments, dominate. Finally, in *La Rampa* Detritic Tertiary Sediments dominate in the terraces, close to *La Sierra* Granite Rocks.

IV.3.2. Climate

Madrid's climate is strongly linked to its geomorphology (Madrid Regional Government 2004a). The location of the chain of mountains in the north of the region has a particular impact on the area to the south. The whole territory has a Mediterranean climate. Three categories of precipitation were identified: < 500 mm. in the south-east; > 800 mm. in the surroundings of *La Sierra*; and a range (500 mm. - 800 mm.) between the former and the latter in the rest of the region. In respect of average annual temperature, three ranges are also defined: < 10 ºC in *La Sierra*; in *La Rampa* temperatures around 10 ºC and 12 ºC; and, meanwhile, in the south-east, south-west and the surroundings of the capital, the average annual temperatures increase to over 14ºC. The urban area of the capital has a special situation, because human and

industrial factors, together with the lack of vegetation, cause an increase of the average temperature, mainly during the night time.

IV.3.3. Ecosystems

The typical ecosystems of Madrid have many uses. These include the improvement of quality of life through tourist activities; the maintenance of green belts close to the capital which contribute to air quality and regulate climate; avoiding erosion and land degradation; reserves of water; providing wild life habitats; and the ecosystems contribute to economic profit from pastures, farming, livestock, wood and related tourist activities.

Ten ecosystems are recognised as representative of natural, cultural and physical characteristics of the region: Mountain Pine Forest, Holm Oak Woods, White Oak woods, Wetlands and Riverbanks, High Shrubland, *"Piñonero"* Pine wood, Chalky Hills and Dales, Fallow land and Dry crops, Marshlands, and Dams & Reservoirs.

- Mountain Pine Forest: The typical mountain ecosystem is characterized by acid soils with low micro-organism activity, low temperatures, high precipitation and frequent cloudiness. Pastures, forest *(Pinus sp., Quercus pyrenaica)* and shrubland are the most common components in the vegetation. In respect of fauna, Vulture - *Aegypius monachus*, Eagle -*Aquila crisaetus*, Owl -*Bubo bubo*, Goat -*Capreolus capreolus*, Fox -*Vulpes vulpes* are the most representatives species as much due to their extinction degree to their population in this habitat. See below Plate IV.1.
- Holm Oak Woods, *Encinar* in Spanish: This is the most typical ecosystem in the region. The *Dehesas* are a genuine form of exploitation of the Mediterranean forest by human activity, through the agrarian and livestock systems. Different species as Holm Oak –*Quercus ilex* (widely known as *Encina*) and –*Quercus faginea*, Juniper –*Juniperus oxycedrus*, Ash –*Fraxinus angustifolia* share the land with grasslands and pastures. Species such as Wild Boar -*Sus scofra*, Eagle -*Aquila adalberti*, Deer - *Cervus elaphus* live in the *Dehesas*. See below Plate IV.2.
- White Oak woods, *Melojar* in Spanish: This ecosystem is intermediary between the *Dehesas* in the Mediterranean forest, and the Mountainous area. This is the typical landscape in the plateau of Madrid, which is above defined as "La Meseta Central", and is the most modified by human activity. Oakwood - *Quercus*

pyrenaica, mountain pastures, shrubland and Pines –*Pinus sylvestris* constitute the landscape.

- High Shrubland: It is located in "La Sierra de Guadarrama". It is the highest area in the region and is based on the original rock, granite. In this area winters are very cold and long, which prevents the growth of any species. The main interests are livestock and winter tourism.

Plate IV.1: Mountain Landscape (Municipality of Cercedilla)



Source: TiGrEES-Madrid case study, 2004.

Plate IV.2: Holm Oak woods *"Dehesas"*



Source: TiGrEES-Madrid case study, 2004.

- *"Piñonero"* Pine wood, known as *Bosque piñonero (Pinus pinea)* in Spanish: It is easily to find them in the west southern of the region. This type of forest has a great landscape value. In addition, the economic profit from their fruit, the pine cone, is also significant. *"Piñonero"* Pine wood shares the space with aromatic shrubland.
- Wetlands & Riverbanks, *Sotos* and *Riberas* in Spanish: This habitat is related to reservoirs of water and is located over quaternary sediments. The type of soil, and consequently the vegetation, changes along the course of river. Soils tend to be original rock at the source, then in the medium course are sandy, and at last, at the mouth are clay. The vegetation is formed by Ash -*Fraxinus angustifolia* and Black poplar -*Populus sp.* Likewise, fauna species are linked to the rivers, such as Polecat -*Putorius putorius* and Otter -*Lutra lutra.* See below Plate IV.3.
- Fallow land & Dry crops: This ecosystem has entirely originated because of human action in the territory, as well as *"La Dehesa"*. Dry crops, cereals and legumes, constitute the common crops. These spaces are being protected for the conservation of some specific species, for instance Great Bustard -*Otis tarda*. See below Plate IV.4.
- *Cuestas y cortados yesiferos,* called Chalky Hills and Deals in English: The most arid, plain and sterile ecosystem in Madrid, well known as "El paramo". The precipitation is the lowest in the region, thus the vegetation is rare, only a few aromatic and thicket shrubland species as Thyme -*Thymus sp.* and Willow -*Salix sp.* Amphibious and reptiles are the largest animal populations.
- Marshlands, known as *Zonas palustres* in Spanish: Wet areas defined as the lowest in altitude and lacking tree wood vegetation. The most characteristic species are: reptiles, amphibians, and aquatic birds. These areas are very important in the migration routes of birds, which stop in there for feeding and breeding, for instance Crane -*Grus grus*.
- Dams and Reservoirs. The network of dams and reservoirs was built during the 1960´s to ensure drinking and farming water supplies for the region.

Plate IV.3: Riverbank (Municipality of Perales de Tajuna)



Source: TiGrEES-Madrid case study, 2005.

Plate IV.4: Dry crops (Comarca de las Vegas)



Source: TiGrEES-Madrid case study, 2005.

IV.3.4. Natural resources

Natural protected spaces (see below Figures IV.5, IV.6 and IV.7; and Tables IV.1, IV.2 and IV.3) have a significant role to play in the conservation and protection of natural resources in the region of Madrid. The Natural Protected Areas cover approximately a surface of 104,2 hectares, and share this territory with the Sites of Community Importance network (SCI) and Special Protection Areas for Birds network (SPA) (see Table IV.2). SCI and SPA are respectively *Lugares de Interes Comunitario* (LIC) and *Zonas de Especial Protección para las Aves* (ZEPA) in Spanish. The SCI network covers approximately 320 ha, and the SPA network covers 185,3 ha (EUROPARC-España 2002). Within the SCI network are included the SPA and the Natural Protected Areas network. Therefore, the protected space in Madrid occupies 40% of the region.

The following Natural Protected Areas (Madrid Regional Governemnt 2004) are particularly significant in Madrid:

- Natural Monument of National Interest *"Pena del Arcipreste de Hita"* was declared protected space in 1930 and became the first one in the region of Madrid. The reason was to guarantee the conservation of the lovely paths, which inspired Arcipreste de Hita's poetry book.
- Picturesque Place *"Pinar de Abantos y Zona de la Herreria"* was later protected (1960) because of its natural value within the famous surroundings of "The Royal Monastery El Escorial", and the speculative threat with aims of building.
- The Natural Site of National Interest *"Hayedo de Montejo de la Sierra"*, which was declared in 1974, represents the only beech grove forest in the region of Madrid and one of the most southerly in the Iberian Peninsula.
- The Regional Park *"Cuenca Alta del Manzanares"* (1985) was protected because of the need for conservation of granite rocks in the region. The protection was also based on maintaining green corridors to connect the urban centre with the most natural areas in the region. Lastly, the aim was to protect unique spaces, such as ecosystems related to riversides.
- The Natural Park *"La Cumbre, Circo, y Lagunas de Penalara"* is the highest peak in the mountainous area. This shelters alpine flora and fauna species as a valuable and unique ecosystem in the central range of mountains. The scientific, cultural,

and tourist interests, together with the fragility of its environment, forced its protection in 1990.

- Fauna hut *"Laguna de San Juan"* protected from 1991 by representing a singular area in conservation, protection, scientific study and recuperation of flora and fauna, especially migrating birds.
- The Regional Park *"Cursos bajos de los Rios Manzanares y Jarama"*. Both rivers, in their middle courses and at their mouths, cut spectacular shapes into the cliffs. This is because of river erosion in the most important gypsum and calcium areas in Madrid. These areas are considered to be of high ecological and archaeological value. Thus, the main reason to protect these areas (in 1994) was the high pressure derived from widespread industrialization and urbanization of peri-urban areas.
- The Natural Reservoir *"Regajal - Mar de Ontigola"*. Scientific and teaching projects have been carried out there from 1994, when it was protected to facilitate these activities and to prevent the expansion of infrastructure in the area.
- Regional Park of *"Curso medio del Rio Guadarrama y su entorno"*. Guadarrama River has suffered urban pressure for a long time, because it is considered as one of the typical areas for second housing in Madrid thus threatening the ecological value of its surroundings. These reasons were good enough to protect this area in 1999.
- The Natural Site *"Soto del Henares"* is the last protected space declared (2000) in the region. Urban and industrial development, together with uncontrolled movements of people, sewage and residuals, threaten this landscape of sharply varying topography broken by gorges, created by the Henares River.

The private and public Forests, and Drover's cattle tracks also have an important role as natural resources in the region. The surface covered by Forest is classified as non-urban by the National Forest Law. Public Use Forests are managed by local and regional government, meanwhile the private ones are managed by private landownership or by regional government through agreement. There are different categories of classification: Public Use; Protector Forests, which are private landownership but have ecological and socio-economical value; Protected Forests, which belong to the protected areas network; and Reserve Forests, a special protection for SPA network and wetlands. Oak -*Quercus sp.* and Ash -*Fraxinus sp.* Forests are included in this category. The Drover's cattle tracks, well-known in Spain as *Vias*

Pecuarias, were used to drive cattle during the traditional seasonal migration of livestock (*trashumancia* in Spanish). Their conservation and maintenance, as public use, helps to keep their cultural value and to implement tourist activities by linking with the rural environment. The classification depends on the width of the tracks: *Cañadas, Cordeles, Veredas* and *Coladas*. Madrid is one of the Spanish regions with a greater density of *Vias Pecuarias*, according to the following data: 1,796 *Vias Pecuarias* with a total length of 4,168 kilometres.

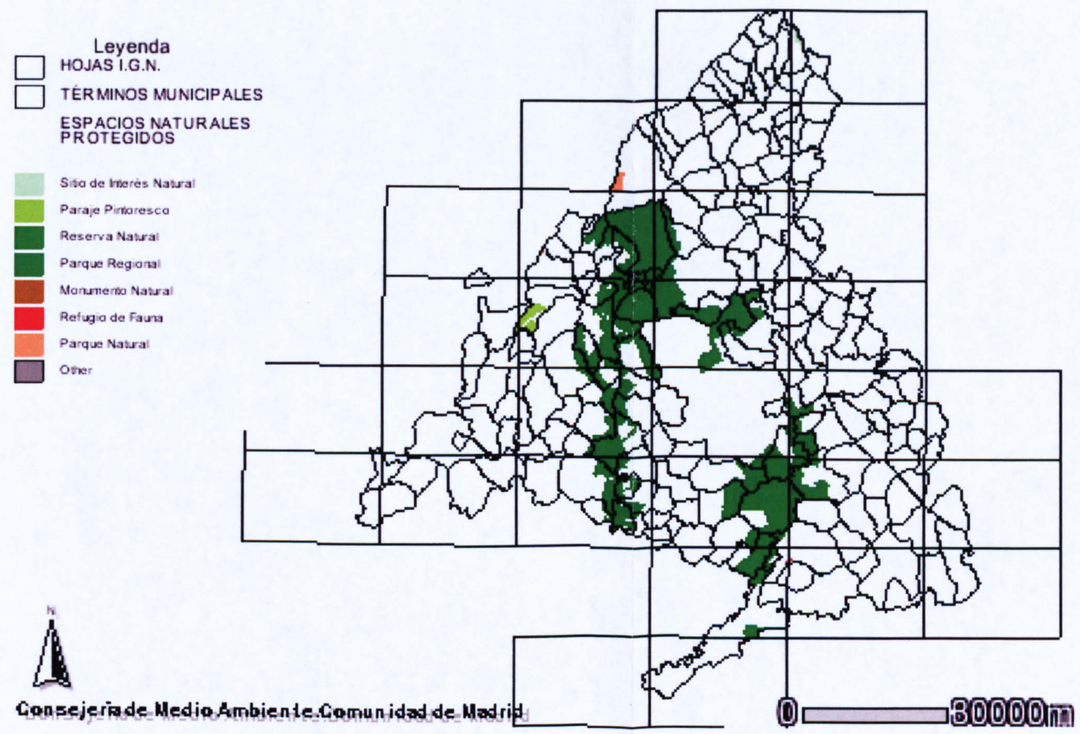
The following figures and tables (Figure IV.5 and Table IV.1, Figure IV.6 and Table IV.2, and Figure IV.7 and Table IV.3) shown that almost the 40% of the territory is protected under the current legislation. Clearly, protected natural spaces are a significant factor in the sustainable development of the region of Madrid.

Table IV.1: Natural protected areas network and link with SCI & SPA network.

Natural Protected Areas	Surface area (ha)	Coexistence with categories of protection
Regional Park "Cuenca Alta del Manzanares"	46728	SCI, SPA
Regional Park "Cursos bajos de los Rios Manzanares y Jarama" (South-East Park)	31550	SCI
Regional Park "Curso medio del Rio Guadarrama y su entorno"	22656	SCI
Picturesque Place "Pinar de Abantos y Zona de la Herreria"	1171	SCI
Natural Park "La Cumbre, Circo, y Lagunas de Penalara"	768	SCI, SPA
Natural Reservoir "Regajal-Mar de Ontigola"	635	SCI, SPA
Natural Site "Soto del Henares"	332	SCI
Natural Site of Nacional interest "Hayedo de Montejo de la Sierra"	250	SCI
Natural Monument of National interest "Pena del Arcipreste de Hita"	50	SCI
Fauna hut "Laguna de San Juan"	47	SCI
Total Natural Protected Areas Surface	104.2	---

Source: EUROPARC-España 2002

Figure IV.5: Natural Protected Areas in the Region of Madrid



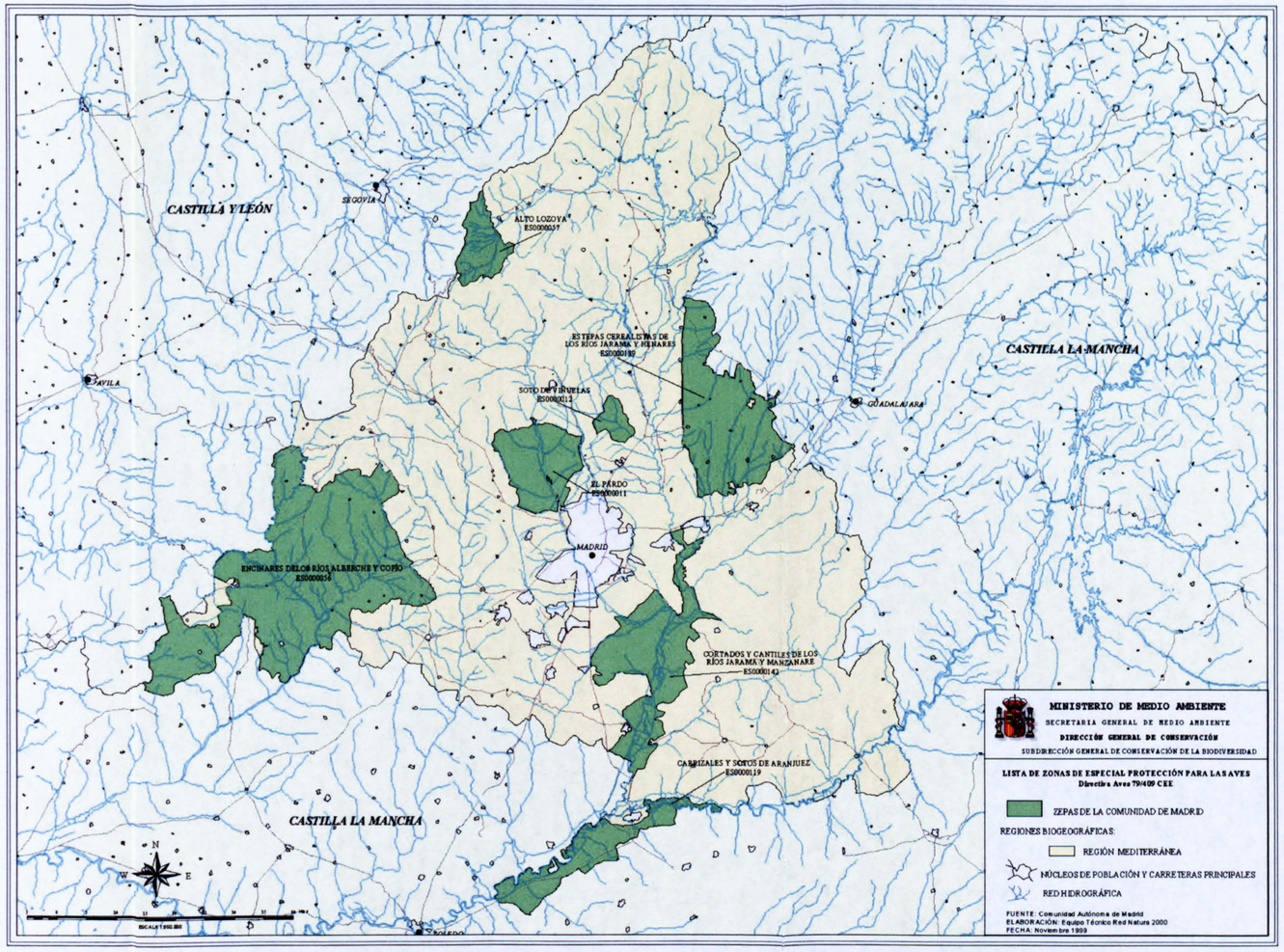
Source: Madrid Regional Government 2002

Table IV.2: Special Protection Areas for Birds network.

SPA
Monte de El Pardo
Encinares de los ríos Alberche y Cofio
Carrizales y sotos de Aranjuez
Estepas cerealistas de los ríos Jarama y Henares
Cortados y cantiles de los ríos Jarama y Manzanares
Soto de Viñuelas
Alto Lozoya

Source: Own work based on EUROPARC-España, 2002

Figure IV.6: Special Protection Areas for Birds network in the region of Madrid



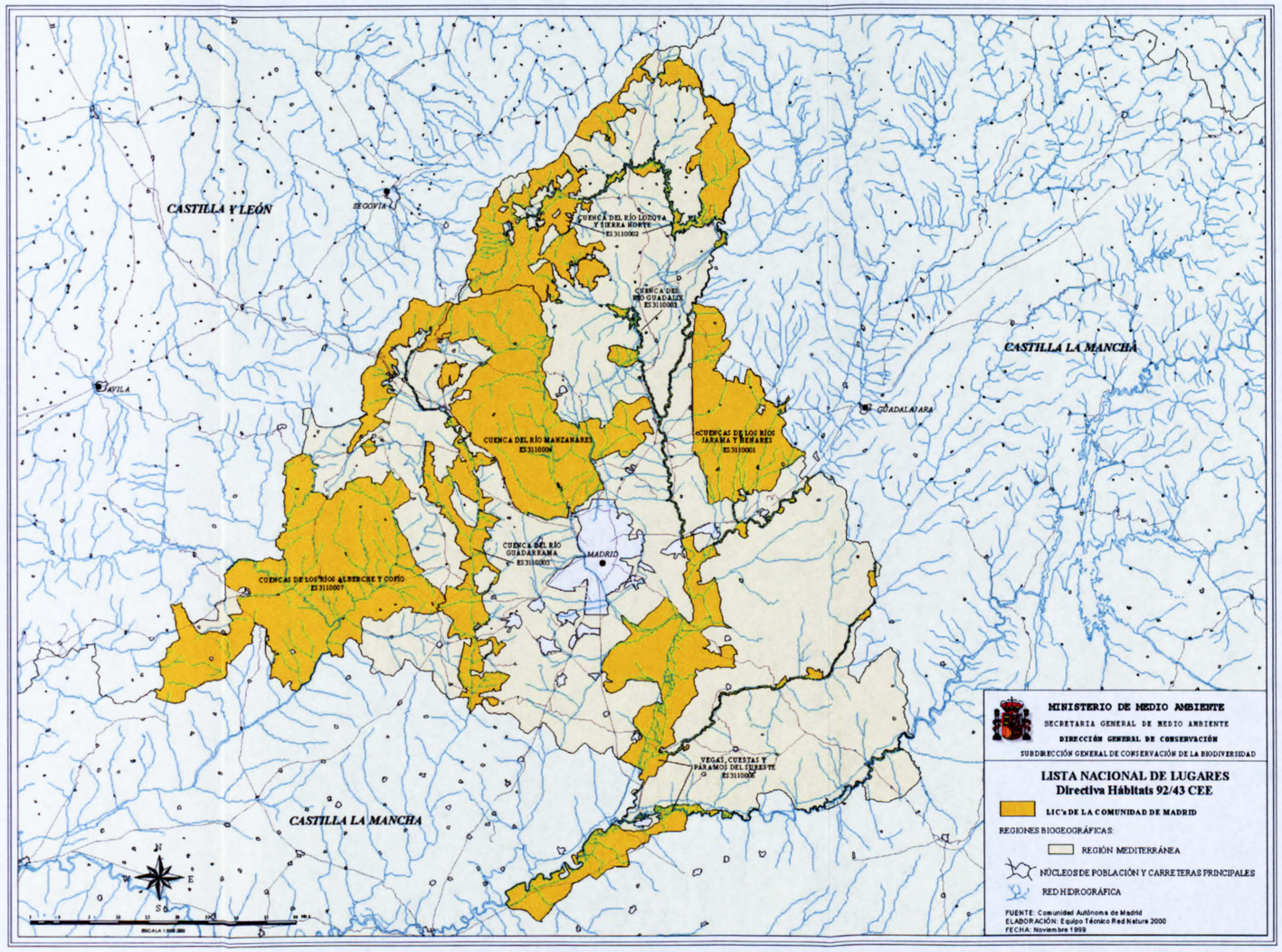
Source: Ministry of Environment 2002

Table IV.3:
Sites of Community Importance network.

SCI
Lozoya River basin
Manzanares River basin
Vegas, cuestas y páramos del Sureste
Jarama and Henares River basins
Guadalix River basin
Guadarrama River basin
Alberche and Cofio River basins

Source: Own work based on
EUROPARC-España, 2002

Figure IV.7: Sites of Community Importance network in the region of Madrid



Source: Ministry of Environment 2002

The desk-based study on the landscape which has begun in the previous section (See *Description of the territory of Madrid* in pp. 52) is partly complemented with the investigation carried out next. The writer will analyse how the national and international agreements could be incorporated in the regional context within the regional programmes. The writer will also identify repercussions of the application of these programmes. Appendix 2 will also provide detailed information about key milestones in the sustainable development context: political, environmental, agrarian and urban planning.

IV.4. INTRODUCTION TO PLANNING PROCESSES IN THE REGION OF MADRID

The existing gap between rural and urban territory has deeply influenced the land-planning processes all over Europe (Economic European Community 1996; Naredo 2000; Altieri and Moreno 2001; Antrop 2004). The land planning policies established in Spain under the dictatorship, from 1940 until the end of the 1970's, were extremely centralised and kept the country behind other European countries (Keating 1988; Llobera 2000; Aja 2001; Gómez Benito and Jesus González 2002). These policies limited economic development all over Spain, especially in rural areas. They caused overpressure on natural resources due to disproportionate development of infrastructure, and an irrecoverable damage to socio-economic systems, including abandonment of agricultural land and rural migration to big cities - called in Spanish '*cabezas de comarca*' and metropolis (Ruiz Aviles 2000).

The current institutional organisation established in 1978 (when the Spaniards voted 'yes' to the Constitution) is based on a decentralised system, which distributes the political and administrative competences between the regions. Despite expecting a renovation of land planning policy addressed by regional governments, the political heritage of the dictatorship persisted until the incorporation of Spain in the European Union in 1988. Since then, the definition of land use and management plans within the framework of European policies and international agreements have constituted one of the political elements used by regional governments.

In recent years, the land planning processes have been modified to seek a balance between rural and urban standards of living, amenities and work (Pavon *et al.* 2002; Antrop 2004). New approaches to land planning link to social factors, agriculture, tourism and environmental policies. These take into account population dynamics, distance from the countryside to big cities or metropolis, household development, agricultural use and tourism. This dissertation will explore the hypothesis that reconciling rural needs with urban demands could be a valuable instrument for resolving land use conflicts.

Land use change processes are mainly driven by policies implemented by the governments. The decentralised administrative system in the region of Madrid should involve coordination between Agriculture, Environment and Urban Planning Directorates. Sadly, this is not usually the case.

IV.5. URBAN PLANNING

IV.5.1. The European Union Context

Land use planning and management decisions are usually made at local or regional level. However, the European Union Expert Group on the Urban Environment states that the European Union has a role to play in ensuring member countries take environmental and social concerns into account when putting together their land use development plans.

The Commission has four major goals to implement in this area (European Commission 2004b). The Directive on Environment Impact Assessment (EIA) and the Directive on Strategic Environmental Assessment (SEA); two Commission initiatives: INSPIRE (infrastructure for spatial information in Europe) and GMES (global monitoring for environment and Security) which will help to enable the participation of citizens in land planning issues; and developing and implementing a European urban environment strategy. The challenge for policy-makers is to come up with a sustainable and integrated approach to urban development and management that works in harmony with natural systems rather than against them. These challenges are also supported by the Regional Policies (European Commission 2004) through the Community Initiatives URBAN and INTERREG which have as main priorities the

development of communication and energy networks, and local and urban development.

IV.5.2. The National Context

The beginning of land planning regulations was issued under the dictatorship in the early 1970's. The Spanish Constitution, approved in 1978, gave the responsibility for land planning to the regional governments (Article 148.3. *Constitución Española*). The current land planning legal framework (Ministry of Environment 2005) is based on the Law 6/1998 - *Ley sobre el regimen del suelo y valoraciones* - and replaced the earlier Law 1/1992. However, land planning issues are regulated by the regional governments. For that reason, there is an enormous variability among the Spanish regions. Some good examples in the Spanish territory are the regions of Valencia, Catalonia, Basque Country and Canary Islands due to the integration of all the land uses in their land planning regulations. These have a number of common features such as the current dynamics of growing population and urban-tourism-industrial development. Consequently, all of them are suffering serious environmental degradation such as the loss of biodiversity. Programmes of assessment of planning have been and are being undertaken by regional stakeholders. These programmes allow the establishment of guidelines to protect specific land uses depending on human activities impacts, need of development and location (Cendrero *et al.* 1990; Garrido 2003 *pers.comm.*; Aguilera-Klink and Sanchez Garcia 2004, Garrido *et al.* 2005).

IV.5.3. The Regional Context

Land planning legislation in the region of Madrid was focused on the *Plan General de Ordenación Urbanística de Madrid* - PGOUM (1984) which sought a fundamental change in how land planning could affect the existing environment. The present legislation is based on Land Law (*Ley del suelo* 9/2001). This law makes it compulsory for every municipality to develop new land planning schemes, which are currently being developed. According to the Land Law, the design of 'Municipal land planning guidelines' must provide the following information: suitable land for urbanization and areas with specific limitations due to their high ecological value or their type of protection, therefore an Environmental Impact Assessment (EIA) is also compulsory.

The rest of the territory not included in both previous categories, will be classified according to the local government's decisions.

Gomez Orea (2001) stated the main guidelines for multidisciplinary land planning in the region of Madrid as the balance between different territorial units to ensure stability and progress. For that, the growth in some areas of the region must be controlled and the transport network between the highest and the lowest developed areas must be promoted. In addition, the balance between territorial development and conservation of environment must be considered issues as forestry, agriculture, landscape, cultural and rural heritage, etc.

The writer noted during the processes ongoing (following Garrido 2003 *pers. comm.*) the lack of awareness of agricultural issues, the unbalanced work (as these kinds of surveys are usually undertaken by architects) and the lack of a proper participatory process (See also commentary on the fieldwork results in Chapter VI). In fact, the processes of 'Municipal land planning guidelines' are being criticised due to the lack of coordination regarding the implementation of Local Agenda 21 (CIMAS 2004; FIDA 2004).

- *Agenda 21 - The Rio Declaration. The United Nations World Summit on Environment and Development in 1992*[3]

"The Rio Declaration on Environment and Development" (United Nations 1992) announced Agenda 21 as a new philosophy of development based on enhancing local characteristics rather than waiting for support from governments, and strengthening the role of local actors in the territory. This policy tool promotes local planning from a bottom-up approach and creates a link between the citizens, local government, regional politicians and international politicians. Despite that, planners, politicians and activists did not have a good enough response to the need of changing policies. Annual reports from Organisation for Economic Cooperation and Development (OECD 2001) showed that we are still far from reaching agreements of Local Agenda 21. This evidence is also gathered in "Obstacles of Agenda 21" (European Commission and WSSD 2002). Therefore, a great effort is required from the local authorities to

[3] It is widely known as 'La Cumbre de la Tierra - Rio 92', in Spanish.

tackle it. Naredo (2000) showed the opportunity of change based on the establishment of new relations between local resources and their management. Llobera (2000) and Ruiz Aviles (2000) defended the role of local governments that are well adapted to mount a well-controlled multi-sectorial response to these problems and optimize the use of natural and human resources. According to the Spanish Environmental Ministry and Foreign Affairs Ministry (2003) creating a regional network of support would favour social flows, diversification of economic systems and would diminish the consumption of natural resources. Local and regional governments are carrying out the implementation of Agenda 21 in Spain. Some of the most successful Agenda 21 projects implemented in Spain are "Sustainable Tourism through Local Agenda 21 Planning in Calvia", a model case all over Spain; and "Rural Women's Participation in Decision-Making in Spain", a project funded by the European Commission on Agriculture (ECA) and submitted at the Food Agricultural Organization of the United Nations (FAO) Summit in 1998 (ICLEI 2003). In the region of Madrid, low budget municipalities receive support from regional government to elaborate and implement Agenda 21 (CIMAS 2004).

IV.6. AGRICULTURAL PLANNING

After the implementation of the Common Agricultural Policy (hereafter referred as CAP) in 1988, rural areas in Spain suffered abrupt changes causing farmers to take early retirement, reduced production levels, land abandonment and rural depopulation (MacDonald *et al.* 2000). Consequently, the European Union responded by introducing the following two reforms: "Reform 1992" and "Agenda 2000" (European Commission 2003a, 2004c). These caused radical changes in agrarian policies, adding rural development and agri-environmental measures. The European Union had a new chance to reach agreements with some of its groups of critics in the Reform of 2003. Despite critical comments from farmers' unions and ecological groups, the reform was approved and at the present time it is being adopted (European Commission 2004c, 2004d). In fact, in recent years the EU has extended socio-structural measures which offer farmers the opportunity to remain on their land, to diversify their businesses, to promote extensive production by linking them with the environmental management.

IV.6.1. The European Union Context

The Common Agricultural Policy, widely called CAP, undoubtedly had far-reaching influences on the rural environment in the EU (Briggs and Kerrell 1992). From the beginning, CAP has had to adapt to new challenges. Budget constraints have always represented a main driving force of CAP reforms. In the early years it concentrated on achieving the goals set out in Article 39 of the Treaty of Rome, securing fair standards of living for the agricultural community and ensuring security of supply at affordable prices, while it controlled imbalances (European Commission 2004e). Consequently, its effects have changed through history, as new policy instruments were introduced.

- *Reform of CAP in 1992 (Treaty of Maastricht)*

A new approach based on a combination of lowering institutional prices and making compensatory payments was introduced in the reforms of 1988. The reform of 1992 had, as its main objectives, to integrate environmental and structural issues into the implementation of CAP and to ensure a fair income for farmers. Therefore, besides trying to increase the competitiveness of European Community agricultural products in the market, accompanying measures were also introduced: early retirement, agro-environmental measures and forestry (European Commission 2003a, 2004e)

Policies in the following years (1994 - 1999) were based on market policy, with price support measures (agreements under the World Trade Organization -WTO). This period was latterly known as *"the first pillar of CAP"*.

The EU Regional Policy (European Commission 2004a) which was established to reduce regional differences all over the European territory, was recognized as one of the main objectives after the reform of 1992. The Structural Funds constituted by the European Agricultural Guidance and Guarantee Fund (EAGGF) and the European Social Fund (ESF), have been complemented by other financial instruments such as the European Regional Development Fund (ERDF) and the Cohesion Funds.

The Conference on Rural Development, organised for the European Union in Cork (Economic European Community 1996) heard some speeches which summarized new challenges for European policy. These included;

- The current trend among European citizens to give more importance to quality of life in areas such as health, security, personal development and enjoyment.
- The exceptional position of suburban and rural areas to respond to these demands of the population.

Future policy actions must extend activities related to agriculture, for instance the creation of non-agricultural employment or the improvement of infrastructure and services (Ruiz Aviles 2000). At the same time a great effort to improve the environment has to be included in the policies of rural development.

- *Agenda 2000*

The Agenda 2000 proposals provided a concrete model for European agriculture in the years ahead. The aim of the Agenda 2000 reform was to deepen and widen the reform set out in 1992 by replacing price support measures with direct aid payments and accompanying this process with a consistent rural policy. The communication "Agenda 2000: For a stronger and wider Union", which the Commission presented in 1997, was a comprehensive response to these requests. Especially, it strengthened the effectiveness of the Structural Funds and the Cohesion Fund (European Commission 2004d).

Two types of measures had assisted in achieving these objectives:

- A horizontal regulation urged member countries to take into account farmers' compliance with environmental requirements and farmers' employment thresholds to decide direct aid in each country (Council Regulation [EC 1259/1999]). A horizontal regulation is understood to be a measure likely to be implemented throughout the member countries in the EU.
- A second horizontal regulation aimed at decentralising the management of the European Agricultural Guidance and Guarantee Fund (EAGGF).

The Agenda 2000 reform gave rural development regulation (Council Regulation [EC 1257/1999]). That is *"the second pillar of CAP"*, which was expected to guarantee the future of the European Community's rural areas. This second pillar created a framework to support sustainable farming and rural development by ensuring a better

coherence between rural development and the market policy of the CAP. Moreover, all issues of rural development tried to be promoted by enhancing the participation of local actors.

Within this spirit, the new Rural Development Policy established the following measures regarding farming and related activities:

- Accompanying measures of the reform in 1992: support for early retirement, agri-environment and re-afforestation schemes, as well as aid to less-favoured areas such as mountain areas or areas subject to environmental constraints;
- Measures to modernize and diversify agricultural holdings: farm investment, setting-up of young farmers, training, investment aid for marketing facilities and encouragement of the conversion to organic farming.

Recently the CAP has been restructured again, CAP reform 2003, because of the need to tackle the problems found during several critical assessments. According to "Impact analyses of mid-term review 2002 proposals" (European Commission 2003), the main outcomes of the implementation of policy mechanisms have been, on one hand the establishment of voluntary 'set-aside schemes' which have led to land abandonment by reducing the production of crops with; and on the other hand, support for Organic Farming as well as extensive livestock increased and favoured.

Apart from the official studies, researchers such as Briggs and Kerrell (1992) present the environmental and cultural effects of policy-induced agricultural adjustment in the EU. They argue that 'set-aside schemes' may help to maintain a mosaic of habitat for common species by establishing temporary corridors. This statement has been supported since the 90's when Potter and Lobbley (1991) defined the farmers as countryside managers. However, the environmental benefits are probably small in concerned landscapes. Other policy mechanisms such as the support in 'less favoured areas' have also been adopted in order to maintain agriculture as part of the rural economy in marginal areas. In respect of the need to observe carefully social effects, farming is entering a state of narrow landscape equilibrium, in which relatively small changes in either the physical or the policy environment may result in fundamental modifications in existing land use systems. As Philips *et al.* (2003) stated, an increasing

investment in local production would have significant benefits for the maintenance of the physical structure of regions. According to Paniagua (2002) the replacement of subsidies, the enlargement of the EU and the world globalization trend must be considered in the new revision of agricultural policy.

For these reasons, and similar ones, further revision of the CAP was planned. Indeed, CAP reform in 2003 was prolonged through 2004. Some key elements to highlight of the new and reformed CAP (European Commission 2003a, 2004c) are a strengthened rural development policy with more European Communitarian budget; new measures to promote the environment, quality and animal welfare and to help farmers to meet EU production standards; and a reduction in direct payments for bigger farms in order to finance the new rural development policy. This reform will enter into force during 2004 and 2005; however some member countries may apply them from 2007 at the latest due to specific agricultural conditions. This reform will also establish the EU's position in the negotiation ongoing with WTO.

The new Rural Development Policy proposed for the period 2007-2013 gathers citizens' demands to focus on the environment, food safety and quality. The Commission wants to simplify its implementation. New features are going to be included as a strengthened bottom-up approach, in which regions and local action groups will have more to say about local needs, and the novel European Agriculture Rural Development Fund (EARDF). This programme has three main objectives (European Commission 2004c, 2004d):

- To improve competitiveness of farming and forestry; by supporting farmers who participate in food quality schemes, by setting-up of young farmers and by developing infrastructure related to the adaptation of agriculture and forestry.
- To favour environmental and land management; through marginal mountain areas payments, NATURA 2000 payments, agri-environment measures which will remain compulsory and animal welfare payments.
- To encourage quality of life and diversification; for instance diversification of non-agricultural activities, encouragement to tourism, and investment to create micro enterprises.

IV.6.2. The National Context

In Spain, the rural migration to metropolis or '*cabezas de comarca*' occurred from the 60's to the later 70's, coinciding with the end of the dictatorship. The economic growth during the 60's led to changing farming systems; vast rural areas with traditional exploitation systems were abandoned, meanwhile new farming systems, intensification of agriculture and livestock started to be competitive (Ruiz Pérez 1990; Gómez Benito and Jesus González 2002). The implementation of CAP, as in other European countries, accelerated land abandonment and loss of traditions by local farmers; meanwhile, the largely industrial farms were favoured (Gomez Limon and Lucio 1999; MacDonald *et al.* 2000). Despite that, in recent years, maintenance of arable lands and traditional systems have been observed due to subsidies received by the CAP reform to promote friendly environmental and cultural practices (Lacasta and Mata 2000).

Spain entered the European Commission in 1988, and the earliest periods, 1989-1993 / 1994-1999 (after the reform of 1992) were essential in Spain for structural adjustment with the rest of the member countries. The main measure was the establishment of a "direct support scheme" within the policy market under agreements with WTO, concerning to "*the first pillar of CAP*".

After the reform of 1992, the EU Regional Policy established Objective areas through Multi-annual Operational Programmes under the Structural Funds (Ministry of European Affairs 2003). These were specifically funded by the European Agricultural Guidance and Guarantee Fund (EAGGF). Then the action priorities for each Objective are explained;

- Objective 1, structural adjustment in less developed regions.
- Objective 2, restructuring areas under industrial slump.
- Objective 3, facilitation of people's setting up in the work market.
- Objective 4, promoting technology changes and new marketing processes.
- Objective 5a, setting holdings in the framework of the CAP.
- Objective 5b, encouraging rural development.
- Objective 6, promoting regional development to avoid depopulation.

Compared to the other EU countries, two of the main problems in Spanish agriculture were *'structural deficiencies in agricultural holdings'* such as old technologies, uncompetitive domestic and external trade, lack of technical assistance, weak production structures; and *'the difficult retention of young farmers in the countryside'* (MAPA 2003). Consequently, a National Law about *'modernisation of agricultural holdings'* was adopted in 1995 (Law 19/1995) which has been lately revised on several occasions, and a regulation concerning landownership was also adopted in 1996 (RD 2484/1996).

The implementation of Agenda 2000 changed the Objectives areas in the Regional Policy. The measures incorporated in *"the second pillar of CAP"* were included in the following Multi-annual Operational Programmes;

- Objective 1: Measures financed by the EAGGF Guidance Section – to modernize and diversify agricultural holdings – Regulation CE 1257/1999;
- Objective 2: Accompanying measures of the 92 Reform;
- Objective 3: Measures in rural development programmes; LEADER and PRODER programmes and support to the Natura 2000 Network.

The following tables (Table IV.4. and Table IV.5.) show an interesting analysis of the implementation of *"the second pillar of CAP"*, that is the Rural Development Programme in Spain (MAPA 2004), during the 1994 – 1999 and 2000 – 2006 periods.

The increase of funds in the second period (2000 – 2006) could be explained because of the significance of Rural Development Programmes reached in the EU policies. In fact, the increase of total public expenditure for rural development between both periods is over 80%.

Table IV.4: Distribution of financial support from the involved Administrations in the Rural Development Programme (RDP)

Public Administrations / Periods	*1994-1999 (%)*	*1994-1999 (mill. euros)*	*2000-2006 (%)*	*2000-2006 (mill. euros)*
Central administration	12.7	1064.51	18.6	2810.83
Regional government	18.5	1550.67	20.6	3113.07
Local government	0.5	41.91	0.8	120.89
Total National	32.7	2741.9	40	6044.8
The European Union	67.3	5640.1	60	9067.2
Total public expenditure	100	8382	100	15112

Source: Own work (MAPA 2004)

In general, the measure *'improving environment'* is the only one which has a significant growth between both periods. This measure implied accompanying measures such as *'agri-environmental and re-afforestation of farm land'* and forestry measures.

Table IV.5: Main distribution of funds according to implemented measures in the RDP

Measures / Periods	*1994 - 1999 (%)*	*1994 - 1999 (mill. euros)*	*2000 - 2006 (%)*	*2000 - 2006 (mill. euros)*
Supporting income	5.81	487	3.73	563.68
Structural and marketing improvements	56.14	4705.65	56.92	8601.75
Improving environment	24.02	2013.35	28.97	4377.95
Economic diversification in rural areas	13.20	1106.42	9.38	1481
Training	0.83	69.58	1.00	151.12
Total public expenditure	100	8382	100	15112

Source: Own work (MAPA 2004)

The current Rural Development Programme in Spain (2002/2006) is based on promoting sustainable management of the rural environment, improving production conditions and structures of farming systems, and protecting the environment.

Organic Farming is seen as a part of this desired sustainable farming system and appears as a viable alternative to the conventional approach, in the recent years. Organic farming may help to maintain ecosystems and other important economic activities such as tourism in rural areas. The plan for organic farming in Spain (MAPA 2004) is based on the guidelines for reform in CAP 2003; modernization of agricultural holdings, promoting environmentally-friendly practices and diversifying development of rural areas. According to the European Commission (2002) 'organic production' is only part of total agriculture production and should not therefore be seen as a substitute for horizontal consumer protection and quality policies and regulation in agriculture.

Consequently, the plan proposed for the Ministry of Agriculture, which was submitted before the outcomes of the public consultation on 2003 (MAPA 2003a), defined a framework for stakeholders' demands. These actors are farmers' associations, trade unions, producers' associations, marketing companies and consumers. The objectives gathered in this plan are: promoting farm production and livestock; supporting transformation and manufacture organic products; improvement of conditions in marketing; restoring consumer confidence in organic products; increasing in training; and decentralization of the sector.

According to the reform of the CAP in 2003, all subsidies or payments for production support will be replaced or scrapped from 2006. Thus, there are needs for new policies. For instance, Kuiper (2000) defended 'organic farming' as an emerging strategy to support marginal farmers and to enhance local markets within policies that promotes local sustainability. Indeed, these new policies must be supported by citizens to ensure implementation, with methods such as popular consultation. The public consultation carried out by the Ministry of Agriculture (MAPA 2004) was taken to involve actors in

the decision planning from regional level to national level in Spain. However how these claims have been or will be implemented could be debatable.

On the contrary, some of the most relevant critical groups against the new reform 2003 could not participate in the elaboration of the last reform of CAP. These groups are mainly represented by *Plataforma Rural* a network of rural communities (see http://www.nodo50.org/plataformarural), *Ecologistas en Acción, an* ecological movement (see http://www.ecologistasenaccion.org) and COAG - *Coordinadora de Agricultores y Ganaderos* in Spanish, *a* farmers' trade union (see http://www.coag.org). They consider the reform as another chance lost to readjust agricultural policies to different realities in member countries. *Ecologistas en Acción* and *COAG* led their proposals to the Agricultural Ministry. *COAG* supports, especially, the maintenance of farming as a family activity, while promoting the setting-up of young farmers. *Ecologistas en Acción* presents the main weakness in Spanish agriculture as the desertification and lack of water resources. In contrast, Spain is the biggest resource of biodiversity in all Europe, and the traditional farming systems guarantee their conservation. According to this group, however the system of subsidies is still based on production instead of environmental benefits (COAG, Ecologistas en Accion and Plataforma Rural 2006)

IV.6.3. The Regional Context

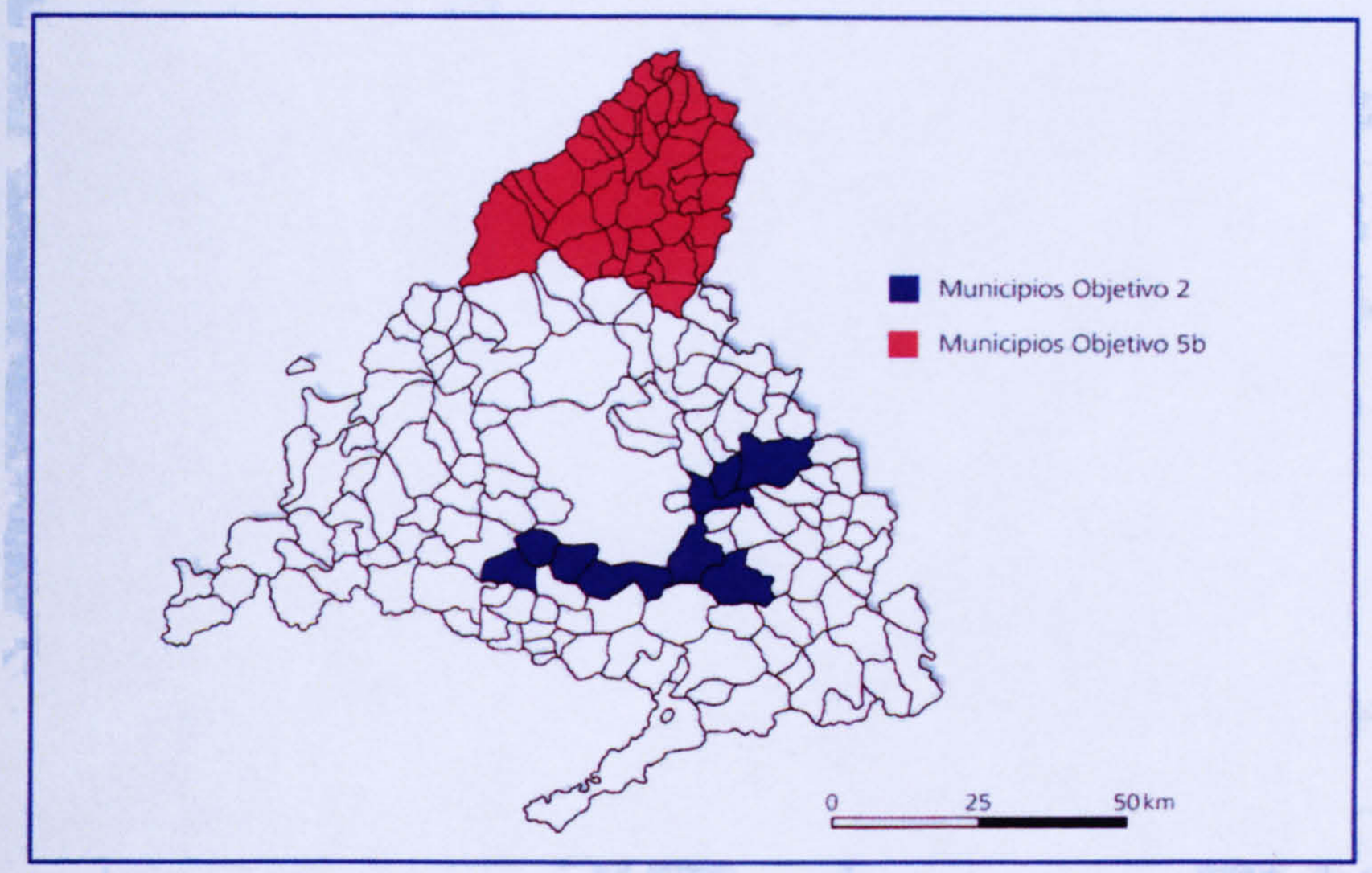
As in the National Context already described (pp. 76), the implementation of CAP accelerated the process of land abandonment and loss of traditional practices. MacDonald *et al.* (2000) paid special attention to mountain areas as the most affected ones. Lacasta and Mata (2002) established other main causes of farming changes in Madrid, such as the raising of land prices and the growth of building-land demand as a consequence of uncontrolled urbanization process and activities related on infrastructural and industrial development. These processes happened usually near to large urban and sub-urban areas, such as Madrid. The agricultural, forest and livestock activities in the region of Madrid are historically located among mountain, plateau and sub-urban areas.

"The first pillar of CAP" (MAPA 2004) is based on a "direct support scheme" within market policy. The specific regionalised instruments for that scheme were only established from 1997. Thus, the analysis of the distribution of funds includes these two periods, 1997 - 1999 and 2000 - 2002. The region of Madrid was represented by 0.81% of the total amount received in Spain during the two periods. This insignificant value is certainly because Madrid did not belong to the most priority objective area (Objective 1 is related on GDP) compared with other regions in Spain. The second period had a national increase around 16.6% in received funds, with extreme differences all over the country. Despite that, Madrid had a very similar increase, around 16%.

The implementation of the EU Regional Policy, funded under the Structural Funds, established Objective areas in each region from the 1st period, 1989 – 1993, the 2nd period, 1994 – 1999, until the 3rd period, 2000 – 2006 (Madrid Regional Government 2003). Before the implementation of Agenda 2000, Madrid had Objective areas 2, 3, 4, 5a and 5b.

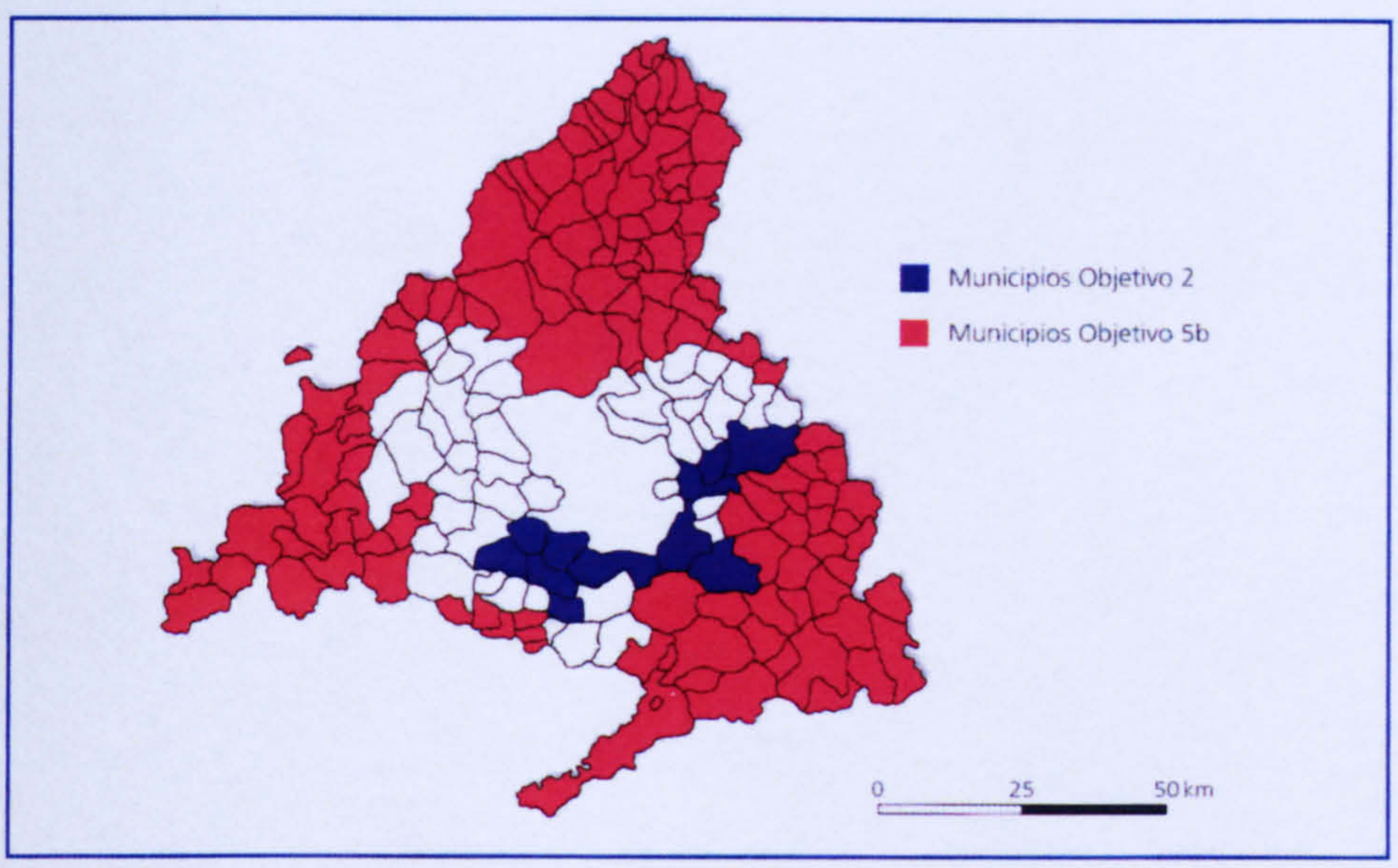
The two following figures give an idea of changes in these Objective areas, as a consequence of the improvement of regional standards during the first two periods. Figure IV.8 represents "Municipalities in the region of Madrid: Objective 2 and 5b" during the 1st period (1989-1993) before the reform of CAP in 1992. Figure IV.9. represents "Municipalities in the region of Madrid: Objective 2 and 5b" during the 2nd period (1994 – 1999), before the implementation of Agenda 2000.

Figure IV.8.: Municipalities in the region of Madrid under the Structural Funds (Objective 2 and 5b), 1989 -1993



Source: Madrid Regional Government 2003b

Figure IV.9.: Municipalities in the region of Madrid under the Structural Funds (Objective 2 and 5b), 1994 -1999

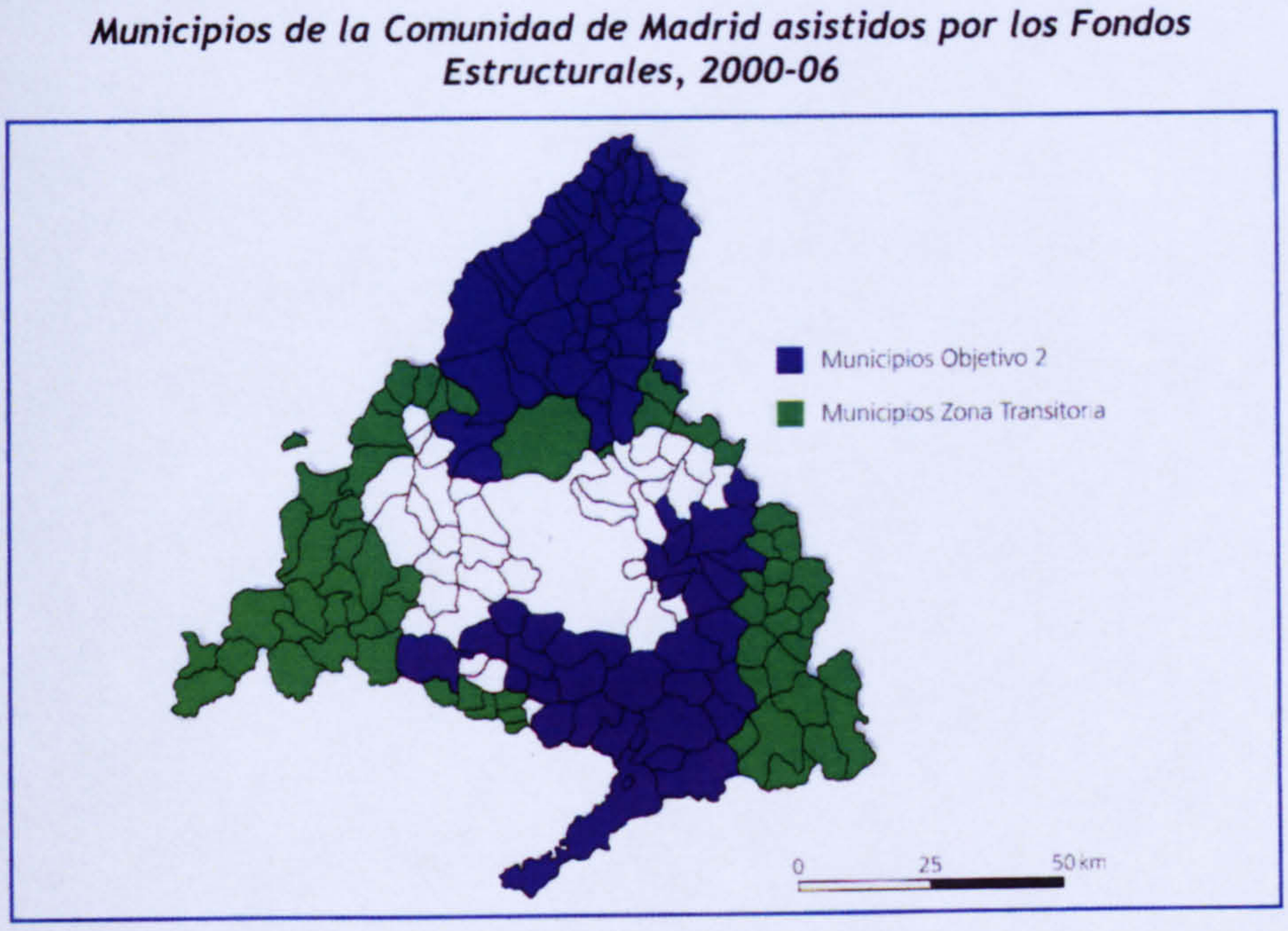


Source: *Madrid Regional Government 2003b*

In the 3rd period, the current programme 2000 – 2006, two different objectives are implemented after the setting-up of Agenda 2000: Objective 2 in order to support such economically and socially less-favoured areas as industrial, urban and rural; and Objective 3 in order to support the modernisation of policies and training systems. The implementation of Objectives 2 and 3 affects approximately 64% of the total territory in the region of Madrid. This involves all of the protected areas *"Parque Regional de la Cuenca Alta del Manazanares"*, *"Parque Natural de Penalara"* and *"Parque Regional del Sureste"* (Madrid Regional Government 2004a)

The following figure (Figure IV.10.) shows "Municipalities in the region of Madrid: Objective 2 and Transitory area - those municipalities which lose their priority" during the current or 3rd period (2000 - 2006), after the implementation of Agenda 2000.

Figure IV.10: Municipalities in the region of Madrid under the Structural Funds (Objective 2 and transitory area), 2000 -2006.



Source: Madrid Regional Government 2003b

The following analysis of *"the second pillar of CAP"* (MAPA 2004), shows the distribution of funds regarding different policies in the region of Madrid from their implementation. *"The second pillar of CAP"* was implemented through the Rural Development Programme in Madrid from the 1st (1994 - 1999) and the 2nd (2000 - 2006) periods. See table below.

Table IV.6: Public expenditure contribution in Madrid respect to public expenditure in Spain during both periods

Lines of action in Rural Development Program / Periods	*1994-1999 (%)*	*2000-2006 (%)*
Supporting income	0.3	0.4
Structural and marketing improvements	1.03	1.276
Improving environmental	1.83	2.00
Economic diversification in rural areas	2.28	1.91
Training	2.47	1.86
Total Public expenditure Contribution in Madrid / Spain	1.36	1.58

Source: Own work based on 'Libro Blanco de Agricultura y Desarrollo Rural' (MAPA 2004)

Madrid, as well as Castilla la Mancha, Extemadura and Andalucia are the regions which have a bigger budget (as a percentage) for *'improving environmental'* factors. This is followed by *'structural and marketing improvements'*, *'training'* and *'supporting income'* as the main measures in the region of Madrid.

The Rural Development Programme for the region of Madrid (European Commission 2004a) seeks to encourage environmentally friendly agriculture with a view to bolstering the sustainable development of the countryside. It also seeks to diversify and revitalise agriculture while ensuring that the citizens are more closely integrated. Some of the priorities are *'rural infrastructure'; 'economic diversification and revitalisation of rural areas'*, with several integrated measures which will encourage diversification, improvements in farm management, tourism, conservation of the rural heritage and

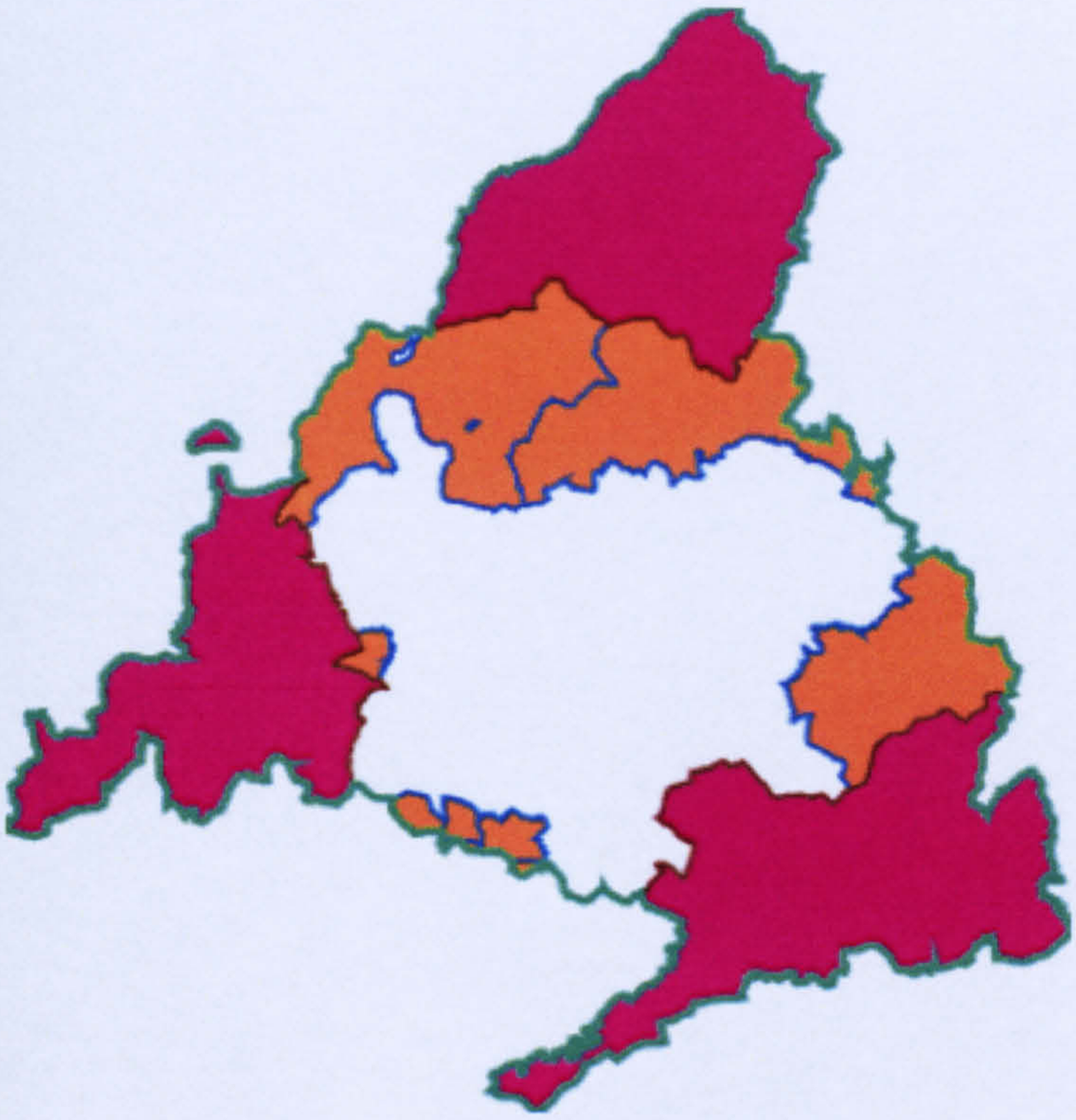
marketing of quality products; *'processing and marketing'* and lastly *'forestry and natural resources'*, a series of measures which will focus in particular on encouraging management of natural resources and landscape, animal welfare and education on environmental issues. *'Forestry and natural resources'* and *'processing and marketing'* are the action lines which the EU gives a significant importance by its financial support.

According to an impact assessment realized for the regional government (Madrid Regional Government 2003a) the new Rural Development Programme of the Madrid Region (2002 - 2006) concentrates most of its interest on developing new businesses, however it has low impact in re-structuring existing small and medium enterprises (SMEs). Initiatives to develop rural tourism and to encourage pluri-activity must have a bottom-up approach as outcomes of the actions of local action groups at the level of the *comarca* (Ruiz Aviles 2000). The involvement of these groups in the planning process, through the LEADER initiative, would clearly be advantageous.

Organic Farming in Madrid (MAPA 2003a) has higher possibilities than many other geographic zones since, due to its location, it is at the centre of production and marketing. The main production models are livestock, located in agricultural land, and forestry use. In this metropolitan region, there are 600,000 ha. of agricultural land under agrarian modernization processes, mainly based on quality production, livestock and specialized production such as flowers.

In addition to the Regional Policy and Rural Development Programmes, the EU adopted Communitarian Initiatives under co-financing with the member countries. LEADER 1, 2, + and PRODER 1, 2 (in their different programmed periods) are the most well-known initiatives and had the greatest impact by encouraging rural areas. These initiatives have played and still will play a significance role in sustainable rural development and revalorization of cultural and natural heritage. This scheme was a successful approach due to the role of Local Action Groups 'LAG' (*Grupos de Accion Local - GAL*, in Spanish) as developers of local development strategies (see Chapter VI). The following figure (Figure IV.11.) represents LEADER + and PRODER 2 Initiatives at the present time (2000-2006 period) carried out by 'LAG' in the different rural areas, widely called *comarcas*, in the region of Madrid.

Figure IV.11: LEADER+ and PRODER 2 Local Action Groups



LEADER +

Aranjuez –Las Vegas

Sierra Oeste de Madrid

Sierra Norte – Valle del Lozoya-Somosierra

PRODER 2

Aranjuez –Las Vegas

Campiña del Henares

Sierra de Guadarrama - Alto Manzanares

Sierra del Jarama

Sierra Norte – Valle del Lozoya-Somosierra

Sierra Oeste de Madrid

Source: RedRural (MAPA 2003)

IV.7. ENVIRONMENTAL PLANNING

New pathways to sustainable development were highlighted by following the significant reports "The Limits to Growth" (Club of Rome 1972) and "Our common future" (Brundtland 1987). These reports spread a new environmental awareness over the world addressing the need to change widely international objectives. The concept of sustainable development added a multidimensional character to different aspects of human beings, environment, technology, economics, society, culture, and politics. Both reports also encouraged the politicians to face up to this challenge and to search for new alternative policies for managing and planning in the public and the private sectors. Jimenez Herrero (1992) stated that the success of this challenge will depend on relationships established between different actors in the whole of society.

In the Earth Summit (United Nations 1992) sustainable development was the chosen strategy concerning subsequent policies. "The Rio Declaration on Environment and Development" established the principles of Agenda 21. Two important agreements, the Convention on Climate Change and the Convention on Biological Diversity, were also reached at this summit. The Convention to Combat Desertification was also approved in 1994. Ten years later, the World Summit on Sustainable Development (United Nations 2002) was set as the target date to implement National Strategies for Sustainable Development -NSSD. The objective of these strategies for sustainable development is to harmonize the economic, social, environmental policies that are operating in each country. The Plan of Implementation of this Summit (2002) recommended taking immediate measures for the implementation of these strategies by 2005 and reaffirmed Agenda 21.

IV.7.1. The European Union Context

The EU was a pioneer by elaborating a "European Strategy for Sustainable Development" (ESSD) approved in 2001 (European Commission 2003c). This strategy established the framework for all the member countries. The EU also adopted a necessary leading role for the members in the implementation of Agenda 21 by publishing "Implementing Agenda 21" (European Commission 2002b). Lately, the ESSD and Agenda 21 have been revised "The WSSD one year on: implementing our commitments" in 2004.

The European Pluri-annual Programmes in Environment have been established likewise as national laws in the member countries. During I (1974 - 1977), II (1978-1981), III (1982-1986) and IV periods (1987-1992) the environmental measures were not clearly linked with the agricultural policy (CAP). The V period (1993-2000), just after "The Rio Declaration on Environment and Development" (United Nations 1992) is the beginning of a real link between agriculture and environment. At the present time, Period VI (2001-2010) is being applied. This Sixth Environment Action Programme is pushing to reach article 6 of the Amsterdam Treaty in 1996 about the protection of environment in the whole of EU policies.

The Birds Directive in 1979 (D79/409/CEE) was the first legal framework of EC legislation on nature protection. The Habitats Directive (D92/43 CEE) came after a decade, in 1992. This has been recognized as the main European Directive on nature protection, probably because of the expanse of the areas involved all over the territory and their relationship with agricultural land. Through measures implemented under CAP, forestry measures and the impact of structural funds in rural areas, the EU has a tremendous influence on land use and consequently on the state of nature conservation in the EU. Both Directives established the beginnings of the protected sites network in Europe, through the following categories; SPA (Special Protection Areas for Birds) belonging to the Birds Directive, and SCI (Sites of Community Importance) belonging to the Habitats Directive.

Natura 2000 will be a European network of sites that were proposed under the first two categories of protection, where human activity must be compatible with the conservation of sites of natural importance. EECONET was the former network created with this objective, based on a physical connection network. Through the Natura 2000 Network, the EU will establish a sites network covering broadly agricultural areas. Delpeuch (2000) explained what kinds of areas will be part of Natura 2000:

- Areas under Habitats Directive subjected to Community interest. SCI (LIC in Spanish) designated by the member countries until 2004 are also included.

Protection requirements and management measures will be gradually implemented on these sites.

- Areas under Birds Directive, SPA (ZEPA in Spanish) designated directly by the member countries.

Farmers and foresters are concerned about the Natura 2000 network, because most of the natural habitats covered by the network are in agricultural or forest areas. These natural habitats have been created and maintained by human activities. The natural habitats would disappear if farming or livestock practices cease. As Potter and Lobley (1991) stated, 'policymakers need information which they could use to set plans up to farms and farming practices that could bring the greatest environmental benefit'. After the positive experience gained through agri-environmental measures (since the implementation of Agenda 2000) the relationship between Natura 2000 and EU agricultural policy could encouraged this by paying farmers for services done to society. This support to farmers appears as a view of pluriactivity in farming, which will contribute to improve farmers' incomes and to diversification activities becoming more attractive, such as rural tourism linked to nature, quality products in Natura 2000 network sites, etc. Some of the member countries and regions are nowadays giving priority at Natura 2000 sites through co-financing agri-environmental measures (Delpeuch 2000).

IV.7.2. The National Context

The nature protection and conservation policy started in Spain with the law of National Parks; then "National Parks" – *Parques Nacionales*, and "National Places" – *Sitios Nacionales* were created as categories of protection. Years later, still during the dictatorship, two new categories appeared "Places and natural monuments of national interest" – *Lugares y Monumentos naturales de interes nacional*. At last, the widest legal framework in national environmental regulations (Law 4/89) was implemented in 1989. This law referred to Natural Areas, Wild Fauna and Flora Conservation. Latterly, Laws 40 and 41/97 have modified Law 4/89 in respect of administration of National Parks.

An article of this law (Encinas *et a.l.* 2004), title II demands for natural resource planning and creates new tools in our jurisprudence "Guidelines for natural resources planning" - *Plan de Ordenacion de Recursos Naturales* (PORN) as a planning tool and "Guidelines for natural resources management" – *Plan Rector de Uso y Gestion* (PRUG) as a management tool. These tools will permit a previous and integral treatment in specific areas for conservation and improvement of natural resources and species in extinction. A special category for natural protected areas is also considered in this title. The first proposal was to establish a network of main ecosystems and natural regions existing in the territory. These Natural Areas are classified in different categories depending on their value, Parks, Natural Reserve, Natural Monuments and Protected Landscapes. Every National Park and Natural Reserve is expected to have "Guidelines for natural resources planning", while the "Guidelines for natural resources management" is only expected in Parks.

However, the Law 4/89 has not been monitored by any body of the government; therefore several regulations are not being well-implemented. PRUG is an example of these regulations not well-implemented, and as consequence PORN are being inappropriately implemented. This planning tool, PORN, is being underused because of being mainly implemented on natural protected areas. Actually, the aim was to plan natural resources as a whole of the territory. That means that the last chance to order the territory environmentally, and not only protected areas, has been lost (Encinas *et al.* 2004).

The current "Natural Protected Areas Network" - *Espacios Naturales Protegidos* (ENP) was created to analyze what percentage of current territory designated for conservation could be part of the future Natura 2000 Network. In fact, the present situation is not optimistic, due to the lack of knowledge about financing and managing these spaces, probably because of the coexistence with other networks.

In 2002, Spain submitted the 'National Strategy for Sustainable Development' (MMA 2002) in the World Summit of Sustainable Development in Johannesburg (United Nations 2002) which was greatly criticised by Spanish stakeholders before its submission due to the lack of participation in the process of elaboration.

"WWF/Adena", *"SEO/Birdlife"*, *"Greenpeace"* and *"Ecologistas en Accion"* supported by the Socialist Party, at that time in the opposition, submitted an alternative version.

IV.7.3. The Regional Context

The Natural Places of National Interest such as the "Pedriza del Manzanares" and the "Cumbres, Circos y Laguna de Peñalara" and the Natural Monuments of National Interest like the "Peña del Arcipreste de Hita" and the "Peña del Tolmo" were created under the national legal framework in 1930, in the region of Madrid.

The Forest Law of 1957 declared as a Picturesque Place "Pinar de Abantos" in 1961 and as a Natural Place of National Interest "Hayedo de Montejo de la Sierra" in 1974. Years later (1978) "Cuenca alta del río Manzanares" was declared a Natural Park, under the National Law (15/75) on Protected Areas. This category was later transformed to Regional Park by the regional legislation.

In the region of Madrid a specific law on Protected Areas does not exist, therefore the national law previously described (Law 4/89) has to be implemented. Moreover, the regional government of Madrid, using its responsibility in conservation of natural spaces, flora and fauna, has approved a series of regulations that provide other different categories of protection such as "Reservoirs and Wetlands" and "Forest and Nature Protection".

In Madrid the natural protected areas represent around 40% of the total surface of territory in the region (Encinas *et al.* 2005a, 2005b). As we can observe in Table IV.7., of that 40%, 13% corresponds to protected areas whose declaration derives from National legislation (Law 4/89) and approximately 63% of protected land derives from the European Community's legislations: SPA (Birds Directive D79/409/CEE) and SCI (Habitat Directive D92/43/CEE). The rest of these protected spaces correspond to different categories such as "Reservoirs and Wetlands" and "Forest and Nature Protection".

SPA (Birds Directive) and SCI (Habitat Directive) will constitute the future Nature 2000 Network in the territory of Madrid. In the meantime, the Natural Protected

network (ENP) could not meet Natura 2000 network requirements, therefore all the habitats had be analysed separately. The establishment of Natura 2000 would suppose an increase of protected land but also an improvement of the physical connection among natural areas. This will give another opportunity to manage not only protected areas in respect of public use but also by traditional and ecological activities inside these areas.

The maps presented below (Figure IV.12, IV.13, and IV.14) describe, respectively, the surface occupied under SPA and SCI (EUROPARC-España 2002, 2004) and the Protected Areas under National Legislation (Madrid Regional Government 2004) in the region of Madrid.

Figure IV.12: SPA, Special Protection Areas for Birds (MMA 2002)

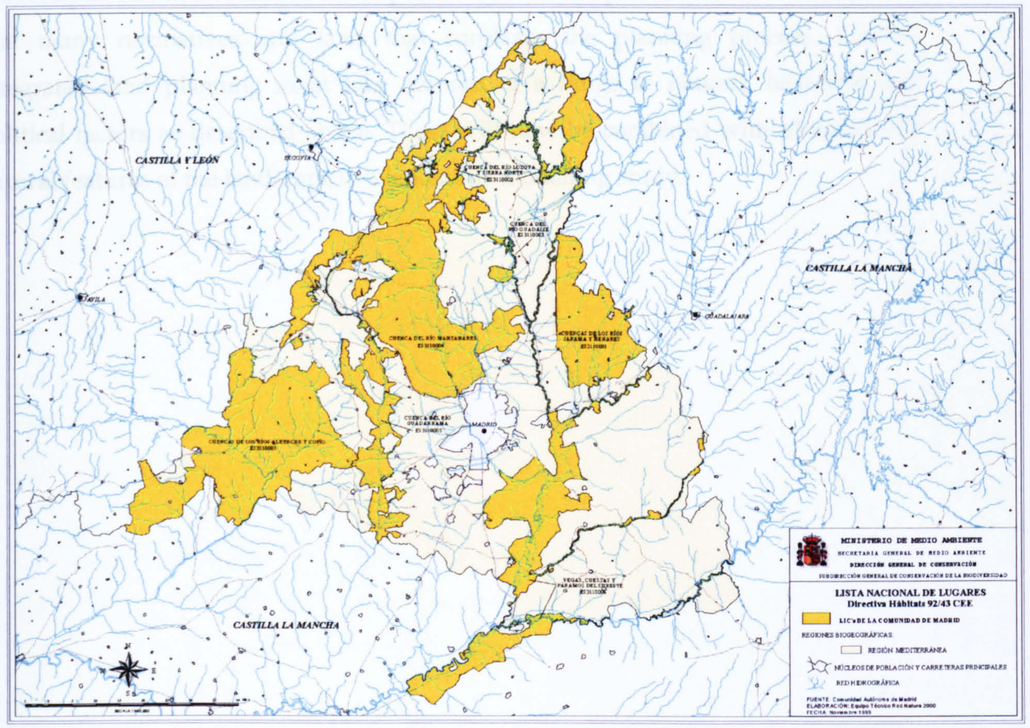


Figure IV.13: SCI, Sites of Community Importance (MMA 2002)

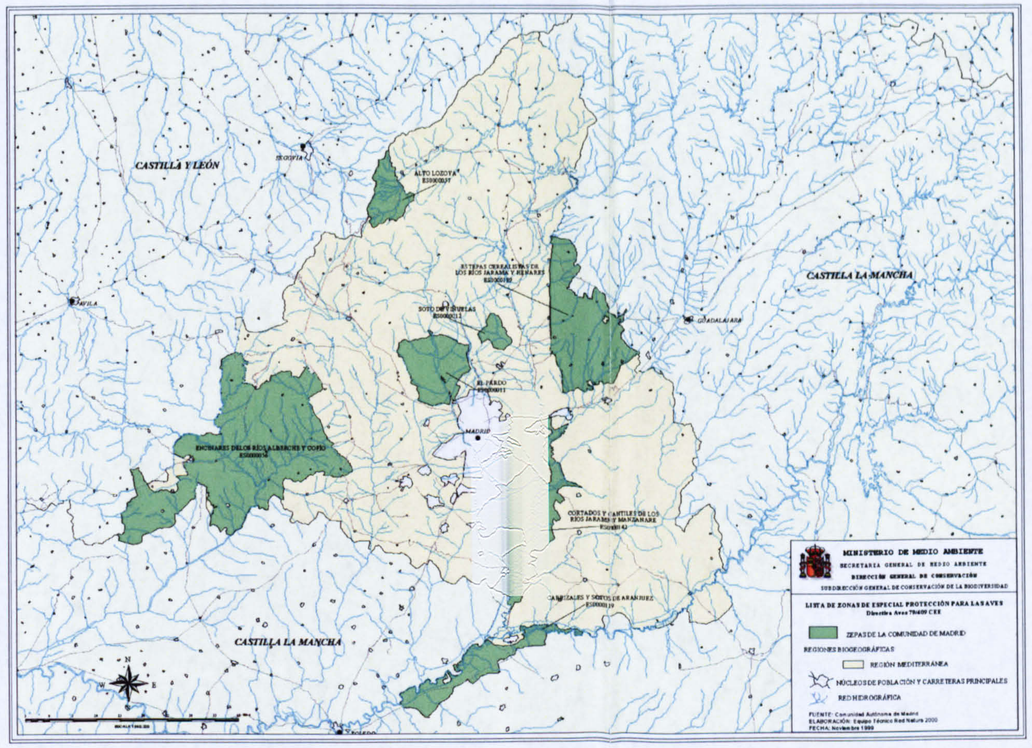


Figure IV.14: Natural Protected Areas under National Legislation (Madrid Regional Government 2002)

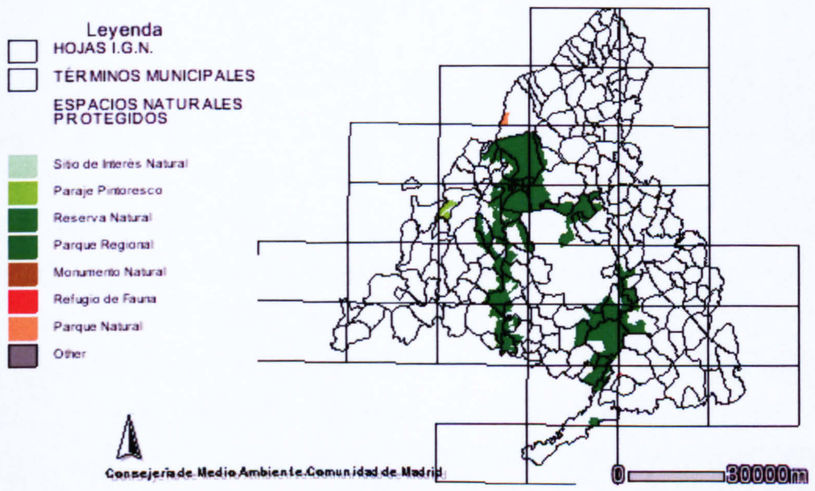


Table IV.7. Protected Areas in Madrid (EUROPARC—España 2002)

KIND OF PROTECTED AREA	*SURFACE (799,500 ha)*	*PERCENTAGE (%)*
Protected Areas by Spanish Legislation (National Law 4/89)	104,187	13.05
SCI (Habitats Directive)	320,043	40.03
SPA (Birds Directive)	178,371	22.31

Source: TiGrESS-Madrid case study (2003)

This chapter has demonstrated the importance of natural protected areas and explored that many normatives and laws that constrain the planning process. Clearly, integrated land planning must take account of a range of natural, historical and political factors as described above. These will now be combined with physical and natural features of the landscape in a landscape modelling study.

CHAPTER V

LANDSCAPE DYNAMICS & INSTITUTIONAL FACTORS: REALITY AND VALUE JUDGMENTS

The previous chapter (Chapter IV) describes the landscape of Madrid and, deals with the controversial planning strategies in the region. This chapter presents the conceptual model, based on the appreciative approach referred to in earlier chapters (Chapter II and III). The empirical model is developed in two stages necessary to bridge spatial and temporal scales of the system. This stage is the precursor to the stakeholder engagement process carried out during the fieldwork described later on (Chapter VI). Afterwards, an analytical land planning tool will be built (its development is described in Chapter VII). The land planning tool will simulate different future scenarios and predict the impact of social, economic, political and environmental decisions for the different groups of stakeholders involved in the landscape.

V.1. LANDSCAPE AS A COMPLEX ADAPTIVE SYSTEM

'A Landscape is the result of local history, it is also the outcome of a flow of organisms (including people) in and out of a specific context and it is the study of a sequence of ecological land mosaics. It has a holistic dimension due to the interaction of natural and cultural elements' (Nassauer 1995, 1997).

As the following references evidence, landscape can be understood as a complex social-ecological system. Forman and Godron (1986) started to explore the linkages between culture and nature. Humankind is the most significant influence in the landscape (Hägerstrand 1995), which can be understood as a complex adaptive system because the dynamics of the landscape are shaped by human activities (Forman 1995; Berkes and Folke 1998; Antrop 2004). Nassauer (1995) also observes 'culture structures landscapes while landscapes inculcate culture' and notes that 'a changing landscape is a legacy'. While Gell-Mann (1994) explains that the only hope for dealing with the complexity of demands and issues that society is facing, is a cultural change itself.

This intimate linkage between culture and nature poses special challenges for the writer. Tress and Tress (2001), for example, explain 'the examination of geological, biological, aesthetic, historical, psychological, social or economical dimensions in isolation is not appropriate to landscape reality'. Recent research initiatives (including TiGrESS) have emphasized the role of integrative research as a way of linking cultural communities without eroding their distinctiveness (Winder 2003; Tress *et al.* 2004).

In Madrid this connection between cultural embeddedness, perception and behaviour is manifest as consistent differences of approach between stakeholder groups. Different groups of land users and landowners, such as farmers, livestock farmers, natural area managers, building constructors, tourism associations, ecologist groups and politicians have different landscape preferences. These differences are related to -cultural- values regarding land uses (Aguilera-Klink and Sanchez-Garcia 2002). The landscape preferences depend on the population's demand for different uses of the territory, the position of the rest of stakeholders regarding this demand, the support to specific uses from regional or local authorities, tourism policies and the land planning regulations. As an activity, planning the landscape is a cycle of perpetual processes, either environmental or human, based on values and preferences that evolve and change, which have short-term and long-term motivations. The vectors of change, both ecologically and culturally, occur over many time scales. That is why, in order to plan the evolution of the landscape, it is necessary to understand their spatial and temporal contexts (Marcucci 2000).

V.2. FIRST CONCEPTUAL MODELLING EXERCISE: MADRID – TiGrESS

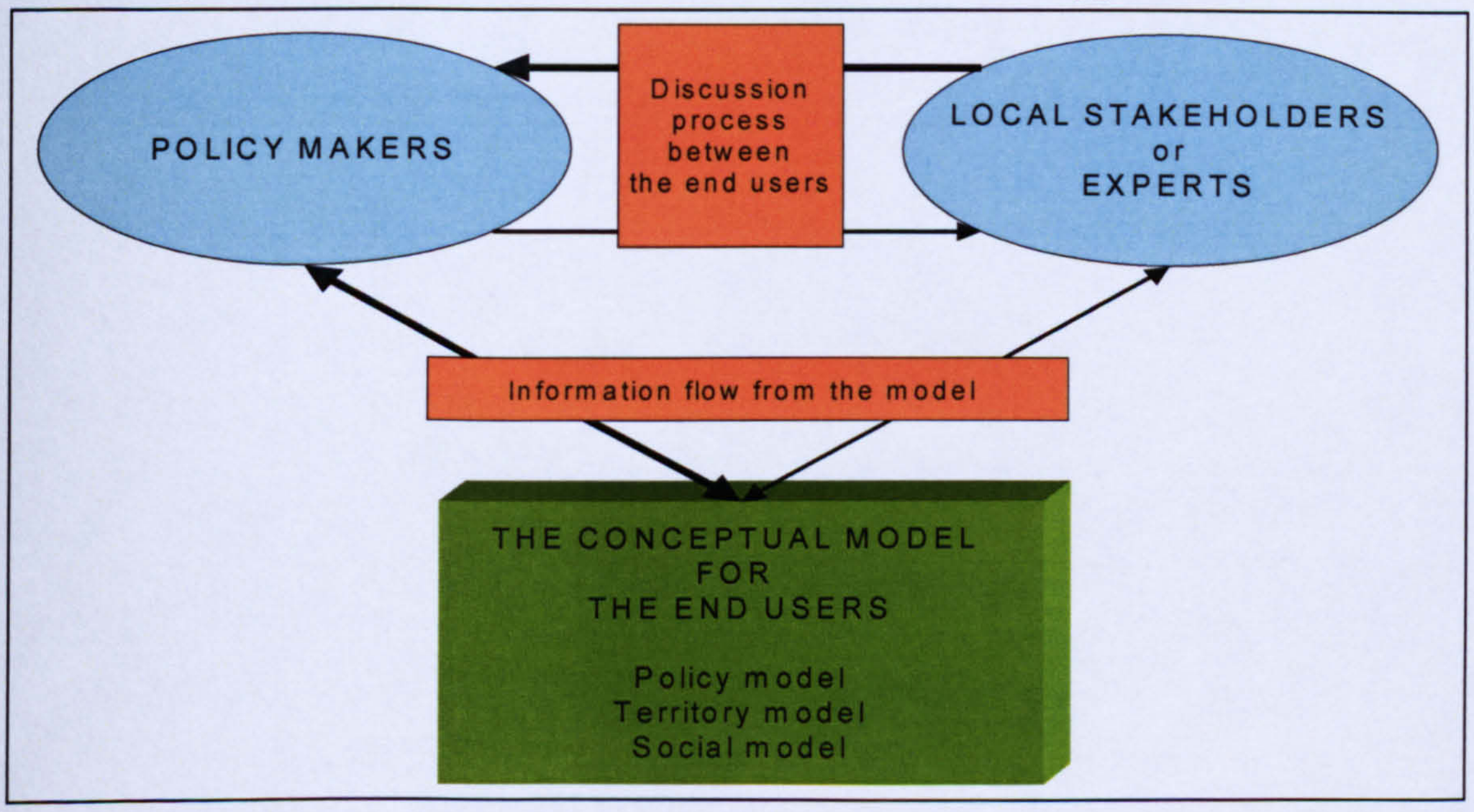
The landscape is shaped by processes, which represent interactions between society and landscape; and relationships between society and governance. If this is so, sub-systems might also need to be understood. We should be aware that these could be complex themselves (Johnson 1995). The sub-systems should respect the *value* and *reality judgments* they inherit from the supra-system. The system is regulated by policies that constrain the processes, and by institutional responsibilities which not only respond to norms but also endeavour to influence the policy makers. Moreover, the non-policy information flows (people's motivations and decisions - preferences)

and managerial information flows are going to be represented in the conceptual model. *"Models are a simplified representation of a system intended to enhance our ability to understand, predict, and possibly control the behaviour of the system (Neelamkavil 1988)"* quoted in Oxley *et al.* (2004:1000)

The figure below (Figure V.1) shows how the end users (planners, politicians, local stakeholders and so on) interact with each other within the complex decision-making system in land planning. As Oxley *et al.* stated, *"...the involvement of policy-makers, stakeholders and other end-users is essential for the specification of relevant decision-making issues and the development of useful and interactive support tools."* (2004:999).

The figure represents the exchange of information and communication (arrows in the box) between policy makers and local stakeholders. Policy makers must expect requests (wider arrow) from local stakeholders, but there will also occur some kind of vice versa communication. Stakeholders, either local ecologist groups or policy makers, are never neutral -they have different values and beliefs- and sometimes take decisions in conditions of complete uncertainty (Vickers 1973). Thus, the future tool would act as a mediator in planning and policy-making between stakeholders. Even so, the conflict will remain.

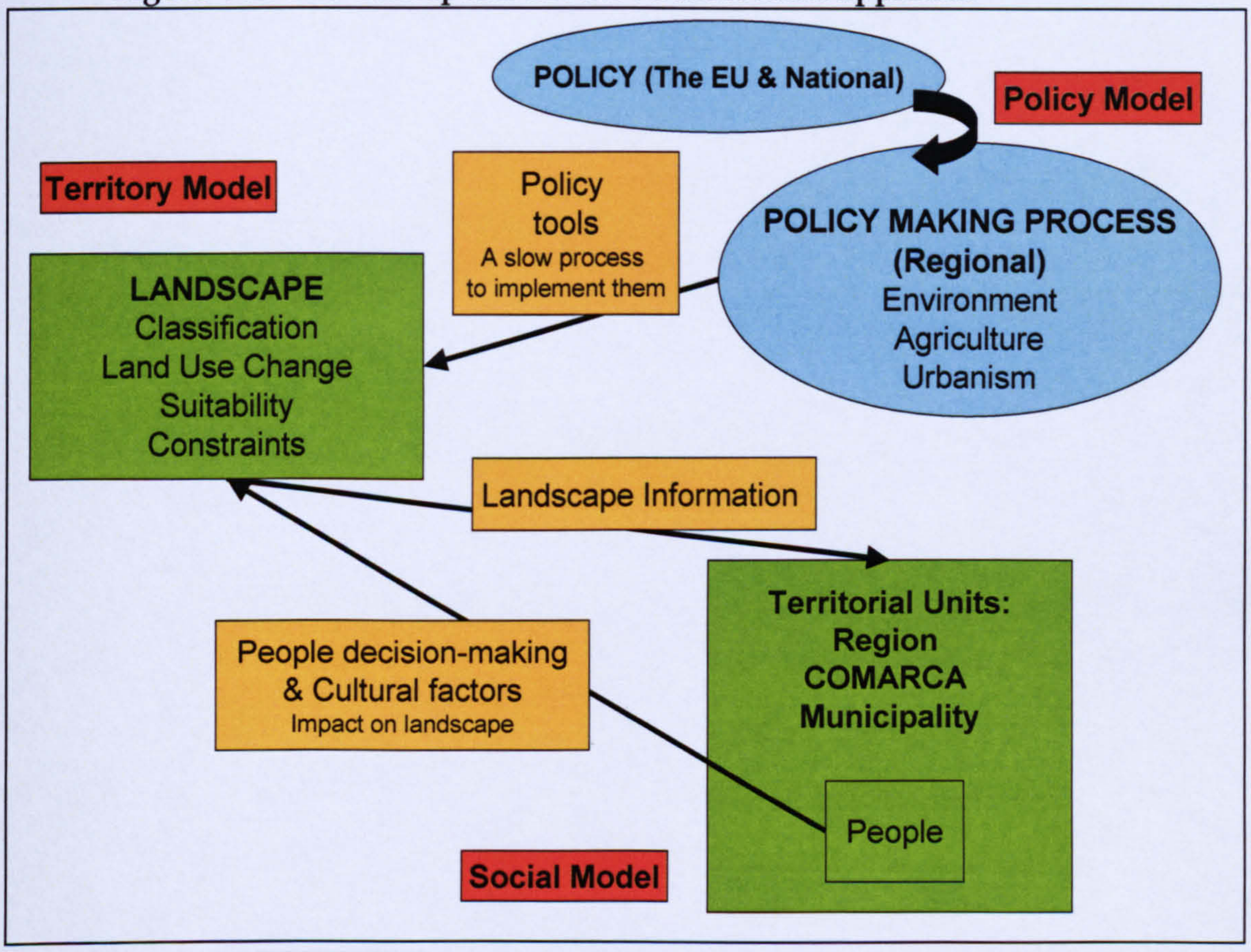
Figure V.1. The End Users and the future Decision Support Tool



Source: Own work based on First Year Report in TiGrESS-Madrid case study

The Figure V.2 below shows how the sub-systems (also called sub-models) are strongly connected. This conceptual model represents socio-political and landscape dynamics. The governance hierarchy uses policy tools which have different effects on the territory. Likewise, the rest of the stakeholders use other kinds of information flow. The stakeholders of the system were defined during the first stages of the reconnaissance phase of the fieldwork (see Chapter VI). However, the end-users of the policy tool are considered as field decision makers in policy-relevant research (Seaton 2001). Decision-makers in the higher levels of the hierarchy are responsible for the regulations and actions that occur in the lower level of the landscape. All boundaries up and down the hierarchy are symbolic, while contact with the tangible world takes place only at the ground level (Vickers 1973). The changes in the landscape depend on the information flows received in the form of regulations or policy tools (such as suitability, constraints or land requirements), as well as people's decisions, which impact on the landscape.

Figure V.2. The Conceptual Model[1]: a theoretical approach



[1] The arrows represent information flows

To follow, the territorial data collection will provide an understanding of the landscape itself and its dynamics. The purpose of this conceptual structure is to provide a discursive approach to build a quantitative model (or land planning tool) that the writer, later (in Chapter VII), calls a decision support tool. This former conceptual model is the basis of the second conceptual modelling exercise, the conversion from static information into terms of dynamics - the landscape modelling process.

V.3. SECOND CONCEPTUAL MODELLING EXERCISE: REALITY AND VALUE JUDGMENTS

Like many urban and peri-urban areas in Europe, the Autonomous Community of Madrid (CAM), has changed dramatically over the last years through immigration, changing agricultural practices, domiciliary, and industrial and infrastructures development. All these processes are driven on spatial and temporal scales beyond the control of regional institutions. Regional planners must understand these drivers and, where possible, mitigate any undesirable consequences they may have, but cannot direct them. Moreover, they can only predict future trends within a very wide envelope of uncertainty. Any attempt to extrapolate observable trends can be vitiated by inherently unpredictable changes in the socio-economic climate, by legislation at national and supra-national levels or by unforeseen conflicts of interest at local levels.

Although traditional interventions have characterized environmental hotspots and imposed prohibitions on development (natural parks, for example); the writer (as part of the TiGrESS - Madrid case study team) advocates a different agro-ecological approach. Sustainable agriculture and natural conservation are not facilities that planners can locate in the spaces not needed for houses and roads, but spatio-temporal processes incorporated into the fabric of a living landscape. We cannot develop an organic farm next to a heavily polluted road. It takes time to convert a conventional farm into organic holding. Farmers need access to markets and many are pluri-active, perhaps engaging in ecological tourism. The location of the farm in space-time is economically and ecologically significant. Nature parks need wildlife corridors so species of fauna and flora can colonize and withdraw from one region to another.

These corridors need not be nature reserves themselves, they could have recreational or agricultural functions, but will have seasonal cycles of use both by humans and non-human species. These harmonics must be reconciled.

These spatio-temporal puzzles cannot be solved by fossilizing land use conflicts and leaving stakeholders to accommodate (or subvert) legislation. A genuine congruence of interests must be sought that meets the aspirations of residents while sustaining bio-diversity. Therefore, it needs here to recall the aim of this thesis: to identify pivotal regions of space-time where relatively minor adjustments to planning regulations and economic incentives facilitate environmental, social, and economical sustainability. From now on, this chapter describes the conversion of a T-G database into a landscape model. The substantial data-gathering exercise and literature review has generated a Geographical Information System (GIS), a biological and field survey, and other experimental results carried out for the different researchers within the TiGrESS team. Although these data are interesting themselves and a valuable resource for future research, their immediate relevance to the planning process is negligible.

Planners and managers have known for decades that some problem-domains are too ill-structured for quantitative and experimental treatment. Simply imposing a natural science perspective on these systems can have unforeseen consequences that echo through space and time, often aggravating problems of social exclusion (Vickers 1965; Rittel and Webber 1973; Churchman 1979). Agro-ecology is one among many areas of contemporary research that lies on the boundaries on both great domains, cultural sciences and natural sciences, and in which substantial problems of knowledge integrations must be addressed.

V.3.1. Preparation of the Spatio-Temporal Dataset

The spatio-temporal dataset built in the framework of the TiGrESS project (Encinas *et al.* 2006) was derived using information ranging from satellite images to ecological surveys of the region of Madrid. Different types of land use and dynamics have been identified in homogeneous units (they are also referred to, from now on, as polygons) through overlaying databases of information. TiGrESS researchers (thus, the writer) has been able to have access to aerial photographs, land use digitalised maps and

satellite images describing Madrid in 1982, 1998 and 2002. The dataset was built on a scale of 1:200,000 at regional level.

- ***Geology and Rainfall***

Geology and Rainfall defined the territory according to ecological and agronomic significance. The distribution of the geological and rainfall categories (See Table V.1 and V.2 below) was represented on the map as territorial homogeneous units which delimit regions more or less uniformly in agricultural use and/or natural vegetation.

Table V.1: Geology categories in the region of Madrid

GEOLOGY (7)
Quaternary Sediment
Detritic Tertiary Sediment
Weathered Tertiary Sediment
Granite Rocks
Metamorphic Rocks
Mesozoic Sediment
Paleogenic Tertiary Sediments

Source: TiGrESS-Madrid case study work based on environmental cartography (Madrid Regional Government 2000)

Table V.2: Rainfall categories in the region of Madrid

RAINFALL (3)
<500 mm
500 / 800 mm
> 800 mm

Source: TiGrESS-Madrid case study work based on environmental cartography (Madrid Regional Government 2000)

- ***Agro-ecosystems***

Eleven agro-ecosystems were identified according to the suitability of the territory. The categories depend on the combination of different species, from the Forest and the *Dehesas* to the Irrigated crops, etc. and what impact human activity has on them. The reason to define these eleven agro-ecosystems is due to the significant role that *farming* has in the territory in the context of this thesis (as well as in the TiGrESS project – Madrid case study).

- *Dehesas* –*Quercus ilex*, Juniper woods -*Juniperus oxycedrus* & Pine woods - *Pinus pinea;*
- Holm Oak woods –*Quercus ilex* & Shrubland. These are *Dehesas* in a state of degradation;
- *Dehesas* –*Quercus ilex* & Pastures. This agro-ecosystem is used a lot for livestock exploitation;
- Crop Mosaic (a mixture of Dry crops with Olive trees and Vineyards), Holm Oak woods (a combination of high and low bushes between *Quercus ilex* and *Quercus faginea)* & Shrubland. All of these species represent one of the most characteristic Agro-ecosystems in the Mediterranean landscape in Madrid;
- *Dehesas*, Bushes & Crops. Broom and Gorse – *Retama sp.* (widely known as *Retamas* in Spanish) are often found on acid soils. There is also a combination with Crops;
- Holm Oak woods, Pastures, Ash woods -*Fraxinus angustifolia* & Riverbanks. This Agro-ecosystem is usually located near the rivers;
- Oak woods - *Quercus pyrenaica* & Pine woods - *Pinus sylvestris;*
- Oak woods - *Quercus pyrenaica* & Mountain Pastures. These last two agro-ecosystems are characteristic of high mountains. The type of exploitation is recreational, livestock and wood;
- Riverbanks and Irrigated crops. The riverbanks represent one of the weakest areas in the territory because of being in continuous competition with other uses, such as Irrigation. The areas of irrigated crops have experienced a widespread growth, especially near rivers, in recent years. The types of crops are vegetables, flowers and greenhouse products.
- Water. This category includes reservoirs, dams, lakes, etc. and their close surroundings.

The following table shows the correlation between the natural ecosystems (natural ecosystems were described previously in Chapter III) and the agro-ecosystems (described in the paragraph above) identified from an agricultural point of view.

Table V.3: Agro-ecosystems and Ecosystems in the region of Madrid

AGRO-ECOSYSTEMS	ECOSYSTEMS
Dehesas, Juniper woods & Pine woods	White Oak woods
Holm Oak woods & Shrubland	Holm Oak woods
Dehesas & Pastures	*"Piñonero"* Pine wood
Crop Mosaic, Holm Oak woods & Shrubland	Holm Oak Woods
Dehesas, Bushes & Crops	Fallow land & Dry crops
---	Chalky Hills and Deals
---	High shrubland
Dehesas, Pastures, Ash & Riverbanks	Holm Oak woods
Oaks & Pines	Pine Forest Mountain
Oak & mountain pastures	White Oak woods
Riverbanks and Irrigated crops	Wetlands & Riverbanks
Dehesas, Pastures, Ash & Riverbanks	Marshlands
Water	Dams & Reservoirs

Source Agro-ecosystems: TiGrESS - Madrid case study work (Encinas et al. 2004)

Source Ecosystems: Environmental Department in the Regional Government (Madrid Regional Government 2003c)

- ***Municipalities and Associations***

The municipal borders are represented by another 179 polygons superimposed, provided information at the administrative level. The regional and municipal levels are the two institutional levels that have the most influence over regional planning. Despite that, there is another administrative level, the *comarca*, which includes nearby areas with similar territorial characteristics. That former administrative level was the basis to join forces and form associations that emerged from regional development

initiatives of the European Union. These data about the Associations of rural development or Local Action Groups (LAG) - known in Spanish as *Grupos de Accion Local (GAL)* - were also incorporated into our dataset. There was none in the first year of study.

Table V.4: Local Action Groups or Associations of Rural Development in 1998

ASSOCIATIONS[2] (3)
Sierra Oeste de Madrid – Western Mountain Range of Madrid
Asociacion de Desarrollo Rural Aranjuez - Comarca de las Vegas (ARACOVE) –Tajo Basin and Countryside
Sierra Norte de Madrid (GALSINMA) – Northern Mountain Range of Madrid

Source: 'First Rural Development Programme' (Madrid Regional Government 1995)

Table V.5: Local Actions Groups or Associations of Rural Development in 2002

ASSOCIATIONS (6)
Sierra Oeste de Madrid – Western Mountain Range of Madrid
Asociacion de Desarrollo Campina del Henares (ADECHE) – Henares Basin and Countryside
Asociacion de Desarrollo Rural Aranjuez - Comarca de las Vegas (ARACOVE) –Tajo Basin and Countryside
Sierra Norte de Madrid (GALSINMA) – Northern Mountain Range of Madrid
Asociación de Desarrollo Sierra de Guadarrama-Alto Manzanares (ADESGAM) – Guadarrama Mountain Range and Upper Manzanares River
Sierra del Jarama – Jarama Mountain Range

Source: Rural Development Programme 2000-2006 in Madrid (Madrid Regional Government 2003a)

[2] There is no Association registered in the Urban Area, widely known as *Area Metropolitana* of Madrid.

- ***Land use***

Land use is the next layer of information to be included in the dataset. All the accessible cartography, especially the satellite images[3] from the TiGrESS – Madrid case study allowed making temporal and geographical surveys. The land use categories were different in the first two years of the survey: 1982 and 1998. See the following tables (Table V.6 and V.7) of land use categories.

Therefore a new re-classification, focused on agricultural and natural conservation interests, needed to be developed using terrestrial data. Since irrigation and riverbanks was only one category in 1982, and both limits were uncertain in 1989, the category of riverbanks (which represents an important value on the landscape) was digitalised based on satellite images. The categories were reduced from fourteen and sixteen, in 1982 and 1998 respectively, to nine in a common classification. If one of these, the area under water and dams, is disregarded in the dataset the number of categories would be eight. Then Land use maps were prepared from satellite images and digitised maps by a process of supervised classification in eight categories.

[3] Landsat Thematic Mapper (TM) with 7 spectral bands and 28.5 metres of spatial resolution. The multispectral sensors are the most appropriate to digitalise land use categories in satellite images.

Table V.6: Land use (1982)

LAND USE 1982 (14)
Dry crops
Irrigation and Riverbanks
Crop Mosaic and Pastures
Pastures
Juniper woods *(Juniperus oxycedrus, Juniperus sabina)*
Mixed forest *(Quercus pyrenaica, Castanea sativa, Betula pubescens, Fagus sylvatica)*
Holm Oak woods *(Quercus ilex, Quercus faginea, Quercus ruber)*
Ash woods *(Fraxinus angustifolia)* and Oak woods *(Quercus pyrenaica)*
Pine woods
Shrubland
Mines or Quarries
Waste Dumps
Urban
Other uses

Table V.7: Land use (1998)

LAND USE 1998 (16)
Crop Mosaic, Pastures, Shrubland
Pastures
Crops
Juniper woods *(Juniperus oxycedrus, Juniperus sabina)*
Pine woods
Perennial units
Deciduous units
Shrubland
Unproductive Land
Rocks
Waste Dumps
Water reservoir
Mines or Quarries
Burned areas
Urban
Other uses

Source: TiGrESS-Madrid case study work based on satellite images -March 1982 and July 1998 - (Ministry of Environment 2000)

Table V.8: Land use Classification

LAND USE CATEGORIES (8)
Irrigated Crops
Crops
Mosaic of vineyards and olive trees
Pastures
Shrubland
Forest (including Riverbanks)
Urban
Unproductive

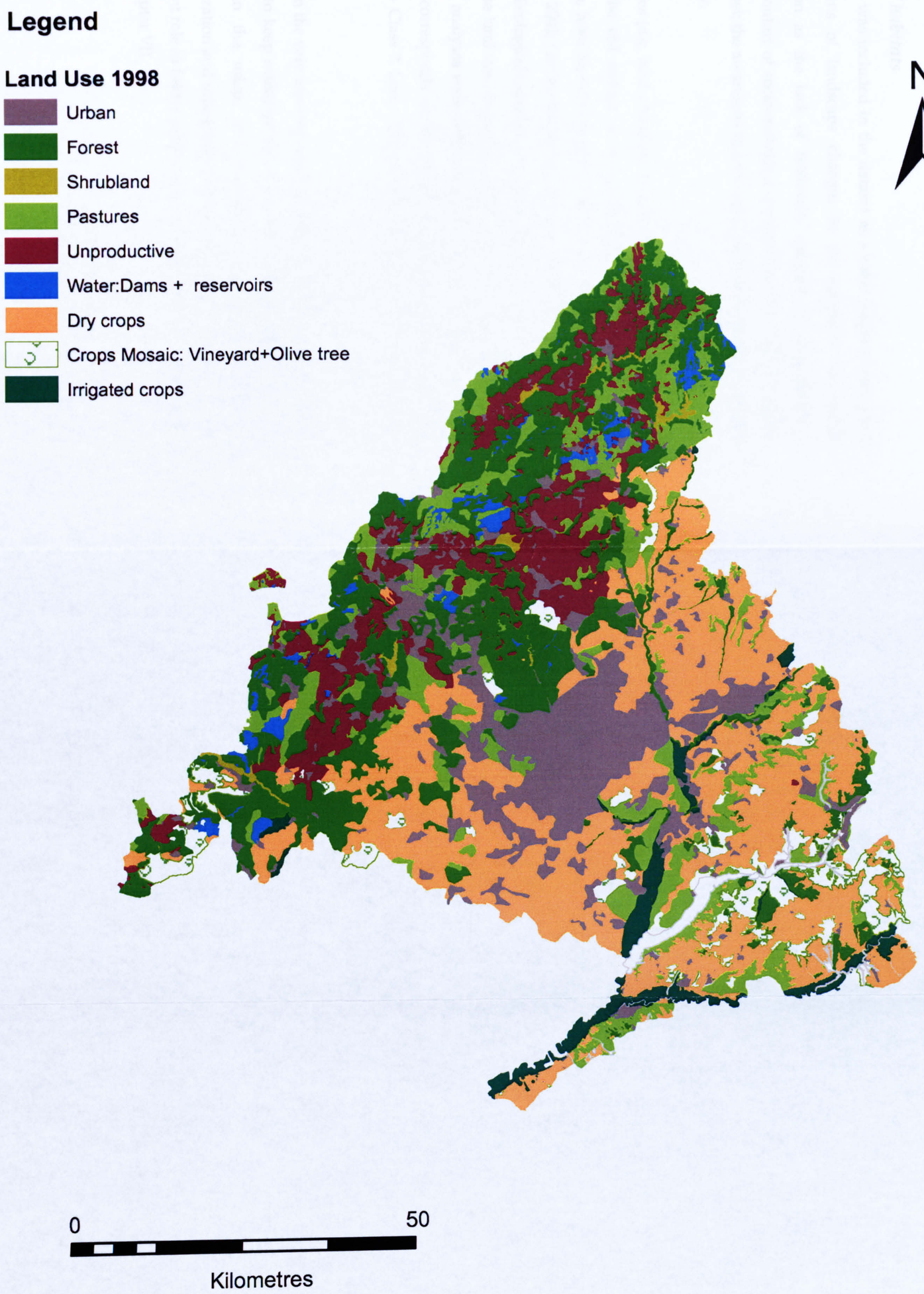
Source: TiGrESS – Madrid case study work (Encinas et al. 2004).

- Irrigated Crops are mainly located near rivers and basin areas. Vegetables are the crops which are the most representative of this category in Madrid.
- Crops or Dry crops, mainly cereals, represent this category. This category is widely known as the Cereal land, in Spanish *"Estepas cerealistas"*, in the south-east of Madrid.
- Mosaic of vineyards and olive trees. Both are traditional crops in the south-east and south-west of Madrid. The combination of these maintains the most traditional crops in the Mediterranean Agro-ecosystem.
- The category of Pastures includes natural pastures as well as cattle pastures and is strongly related to the Forest unit in the North of the region.
- The category of Shrubland, usually in patches, is a consequence of forest degradation because of human actions. Species related to the original forest, *Retama sphaerocarpa, Thymus sp., Lavandula sp. etc.* appear in shrubland patches.
- Forest units (including Riverbanks) are located depending on water requirements. Therefore, *Fraxinus angustifolia* and *Betula pubescens* are typical species that are found next to rivers and basins. Species such as *Quercus pyrenaica, Juniperus oxycedrus, Castanea sativa* and *Fagus sylvatica* are not as dependent on water as the former ones.

- The urban category is represented by the metropolitan area of Madrid and the peri-urban area, which are increasing sharply due to the high urban pressure all over the territory. In this category industrial use is also included.
- Unproductive land refers to abandoned land including dumps, mines and quarries. This use is mainly found in the peri-urban areas.

See the nine land use categories (8 land uses plus the land occupied by water uses) in the following map (Figure V.3).

Figure V.3: Land use Categories in 1998 *(Source: Own work)*



- ***Fragmentation of habitats***

Fragmentation of habitats was included in the dataset as a *value judgment* and gives information about patterns of landscape changes in the territory. The writer understands fragmentation as the lack of resilience, capacity to re-adjust to a perturbation, within the context of socio-ecological complex systems. That brought a new approach in our dataset: the awareness that the static patterns in the dataset could be interpreted dynamically.

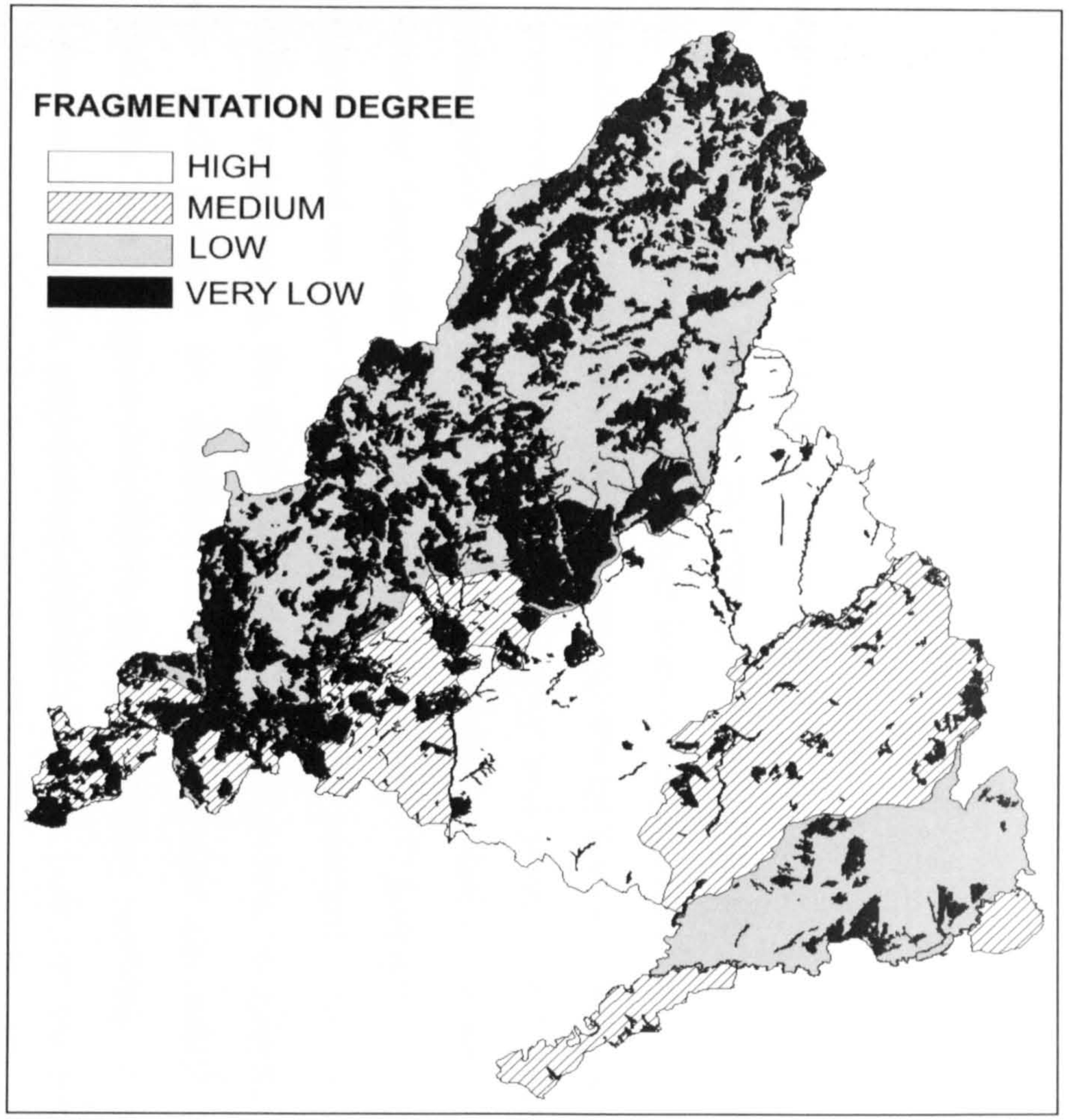
The landownership changes (e.g. land consolidation plans bring together the smallest plots of land breaking the old system of landownership) and consequently the agricultural intensification, have been the main causes of rural landscape degradation in Madrid (Crecente *et al.* 2002; Gomez Benito and Jesus Gonzalez 2002; Encinas *et al.* 2004, Garrido *et al.* 2005). Ecological corridors and natural vegetation patches were the chosen variables to analyse land use categories in 1982 and 1998. Four fragmentation categories based on these analyses were assigned to different sets of land uses. The degree of fragmentation corresponds on the dataset with the following categories: High – Class 1, Medium – Class 2, Low – Class 3 and Very Low – Class 4. (See Table V.9. and Figure V.4.)

Riverbanks are included in the very low degree of fragmentation because of their high natural value. Their role to keep extensive natural areas in Madrid interconnected is particularly important in the urban and peri-urban area, where agricultural intensification, industrialization and urbanization have destroyed broad natural areas. These could play a relevant role in future scenarios, as will be explained in the Booklet (Appendix 3) and the Chapter VII.

Table V.9: Fragmentation Degree Categories

DEGREE OF FRAGMENTATION	DESCRIPTION
High	Scarce, scattered and isolated natural and forest areas. Low density of ecological corridors. The highest landscape change in Madrid.
Medium	Medium density of ecological corridors. The reduction of agricultural intensification allows maintaining biodiversity and extensive land properties which could be part of the ecological corridors network.
Low	The typical land owner structure is small properties. These are composed of natural areas, forest and pastures in the highest mountains in the northern area and mosaic of vineyards, olive trees and cereals in the southern region. This landscape pattern has allowed the maintenance of a well structured ecological corridor network.
Very Low	This category is directly related to forest patches in different stages of conservation. Riverbanks represent macro-corridors which can connect extensive natural areas in Madrid.

Figure V.4: Fragmentation Degree Categories



Both Table and Figure Source: TiGrESS – Madrid case study work (2003)

- ***Homogeneous units or polygons of the dataset***

The next task in the process of building the dataset is to establish the homogeneous units or polygons in the territory. The degree of fragmentation, land use maps and associations' borders (these three classifications provide the temporal characteristic to the dataset) were overlain on the agro-ecosystems map and municipal borders to create a temporal-spatial dataset in which all the polygons are defined according to landscape potentiality. Originally, the map was divided into 1370 polygons, but after several corrections based on their small size and their similar patterns (200 polygons were joined to their neighbours), the map was reduced to 1113 polygons. This level of reduction was. Each polygon (in columns) has a data record (in rows) with information about the area in square kilometres (km^2), landscape potential or agro-ecosystem classes, municipalities, associations (where relevant), area and percentage covered by the eight land use categories and degree of fragmentation (See the screen dump below).

Figure V.5: Screen dump and detail of the dataset (1982 and 1998)

Attributes of Region

FID	Shape*	OBJEC	NAMEMUNI	Mo	Area	OID_	OBJECTID_2	SUAREA	URB02	FOR02	SHRU02	PAST02	ABAN02	CROP02	
0	Polygon	1	ARANJUEZ	3	358509.113895	0	1	358509.172						358509.172	
1	Polygon	3	ARANJUEZ	3	901736.853445	1	3	901736.818						901736.818	
2	Polygon	4	ARANJUEZ	3	8435646.19127	2	4	8435645.983						8405150.954	
3	Polygon	5	ARANJUEZ	3	74447.889820	3	5	74447.929	27114.470					47333.459	
4	Polygon	6	ARANJUEZ	3	1131372.7498	4	6	1131372.693						1131372.693	
5	Polygon	7	ARANJUEZ	3	149998.932682	5	7	149998.839						149998.839	
6	Polygon	8	ARANJUEZ	3	114883.21414	6	8	114883.205						114883.205	
7	Polygon	9	ARANJUEZ	3	37465.619946	7	9	37465.613						37465.613	
8	Polygon	10	ARANJUEZ	3	4937739.30079	8	10	4937738.971	19245.879					4643068.011	15
9	Polygon	11	ARANJUEZ	3	590039.259388	9	11	590039.154		453.026	589586.128			0	
10	Polygon	13	ARANJUEZ	3	517332.077769	10	13	517332.067						517332.067	
11	Polygon	14	ARANJUEZ	3	293658.610055	11	14	293658.559		19764.530				273894.029	
12	Polygon	15	ARANJUEZ	3	283102.463806	12	15	283102.541		93539.914				189562.627	
13	Polygon	16	ARANJUEZ	3	2291598.63327	13	16	2291598.745	841.445	185011.917	913426.662			1192318.721	
14	Polygon	17	ARANJUEZ	3	1961596.76447	14	17	1934977.017		294036.132	713433.372			927507.513	
15	Polygon	18	ARANJUEZ	3	1328774.70298	15	18	1328774.515		305438.011	143646.952			879689.552	
16	Polygon	19	ARANJUEZ	3	1012243.4455	16	19	1012243.402			1012243.402			0	
17	Polygon	20	ARANJUEZ	3	1742414.36416	17	20	1742414.271		218177.558	258652.420			1265584.293	
18	Polygon	21	ARANJUEZ	3	280903.003302	18	21	280903.014		83609.489	197293.524			0	
19	Polygon	22	ARANJUEZ	3	2172340.90948	19	22	2170776.133		698206.401	1355416.232			117153.5	
20	Polygon	23	ARANJUEZ	3	4098166.76263	20	23	4098156.556	697326.047	1318341.185	1743086.757			339402.567	

Record: 1 Show: All Selected Records: (0 out of 1113 Selected.) Options

ID	NAMEMUNI	POPULAT	ASSOCIAT	AGROECOSYS
2	ARANJUEZ	40928	ARACOVE	Bosque de ribera y regadios
5	ARANJUEZ	40928	ARACOVE	Dehesas de encinas y de retamas, Cereales y Vi±edos
6	ARANJUEZ	40928	ARACOVE	Bosque de ribera y regadios
7	ARANJUEZ	40928	ARACOVE	Dehesas de encinas y de retamas, Cereales y Vi±edos
9	ARANJUEZ	40928	ARACOVE	Bosque de ribera y regadios

Source: Dataset TiGrESS-Madrid case study

All the steps taken were reversible, we could go back to the original data at any time. This allowed the process which generated the spatio-temporal dataset to be repeated three times and replicated using slightly different procedures to ensure the robustness of the observed patterns. These patterns are developed below.

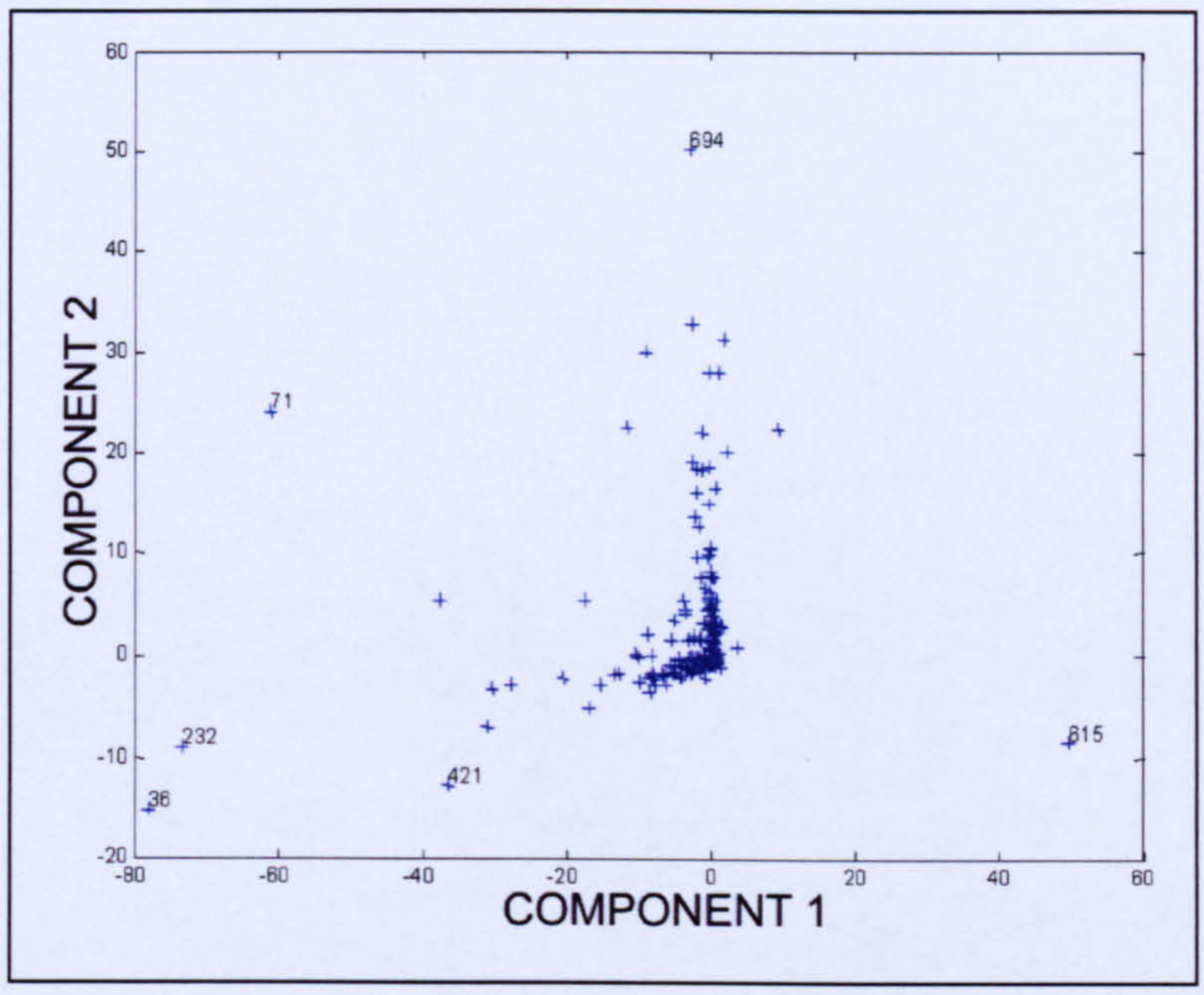
V.3.2.Landscape patterns search and Completion of the Dataset

- ***Landscape patterns (or Dynamics) search***

The need to simplify and understand the enormous and interesting dataset, to provide an efficient planning tool for the regional planners who do not legislate in hectares or polygons of few squares kilometres, explained the search for the main patterns in the landscape of Madrid. Despite the generalisation, those patterns will permit distinguishing between isolated polygons and groups of polygons. Both cases are very important in the dynamics of the territory.

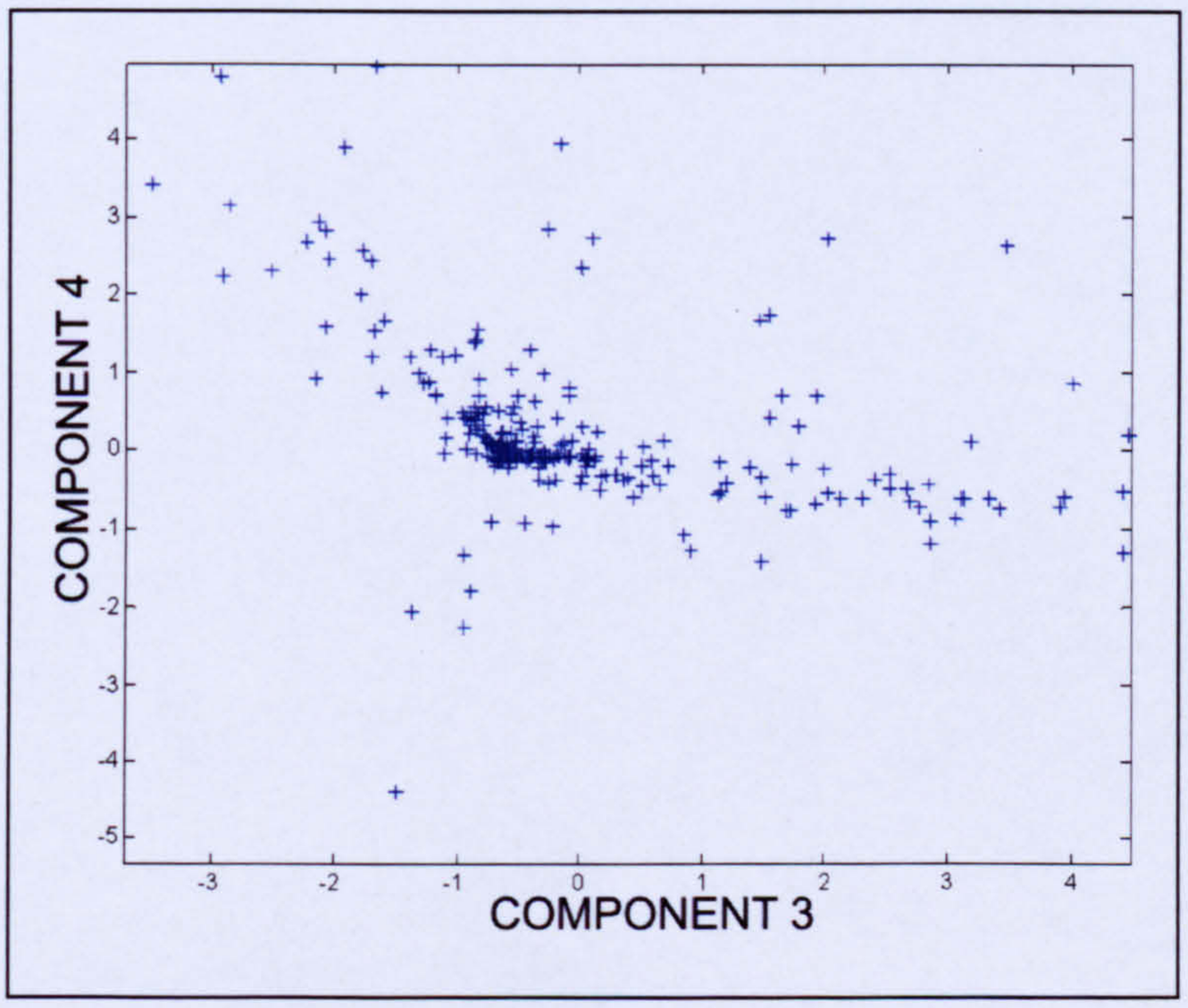
The Principal Component Analysis (PCA) was used to illustrate the pattern that had been discovered previously by the researchers in TiGrESS-Madrid case study through territorial surveys and analysis of land potentiality data. The PCA used variance-covariance measures on a percentage of the area covered by each category of land use. As a result of this analysis a four-component solution that explains about 80% of total variation in land uses was obtained (See Figure V.6 and V.7). The solution was interpreted as: Component 1, intensity of human exploitation; Component 2, Urban use in opposition to Crops; Component 3, Forest in opposition to Crops; and Component 4, Dry crops in opposition to Irrigation. Despite existing slight deviations in the graphic representation, these results are considered the most appropriate. The human use of land is a constraint for the rest of the land uses, except the protected natural land use, where other uses could probably be prohibited. For deeper explanation about this statistical analysis, see Encinas *et al.* (2006).

Figure V.6. Plot of Principal Component Scores(Component 1 against Component 2)



Source: TiGrESS-Madrid case study work

Figure V.7: Plot of Principal Component Scores(Component 3 against Component 4)



Source: TiGrESS-Madrid case study work

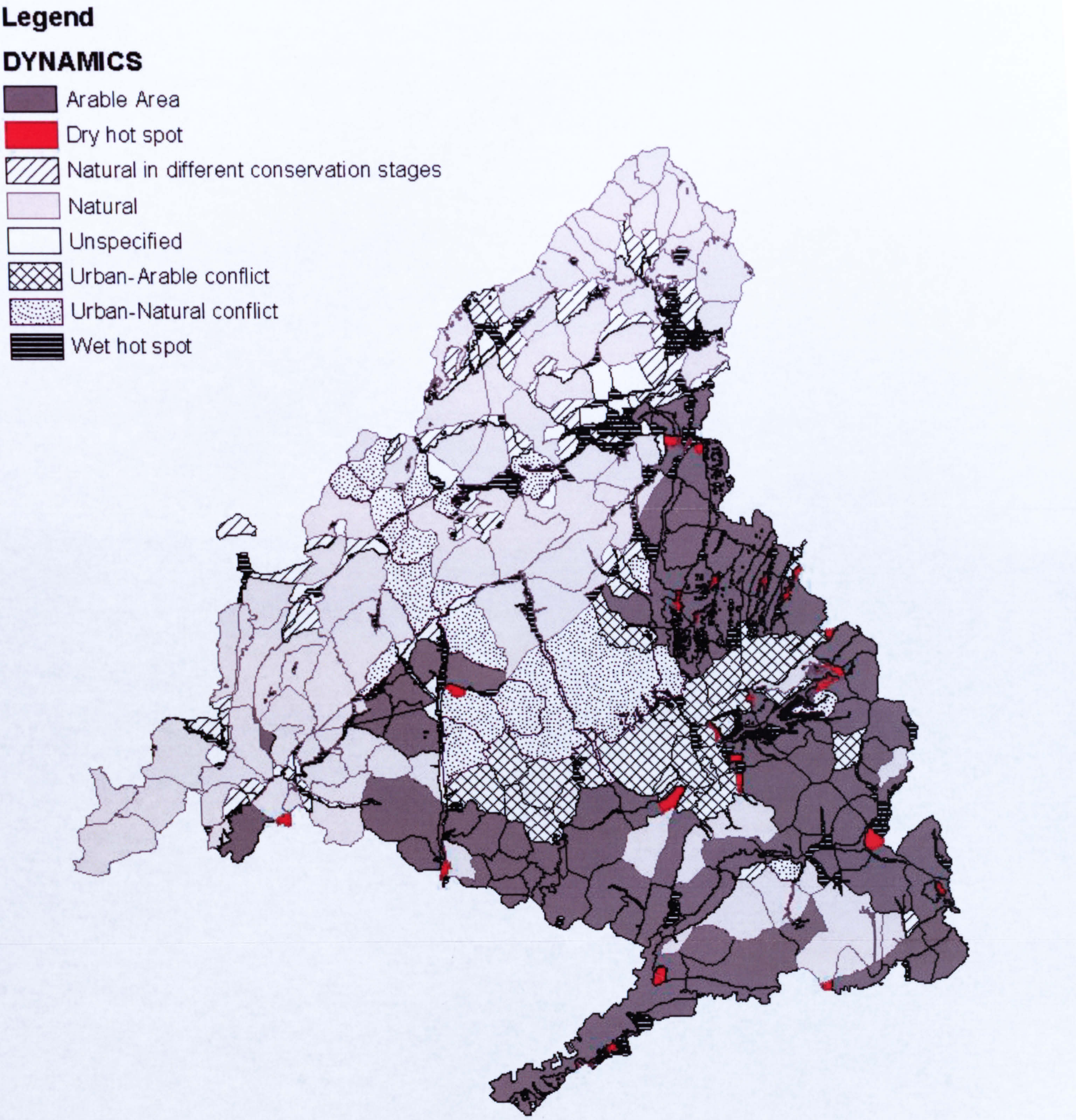
Using the components of the PCA, a set of maps for each component was represented. Then a composite map (see below the Table V.10 and the figure related to the table - Figure V.8) was elaborated to discover the main patterns or dynamics –*value judgments*- among the polygons of the dataset. In the map a North West – North East strip could be seen, which is made of natural areas in different stages of conservation. A thinner strip could be also recognized from the metropolitan area (urban and peri-urban area) to the Northern region, which seems to follow the lines of the most important motorways. The fields in the countryside to the South of the metropolitan area are traditionally agrarian. To the South-East, urban expansion into wetlands and natural areas is observed.

Table V.10: Dynamics in the region of Madrid

DYNAMICS (7)	DESCRIPTION
Urban-Natural Conflict Areas	Urban Spreading in Natural Areas
Agrarian-Urban Conflict Areas	Urban Spreading in Traditional Agrarian Areas
Agrarian Areas	Agrarian Areas
Natural areas in different stages of conservation 1	Forest area in good stage of conservation
Natural areas in different stages of conservation 2	Forest area in stage of degradation.
Dry hot spot	Conflict areas with crops and remnant natural patches in cliffs
Wet hot spot	Conflict areas with irrigated crops and riverbanks potentiality
Unspecified	Not identified or classified

Source: TiGrESS – Madrid case study (2004)

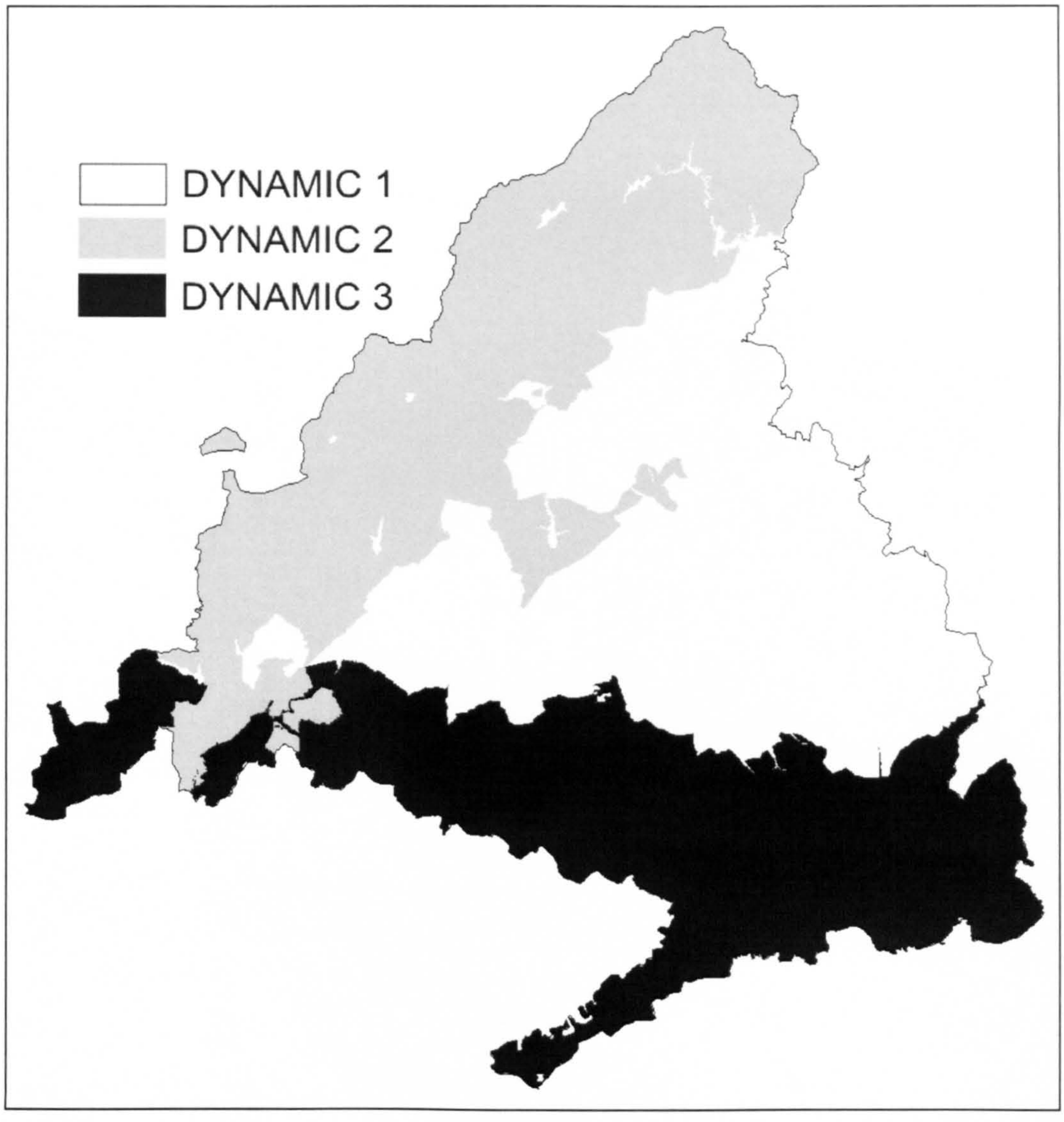
Figure V.8: Dynamics in the region of Madrid



These dynamics in the landscape of Madrid, which are based on the empirical analysis of static data, such as agro-ecosystems, have a debatable interpretation. Landscape suitability and potentiality could not be the only answer to land use changes and conflicts because these are usually connected with strong amounts of money that incentivise them. Notwithstanding the above, the following chapter (Chapter VI) will deal with the role of society in land use change, the most appropriate approach seems to be this one. What is really striking is that among the seven different dynamics in the region (see Table V.10 and Figure V.8. above) three main dynamics are easily recognised by similar characteristics on agro-ecosystems, land uses and fragmentation of habitats. See Figure V.9 below.

The first zone, *Dynamic 1,* is represented by flat or undulating areas which have been widely transformed by the intensification of agriculture (mainly cereals) and urban development. Very few unexploited areas remain. It is located in the East, Southeast and Centre of Madrid. The second, *Dynamic 2,* contains forestry, shrubland and pastures areas, with a significant proportion of natural habitat located in hilly areas to the North and Northwest of Madrid. *Dynamic 3* contains crop mosaic (cereals, vineyards, olive tree and shrubland) with scattered natural areas. It is located in the South, Southwest and Southeast of Madrid. These three dynamics define three landscape patterns in the territory of Madrid. Therefore, the three have been incorporated in the dataset, which means this classification for the polygons: Model 1, 2 or 3.

Figure V.9: Three Dynamics in the region of Madrid



Source: TiGrESS-Madrid case study.

The next step was an attempt to check that the region of Madrid is consistent with empirical data. Differences in land uses between 1982 and 1998, based on a mathematical validation (for further information see Encinas *et al.* 2006) were mapped in an attempt to find any other relevant patterns. Despite these graphical illustrations of land use changes (see for example Figures V.10 and V.11), none other than the three dynamics could be identified.

Figure V.10: Validation of Land use maps: Urban Variability

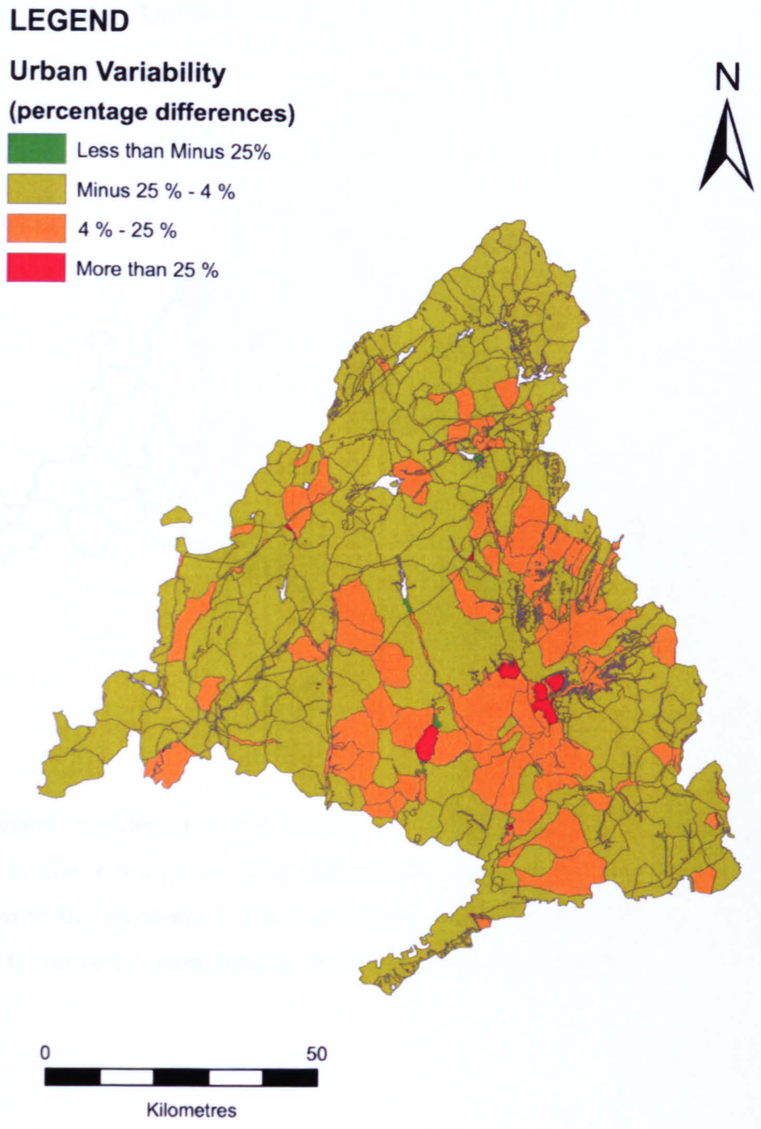
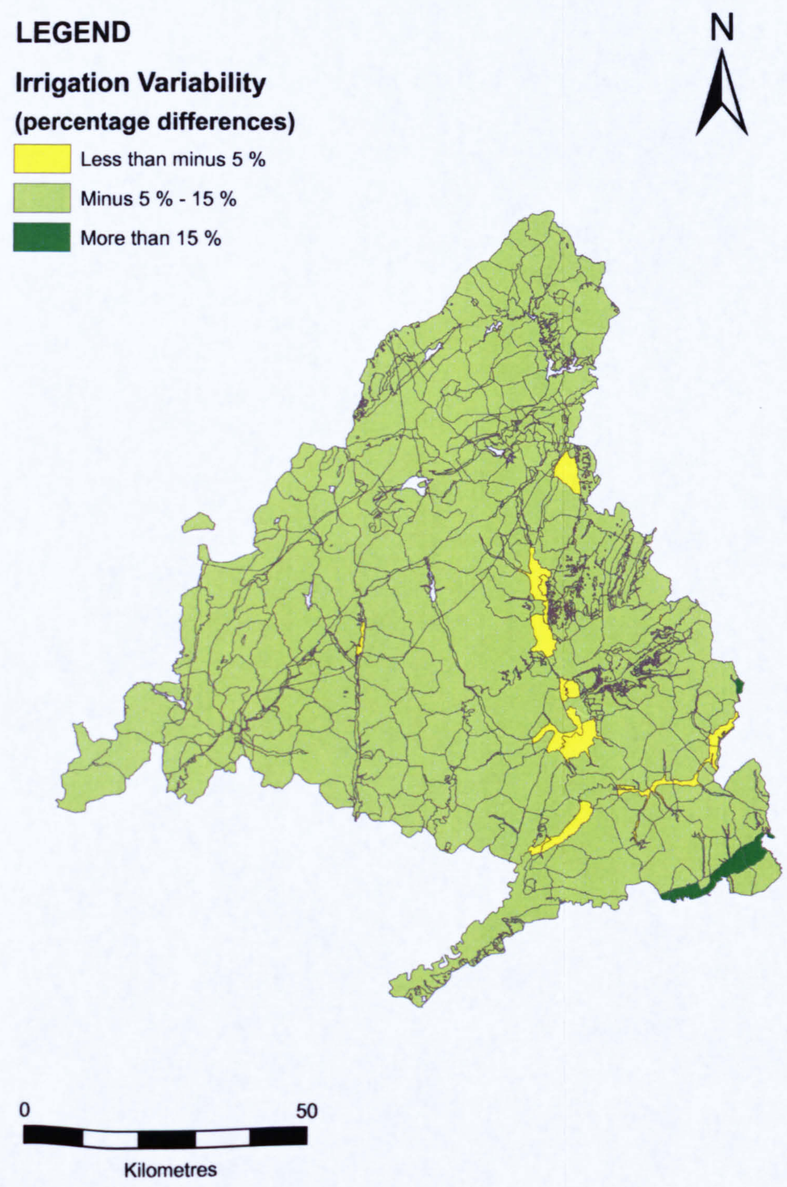


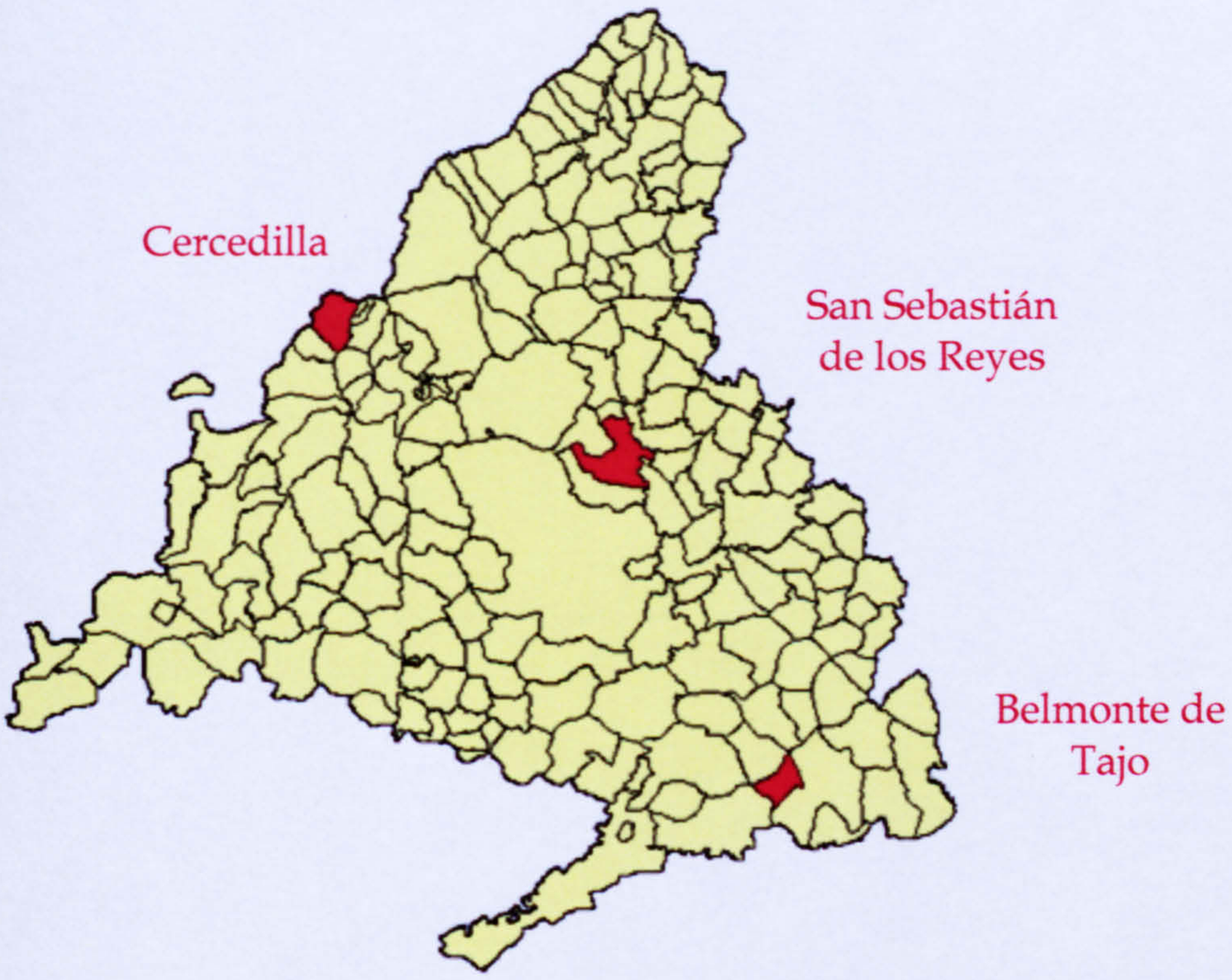
Figure V.11: Validation of Land use maps: Irrigation Variability



Source: TiGrESS-Madrid case study (2004)

Actually, the choice of the three municipalities as case studies at municipal level (the first stages in TiGrESS) coincides by chance with the three dynamics identified; Dynamic 1: *San Sebastian de los Reyes*, Dynamic 2: *Cercedilla* and Dynamic 3: *Belmonte de Tajo*. See map below.

Figure V.12: Municipal Level



This statement re-orientated the research. The three case studies have become examples in the research of land use conflicts and changes to extrapolate the information to the *Dynamics 1, 2* and *3* in the region of Madrid. The following table (Table V. 11) shows the main features of the municipalities case study.

Table V.11. Main characteristics of the 3 municipalities

MUNICIPALITIES	*Agro-ecosystem*	*Category of Comarca*	*Natural Protected areas*	*Fields of development*
CERCEDILLA *Comarca "Sierra del Guarrama-Valle del Lozoya"* *Dinámica 2*	Livestock & Pastures	Rural *Comarca* (< 10.000 inhabitants) Mountainous area → Less favoured	Regional Park → foreseen as future National Park	Limited growth Urban & Tourism
BELMONTE DE TAJO *Comarca "de las Vegas"* *Dinámica 3*	Traditional mosaic of crops: Olive, Vineyard & Cereals	Rural Comarca (< 10.000 inhabitants)	No Protected areas	Very low growth in general
SAN SEBASTIAN DE LOS REYES *Comarca "Metropolitana"* *Dinámica 1*	Irrigated crops & greenhouses	Urban *Comarca*	Regional Park & SCI	High growth Industrial, Urban & Infrastructural

Source: Own work

- ***Completion of the dataset***

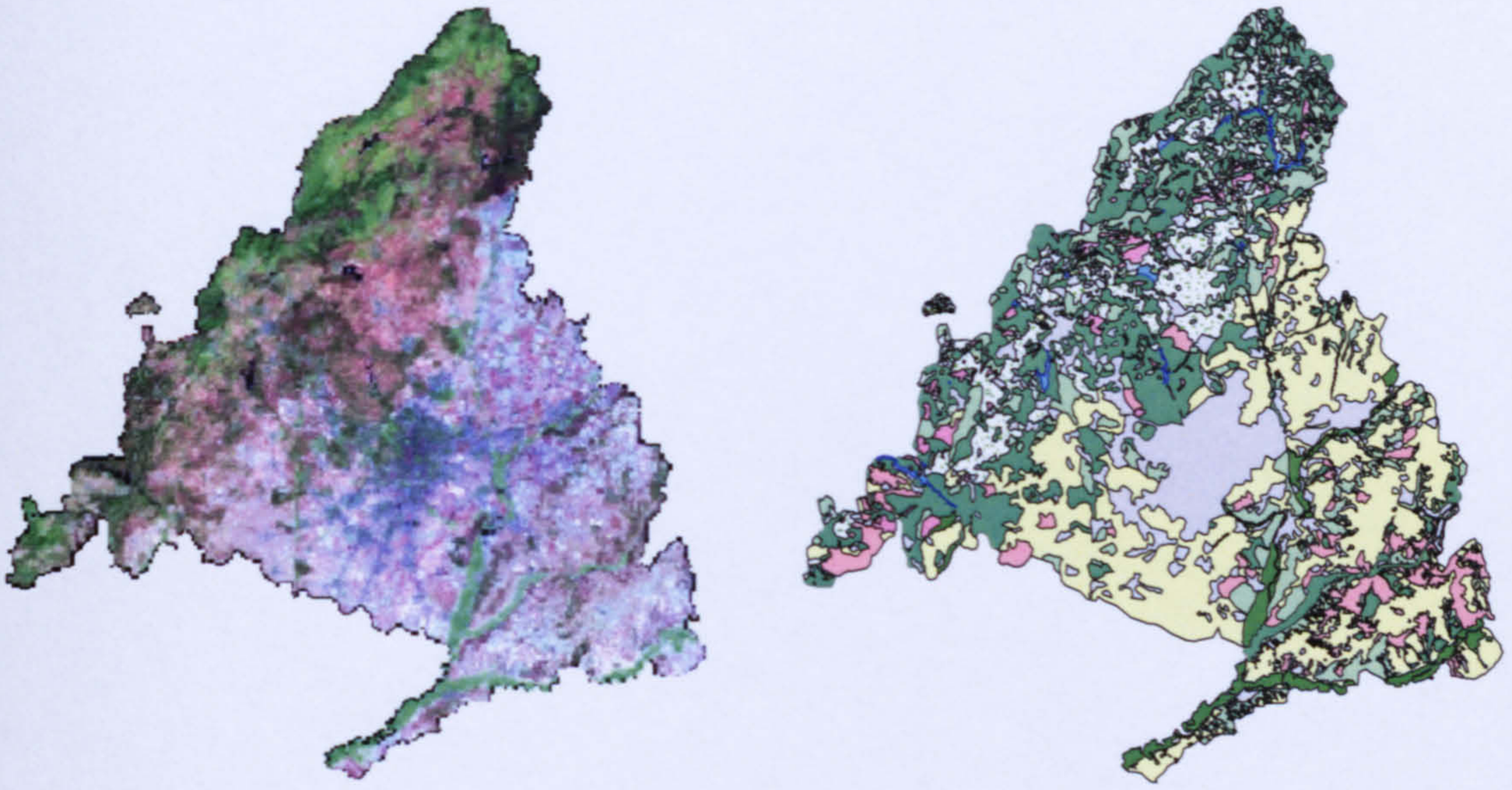
Information at municipal level had to be incorporated to the dataset. The lack of resolution of the satellite images at municipal level obliged the use of aerial photographs[4] (1957 and 1984) and digital ortophotos (2000). These last ortophotos were the basis for referencing and digitising the aerial photographs in order to define land use categories and fragmentation at a scale of 1:25.000.

Two new classifications were incorporated to the dataset. As one of these steps to complete the dataset, the satellite image[5] (August 2002 ETM) that describes Madrid in 2002 allowed the classification of the Land use categories at a scale of 1:200.000 (at regional level). The following maps (see Figures V.13, V.14, V.15, V.16 and V.17) show the satellite image and the Land use map with the eight categories plus water uses.

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[4] American Flight 1957 and 1984: Aerial photography in black and white
[5] Landsat Enhanced Mapper (ETM) with 7 bands and 15-28.5 metres of spatial resolution.

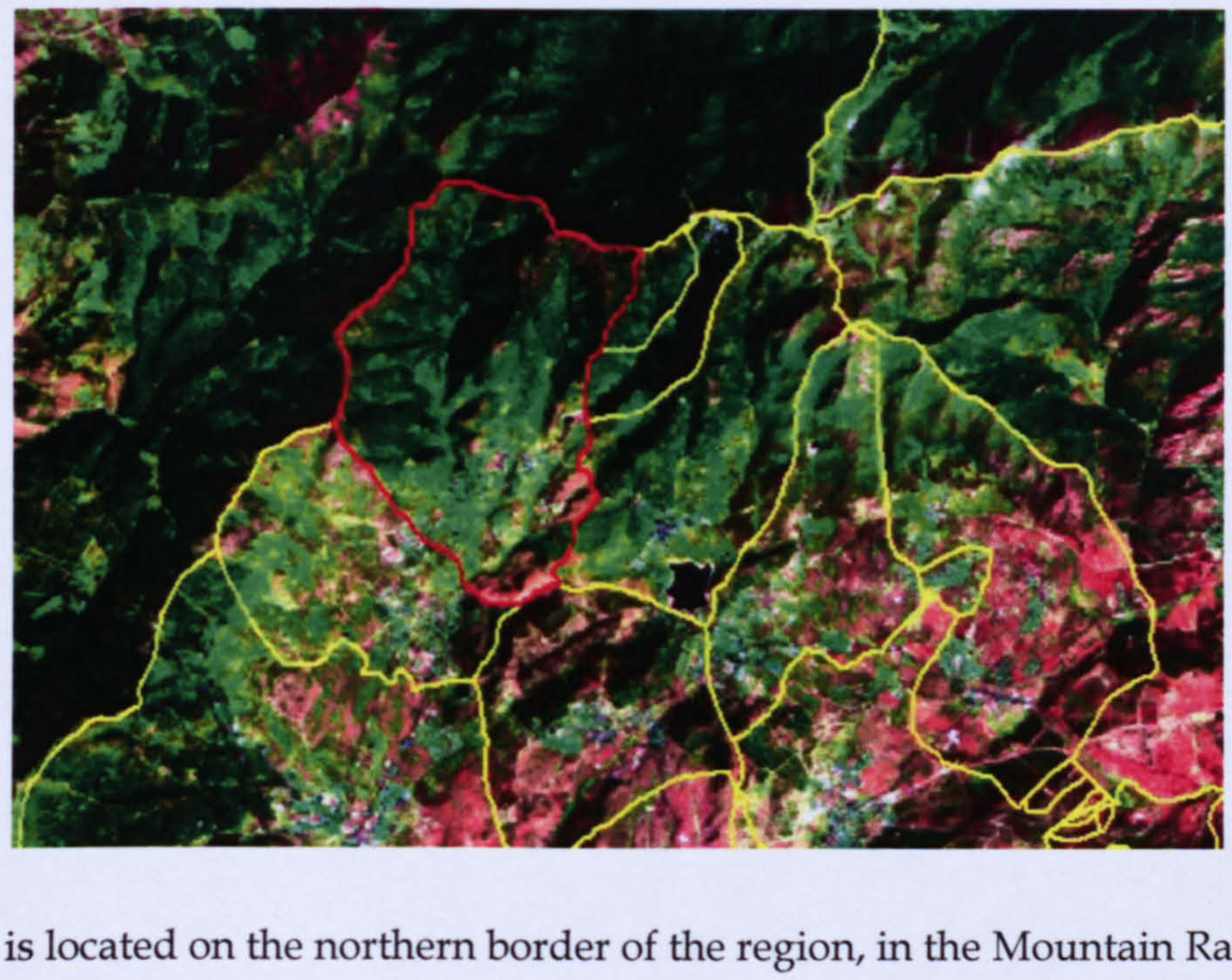
Figure V.13: Land use map from the satellite image (2002)



Landsat ETM RGB = 08-2002

Land-use map from ETM image

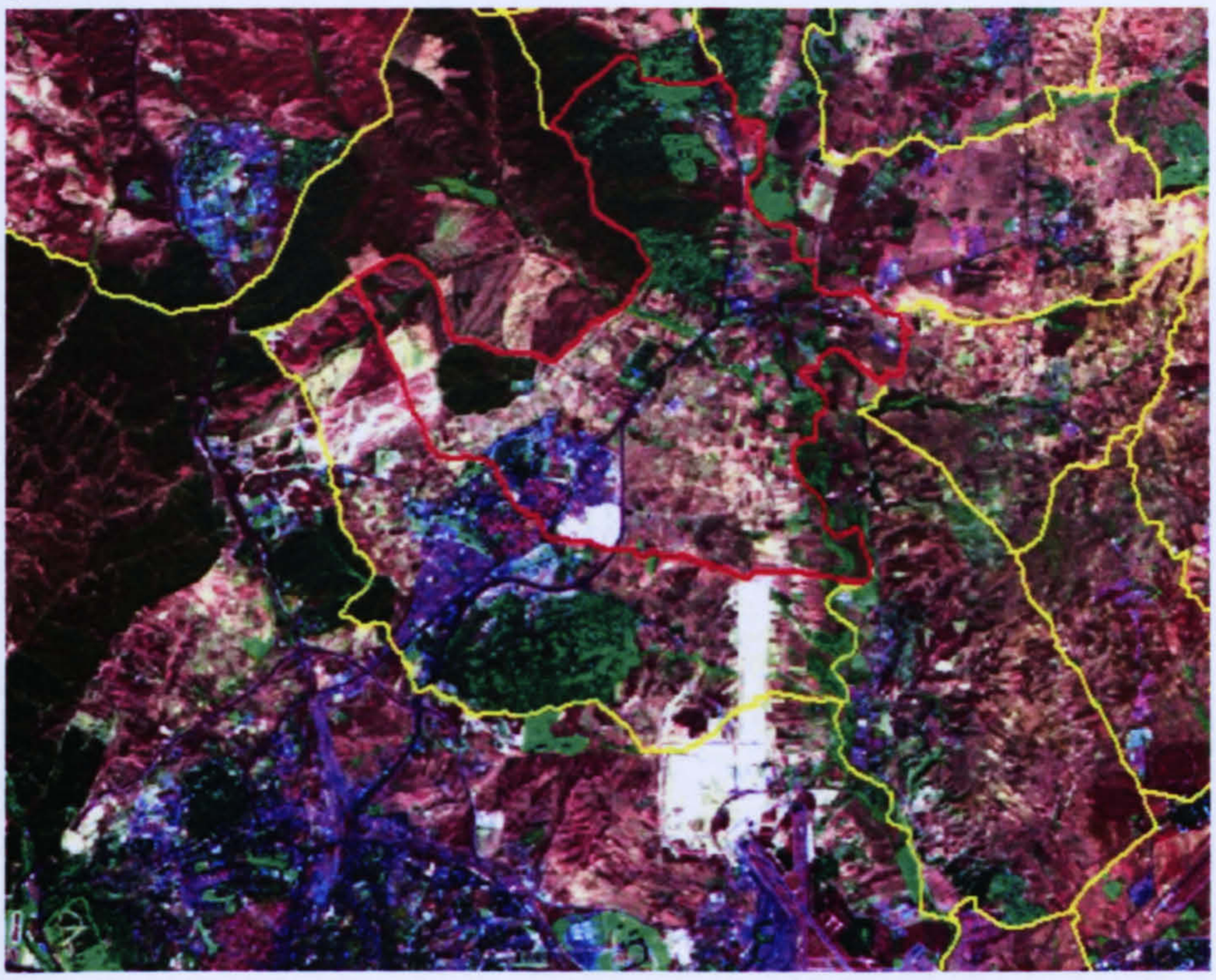
Figure V.14: *Cercedilla* from the satellite image (2002)



Cercedilla is located on the northern border of the region, in the Mountain Range

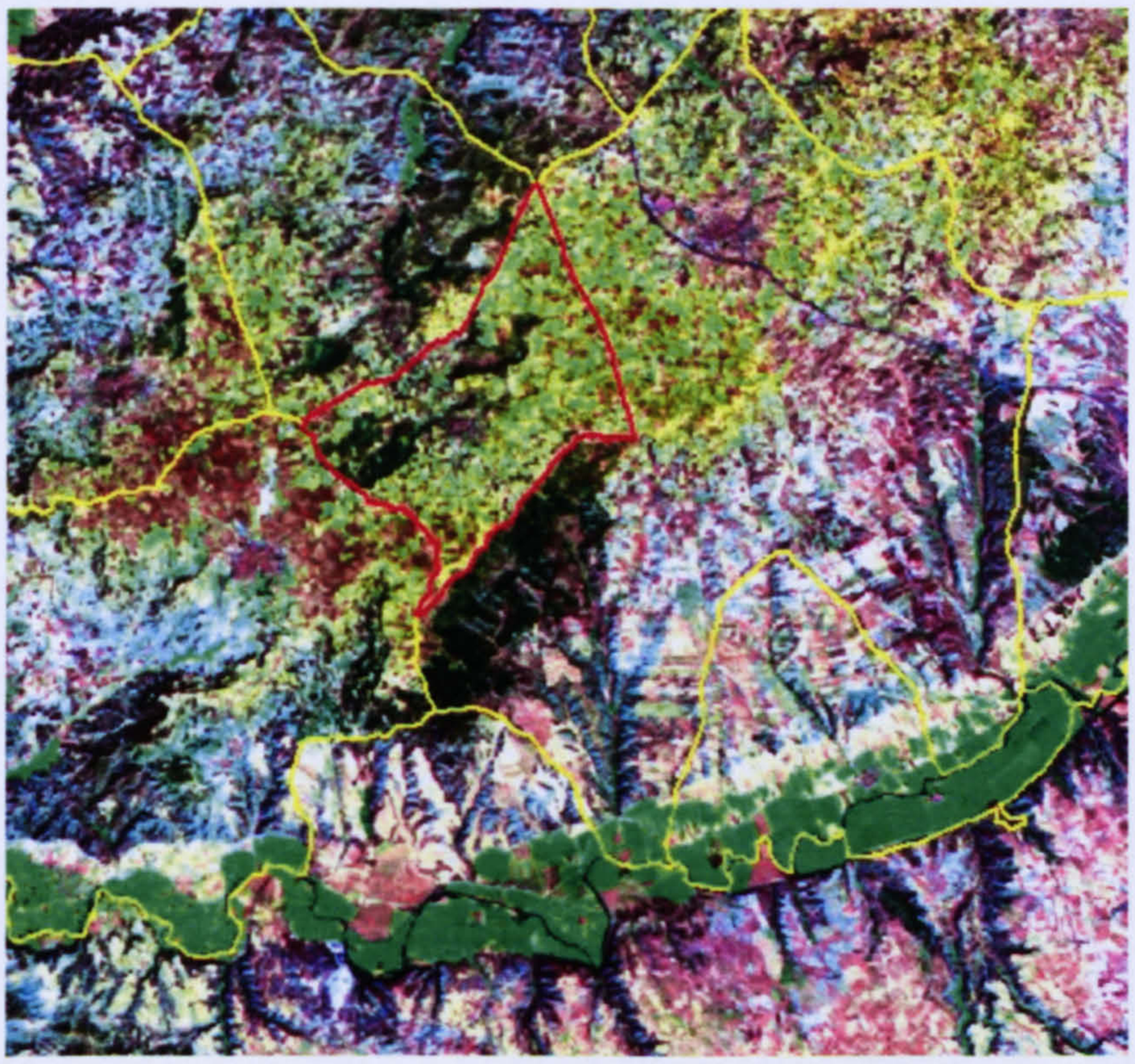
Both figures source: TiGrESS-Madrid case study

Figure V.15: *San Sebastian de los Reyes* from the satellite image (2002)



Barajas Airport, Jarama river and the City of Madrid are easily observed

Figure V.16: *Belmonte de Tajo* from the satellite image (2002)

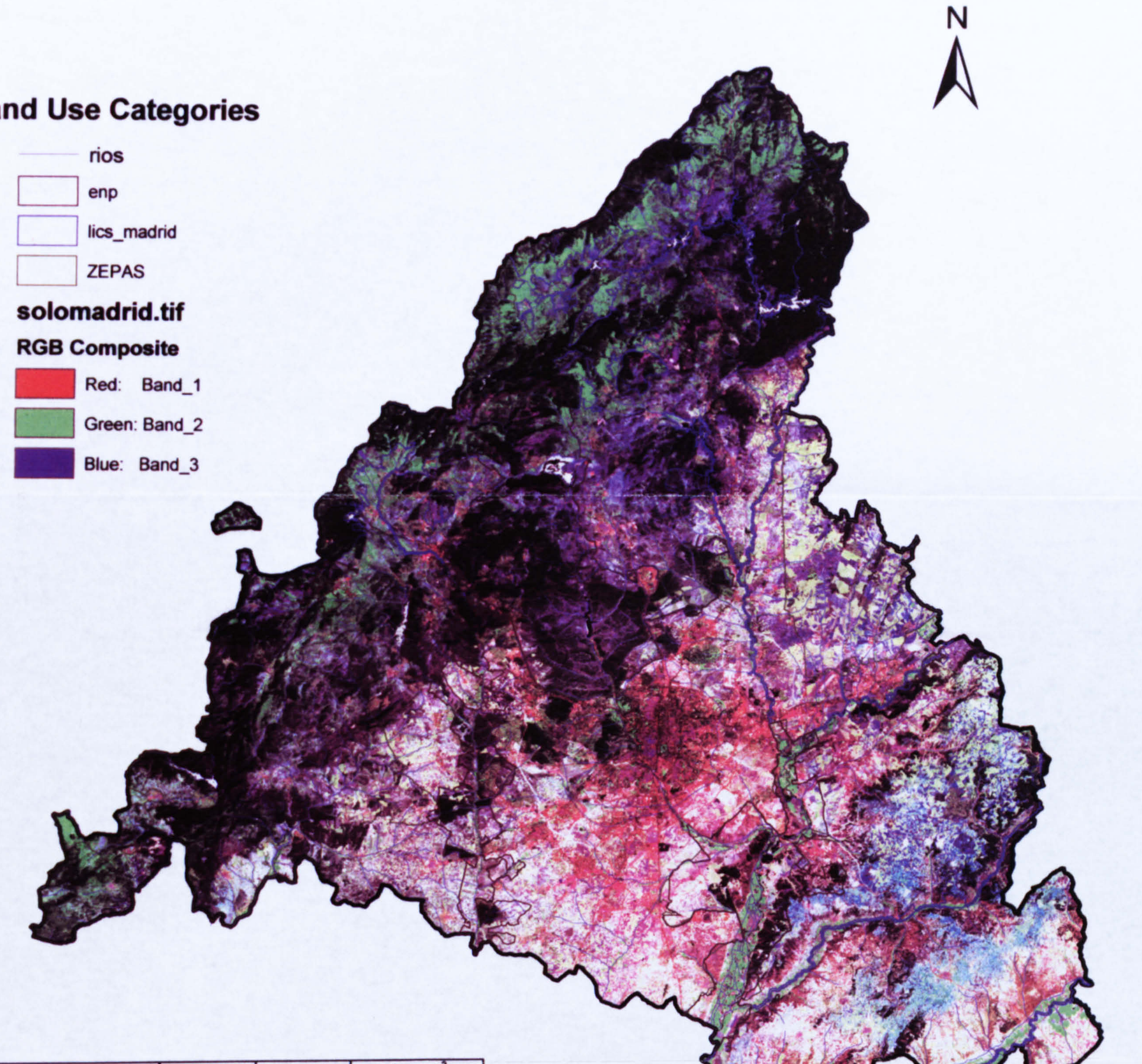


Dry Crops and Irrigated crops following the Tajo river are distinguished

Both figures source: TiGrESS-Madrid case study

Figure V.17: Land use map - satellite image- and detail of land use categories (2002)

Land Use Map



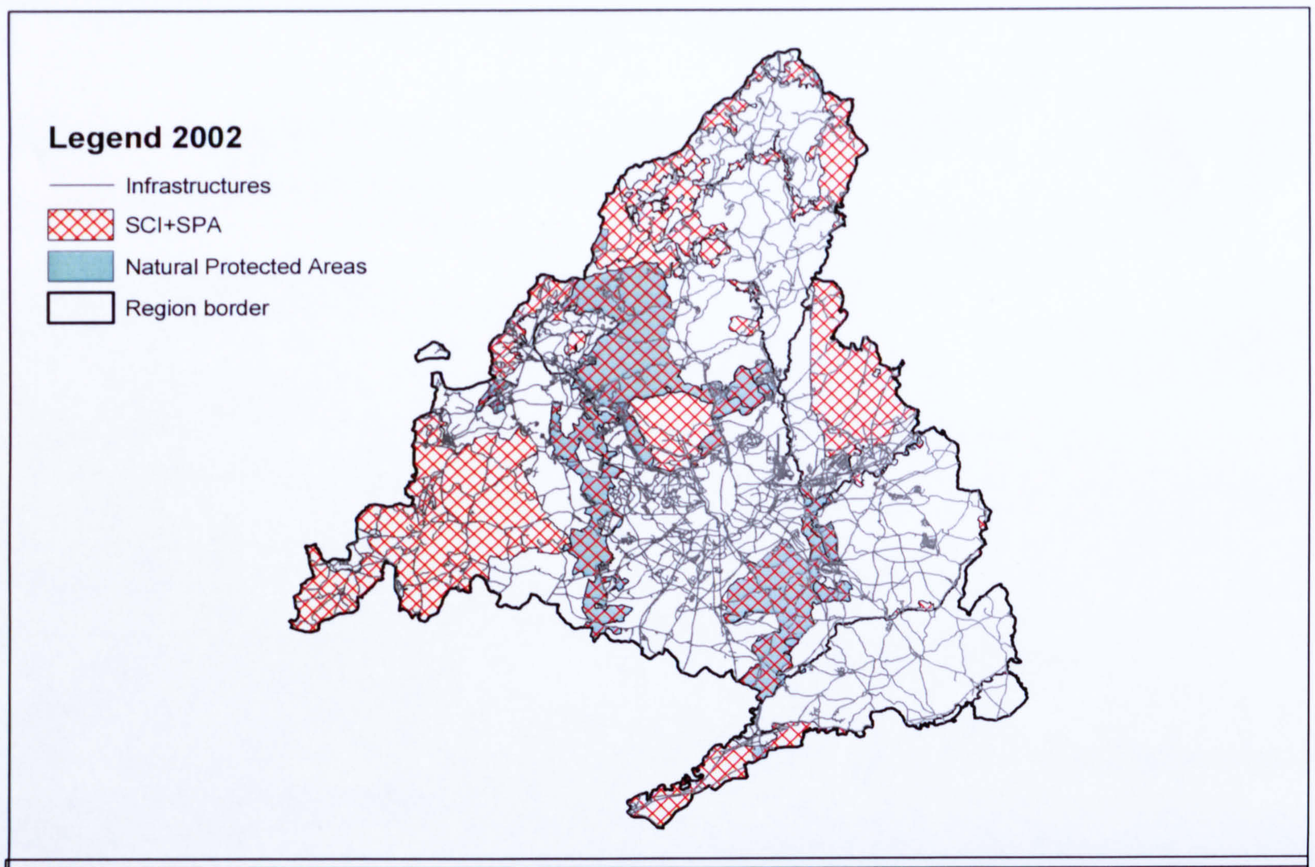
Land Use	Percentage	Count	Area m^2
1. Urban Areas	11.3	22578	9031200
2. Forest	24.0	48144	19257600
3. Water	0.7	1366	546400
4. Shrubland	12.7	25429	10171600
5. Pastures	9.4	18946	7578400
6. Unproductive	2.0	4066	1626400
7. Cereal	32.1	64467	25786800
8. Vineyard+Olive Tree	4.9	9873	3949200
9. Irrigated Crops	2.9	5779	2311600
Total	100	200648	80259200

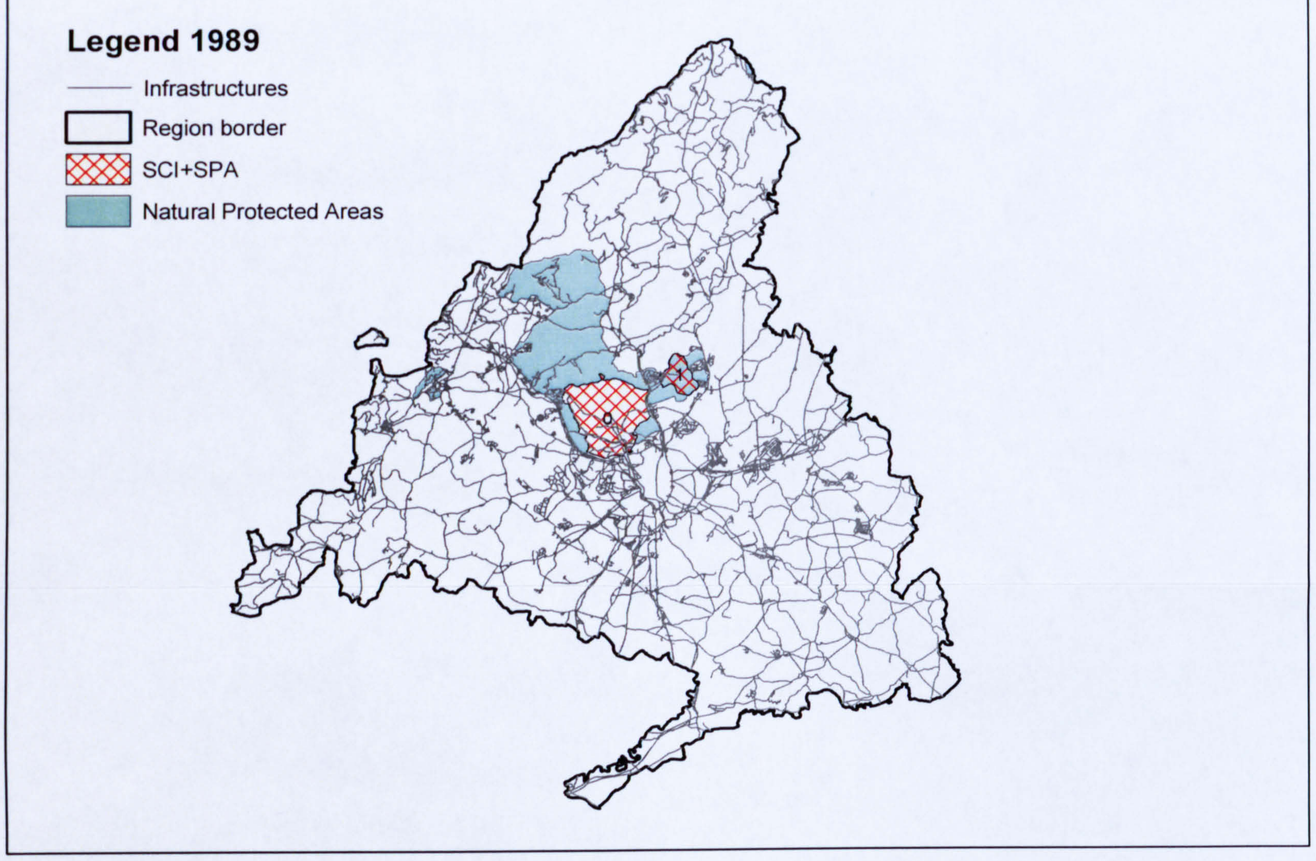
Source: TiGrESS-Madrid case study (2004)

Finally, another two information layers were included in the dataset at regional level, enabling an appropriate analysis of the land use changes for which Infrastructures and Protected spaces maps were needed. The protected spaces and the main infrastructures were digitised on satellite images in the three years of survey at regional level, 1982, 1998 and 2002. Both classifications were also elaborated at municipal level under the same process.

In the case of the Protected spaces - Natural protected areas, SPA and LIC - the digitalization process was supported in territorial and bibliographic information. The Infrastructure map was represented in four categories, Highways & motorways, National roads, Secondary roads and Railways. This differentiation attempts to emphasize the impact caused by this kind of infrastructure (see below the Figure V.18)

Figure V.18: Protected spaces and Infrastructures in the region of Madrid (1982/2002)





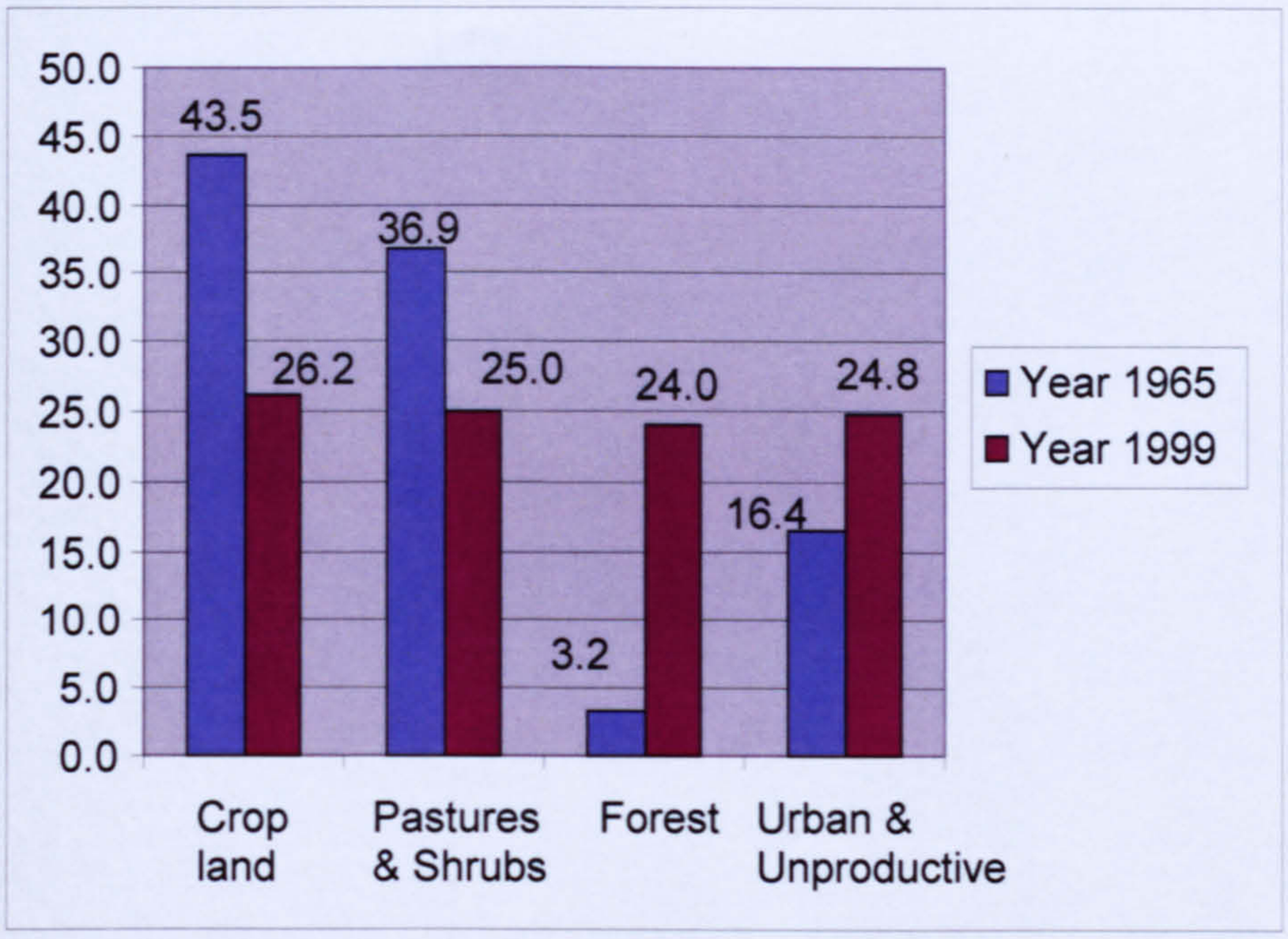
A complementary survey of land use changes in the region and the municipalities case study was undertaken based on the information acquired on the dataset.

V.4. ANALYSES OF LAND USE CHANGE IN THE REGION AND THE MUNICIPALITIES CASE STUDY

The region of Madrid has suffered, over the last few decades, especially in the 1990's, important landscape changes. This is a conclusion from the previous research of land use maps and it can be distinguished in the following graph.

Firstly, the loss of agrarian land is because of the continuous abandonment process and the increasing value of land, mainly located in the South and Southeast of the region. Secondly, an uncontrolled urbanization process is taking place in the surrounding areas of the urban centre, the City of Madrid. Lastly, the mountainous area, is suffering the abandonment of livestock activity and the strongest impact of regional tourism, simultaneously. The natural areas are well-conserved in this area, whereas the rest are isolated both in their management and physically within this territory. The increase of forest land is also related to the agri-environmental measures of the regional rural development programme that subsidizes reforestation of farming land (MAPA 2004). Agrarian land (including Irrigated crops, Dry crops and Crop Mosaic) represented over 29% of the surface in the region of Madrid in 2002 (MAPA 2004). See below Figure V.19.

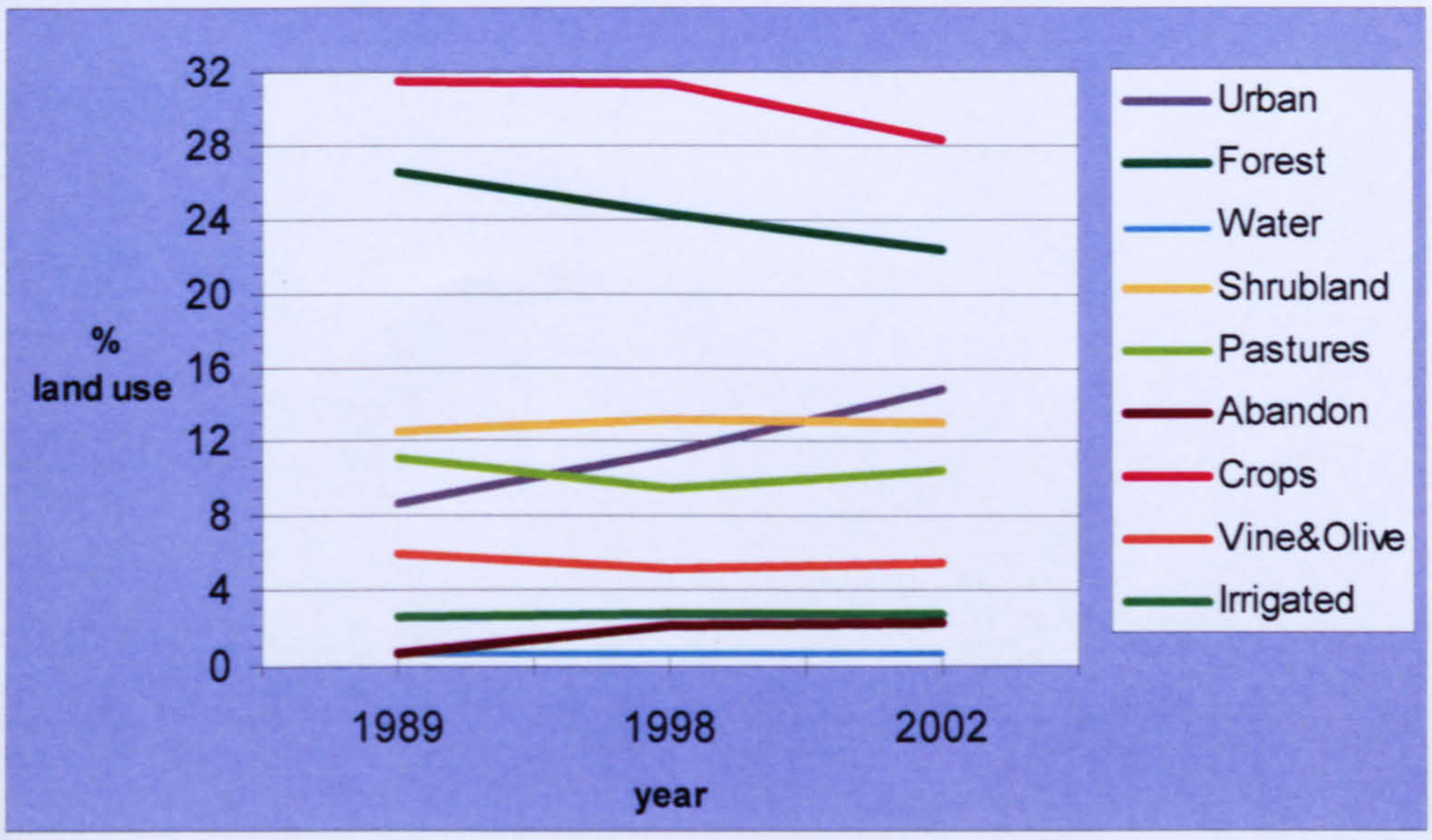
Figure V.19. Land use changes from the 60's to the 90's in the region of Madrid (% hectare of land surface)



Source: Agrarian Census (MAPA, 1999)

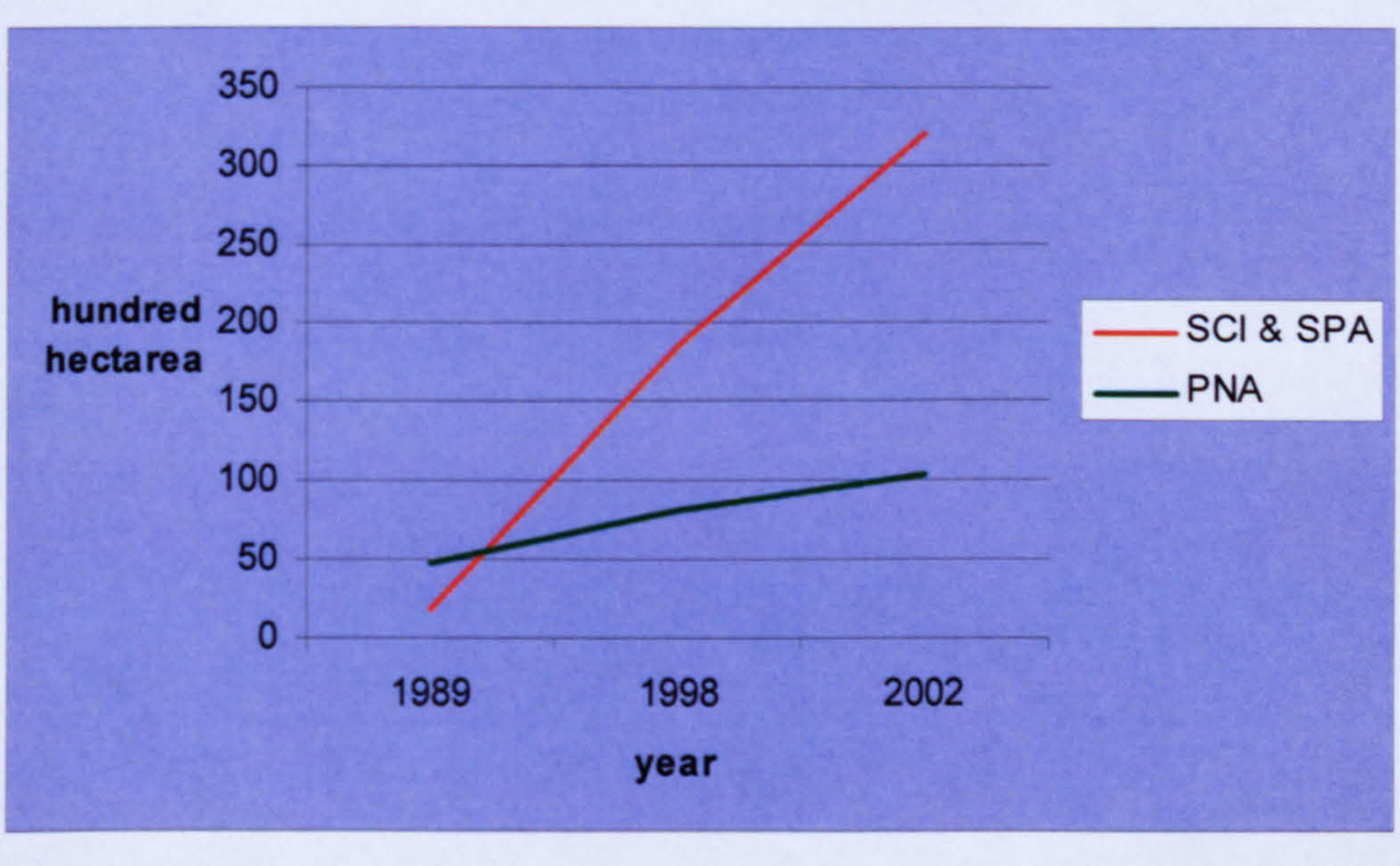
The spatio-temporal dataset and the maps associated with it (land use, infrastructures and fragmentation) allow the writer to undertake a statistical analysis comparing three different points in time of the ecological succession. The land use changes were obtained from the interpretation of aerial photographs and digital images and the results were mapped using a GIS. In order to understand the current rules of change, suitable actions were necessary to be taken at the appropriate social and geographical scale. That is both at regional level; at a scale 1:200.000 in 1982, 1998 and 2002, and at municipal level; at a scale 1:25.000 in 1957, 1984 and 2000. The following graphs (Figures V.20, V.21 and V.23) and maps (Figure V.22 and V.24.) provide an idea about the statistical analyses that were carried out.

Figure V.20. Temporal evolution of land use categories in the region of Madrid



The pattern of exponential growing of urban land occupying other uses is clearly identified.

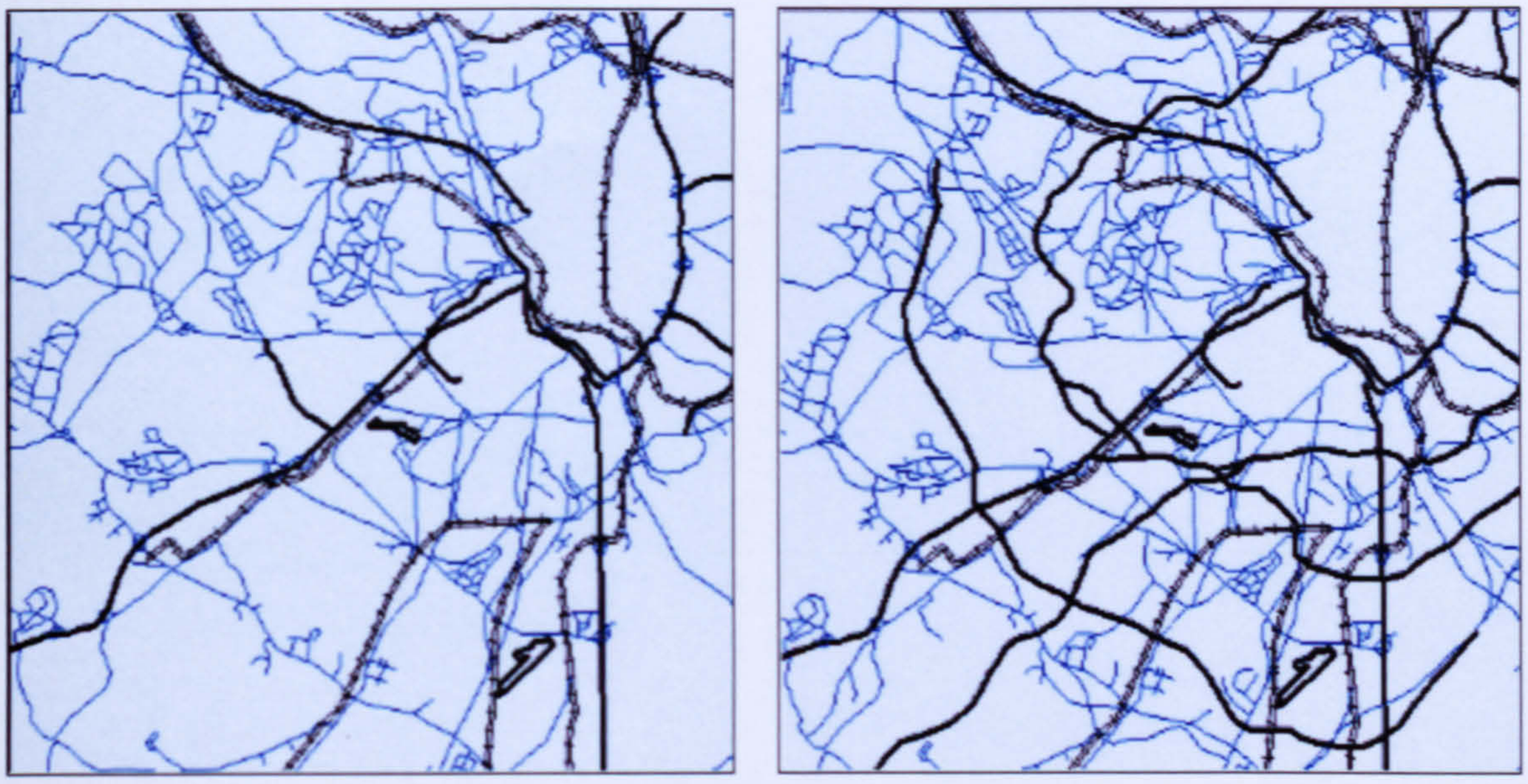
Figure V.21. Temporal evolution of Protected Natural Spaces in Madrid



SCI and SPA, spaces under European Communitarian Directives, and PNA - Protected Natural Areas- under Spanish legislation.

Both figures source: Own work based on the dataset created by TiGrESS-Madrid case study

Figure V.22. Temporal evolution of Infrastructures in the region of Madrid (1989/2002)



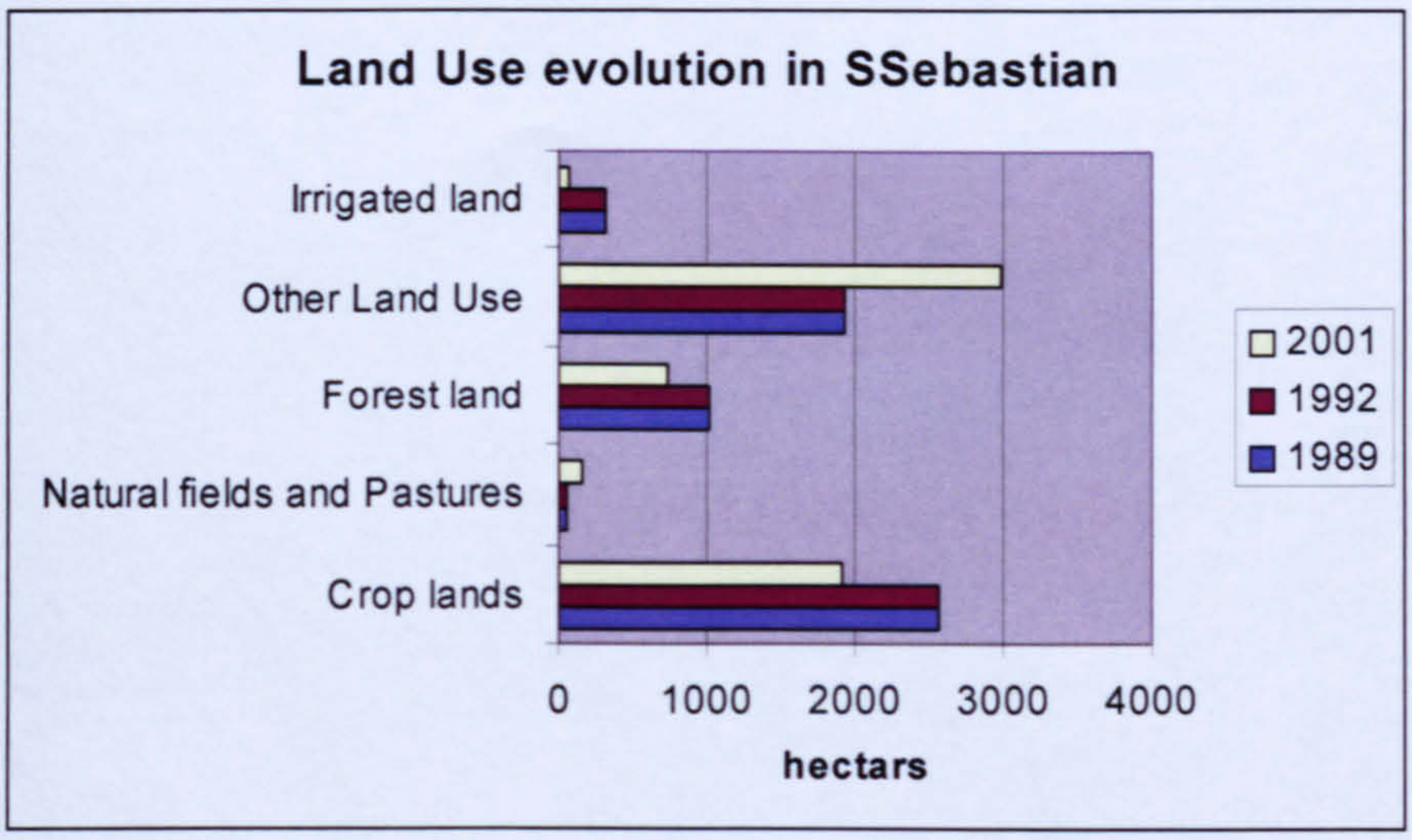
Source: Own work based on the dataset created by TiGrESS-Madrid case study

The increase of infrastructures is mainly due to motorways and ring roads. The most striking change is the building of the new highways surrounding Madrid. This change has only been observed in 2002, since these started to be built after 1998.

The Regional Government has announced a new project to develop almost 100 kilometers of new infrastructures in the southern region (Press report in 22nd of January 2004, see http://www2.madrid.org/prensa).

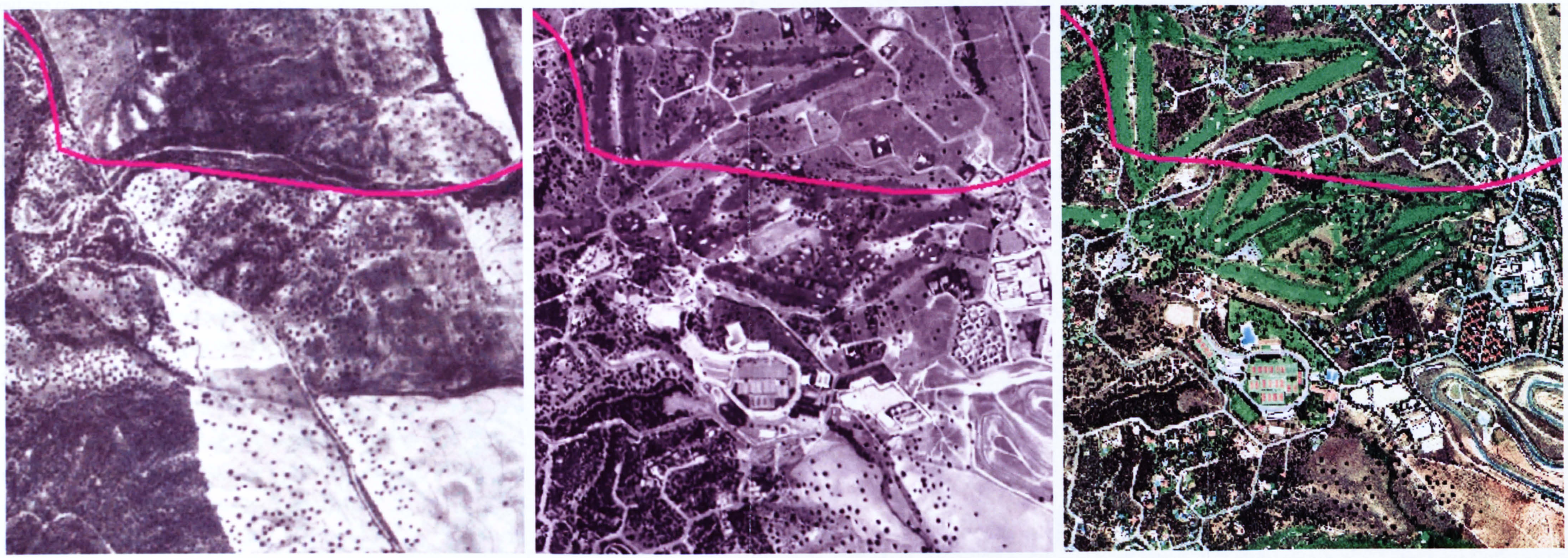
Land use changes were mapped and statistically represented as can be observed in the following graph and map below (Figure V.23 and Figure V.24). The analyses undertaken show the changes in the municipality of *San Sebastian de los Reyes*, however, similar analyses were undertaken in the three municipalities. The biggest increase of industrial and urban land has occurred in the municipalities near the City of Madrid.

Figure V.23. Temporal evolution of land uses in San Sebastian de los Reyes



Source: Own work based on Normas Subsidiarias Municipales (1985)

Figure V. 24. Temporal evolution of Land use at municipal scale (1:25.000)



1957 1984 2000

The same mapped area in the municipality of *San Sebastian de los Reyes*

To conclude this chapter:

"...splitting the landscape into large, contiguous blocks without a detailed (in some cases, polygon by polygon) quest to understand database structures and the significance of local outliers could produce a very nice simulation model, but would not have helped us distinguish the pivotal role of river-valleys even those that currently exist in degraded condition- from other polygons of comparable size that were mere artifacts of data preparation." (Encinas, Hernández, Hernández, Martínez and Winder 2006: 13)

I have acquired knowledge about *reality* and *value judgments* of the land planning system in the region of Madrid. I now need to move towards the definition of the actions to take –*operational judgments*-.

"...the expert planner from out of town would not know the dynamics of change or recognize landscape legacies (...) Even citizens, who are intimately familiar with a landscape and its workings, will not necessarily understand the consequences of common events..." (Marcucci 2000: 77)

The understanding of beliefs and values in local cultural communities will be the source of this knowledge. The political willingness of a local community to co-operate with policy interventions will give some clues to the actions taken or to be taken in planning. The following Chapter VI will deal with these ideas. Stakeholder engagement exercises will be focused on the identification of stakeholder groups: policy- and decision-makers; political insiders, outsiders and so on. It will also investigate how the stakeholder engagement process can complement the landscape modelling process, in order to integrate eventually to explore the potential effects of certain scenarios[6] (see Chapter VII) in order to inform regional planners and other end-users.

[6] For instance sustainable farming, urbanization and ecological tourism, which are supported by the action of specific policy instruments (i.e. management of special protected natural areas and maintenance of high amenity values)

CHAPTER VI

THE STAKEHOLDER ENGAGEMENT PROCESS: EXPLORING POLICY OPTIONS (OPERATIONAL JUDGMENTS)

This chapter describes the contribution of the fieldwork to the challenges of the research. On the basis of this, the writer explores how to generate or/and facilitate information flows among stakeholders involved within the multi-layered governance of the Autonomous Community of Madrid (CAM). The writer has prepared for this work by undertaking a desk-based study of land planning schemes and development plans, natural areas management plans and participatory processes at local and regional level, concentrating on the Madrid region. The work on landscape modelling and fragmentation undertaken in Chapter V and TiGrESS also contributed substantially to the preparatory phase of this process (Encinas *et al.* 2004; Encinas *et al.* 2006). The social inventory reveals a rich list of stakeholders directly and indirectly involved in land planning and management of the landscape.

VI.1. BACKGROUND AND DESIGN OF THE FIELDWORK

Although, the steps followed for the development of the fieldwork were iterative and decisions on how to proceed were taken while in the field, the process could be roughly sequenced as shown below. A portfolio of participatory planning techniques selected is included (adapted from Chambers 1992; Pretty 1995b; Lawrence Neumann 1997; Ardon Mejia 2001; Mata 2001; Garrido 2003 *pers. comm.*; Pretty 2003; Hernández J.P. 2004; Open University 2005; Wageningen University 2005).

- Desk-based study and case study analysis.
- Preparation of the fieldwork (the chronogram shows how the activities are phased in over three years of research towards the final aim).
- Establishment of social relations with stakeholders, and adoption of a social role, presentation and personal involvement with stakeholders.
- Qualitative procedure: semi-structured interviews, questionnaire techniques (such as observation, sensitive interviewing, listening and collection, notes taking, recordings) and design of diagrams and maps (rich pictures and stakeholder mapping) used for data collection.
- Analysis of data (qualitative techniques for data coding), elaboration of preliminary hypothesis and focus on specific aspects of research.
- On-going validation and cross-checking of the provisional results to complement with other techniques of participatory planning such as the logical framework approach (problem tree and objective tree) and diagramming (influence diagram).
- Re-focusing main achievements of the fieldwork and publication of research tool: Booklet of guidelines for sustainable planning in Madrid (see later in this chapter)
- Arrangement of the next step of meetings (focus groups) and participatory observation.
- Physical disengagement from the field case studies.
- Final hypothesis and conclusions for the engagement of stakeholders.

At the beginning of the TiGrESS project, during June and July 2003, Dr. Garrido (coordinator of TiGrESS - Madrid case study team), along with the Spanish Society on Organic Farming (SEAE), identified the case studies in the region. The municipalities of *Belmonte de Tajo, Cercedilla* and *San Sebastian de los Reyes* were formerly chosen due to the key role the organic farmers had in those areas. It should, perhaps be emphasised that the enthusiasm, easy-going attitude and willingness of these farmers to participate was a key factor in selecting these regions. Dr. Garrido, whose experience working within other research projects in encouraging organic farming in Spain was invaluable, established contact with the farmers.

My first steps were to establish contact with them, to locate their farms and investigate their system of interests and the relationships among the stakeholders involved in the local development. It should be emphasised that CAM is a multi-layered governance structure and each stage of research operated on two or more spatial and time scales. As the work progressed, organic farming lost its leading role in the dissertation and the ideas about the stakeholder community developed, and these developments meant that each stage of research involved a revised (actually an extended) list of stakeholders. At each stage in the fieldwork, research was addressed towards the stakeholder community, as it was understood at that stage. There is a relationship between the location of a piece of fieldwork on the chronogram and the comprehensiveness of the understanding of those communities. The fieldwork consisted of a three-stepped progression with an extended set of stakeholders at each step.

The chronogram (see Table VI.1 below) shows the time spent in each stage, as well as how each stage of fieldwork stemmed from the previous one, and the three of them linking back to the main objective. Interviews complemented by questionnaires and conversations, and latterly focus groups were used for the data collection. Spanish experts in rural planning (Gómez Orea 2001; Oñate *et al.* 2002) as well as British qualitative research experts (Lemon 2007), suggested the following questions be addressed: Who are the stakeholders? What are their systems of interest? Do stakeholder preferences create conflicts of interest? Stakeholders included those individuals or groups involved in environmental management and land planning, as well as influencing the approaches to decision making. Farmers, associations, landowners, rural development groups, managers, planners and political authorities formed the range of stakeholders in the particular field investigated.

Table VI.1. Chronogram of the three stages of Fieldwork

Activities in the First Year of Fieldwork(Winter and Spring)	*December 2003*			*January 2004*			*February 2004*				*March 2004*					*April 2004*	
Number of weeks	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*
Re-contact with the stakeholders																	
Design of questionnaires																	
First meetings																	
Interviews Farm level																	
Interviews Municipality level																	
Interviews Regional level																	
Observation of the participation process																	

N.B. CHRONOGRAM OF FIRST YEAR OF FIELDWORK: The fact of re-establishing contact in the earliest stage of the fieldwork is because of no contact had taken place since the case studies were selected in June and July 2003.

Activities in the Second Year of Fieldwork (Winter and Spring)	*December 2004*		*January 2005*					*April 2005*				*May 2005*					*June 2005*		
Number of weeks	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*
Logical Framework Approach																			
Set the discussion process: re-design of questionnaires																			
Interviews Local level																			
Interviews Intermediary level																			
Interviews Regional level																			
Interviews National level																			
Stakeholder mapping																			

Activities in the Third Year of Fieldwork (Winter)	*November 2005*			*December 2005*				*January 2006*				*February 2006*				*March 2006*	
Number of weeks	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*
Publication of the Booklet																
Distribution of the Booklet																
Discussion groups at Local level																
Discussion groups at Intermediary level																
Discussion groups at Regional level																
Discussion groups at National level																
Observation of the stakeholder engagement process																

In this preliminary stage, a large description of the municipalities was necessary for the preparation of the fieldwork. The work was based on the desk-based study later completed and verified by the interviews held with stakeholders in each municipality. In the case of *San Sebastian de los Reyes*, the researcher collected part of the information from the Town Council web page to overcome the difficulty of access to the politicians in the local government.

CERCEDILLA

Geography: Cercedilla is located in the mountains of Madrid, in the northern part of the Region, close to the border with another region, Segovia (in Castilla Leon Autonomous Community). Area: 33.8 km². It is located 60 km. from Madrid. Cercedilla has a good infrastructure and very good communications with the nearest big city, Madrid, by road and by train. It has successful tourist attractions and its population can be doubled several times each year (weekends and holidays time), in winter due to snow sports and the rest of the year to rural tourism and adventure sports.

Population: It has approximately 5,500 inhabitants. In the last decade, the population grew by 37% and it continues growing. The main characteristic of this town is its young and mature population, who are 25/40 years old. There is also a peak in people are 65 years old, mostly retired or nearly retired.

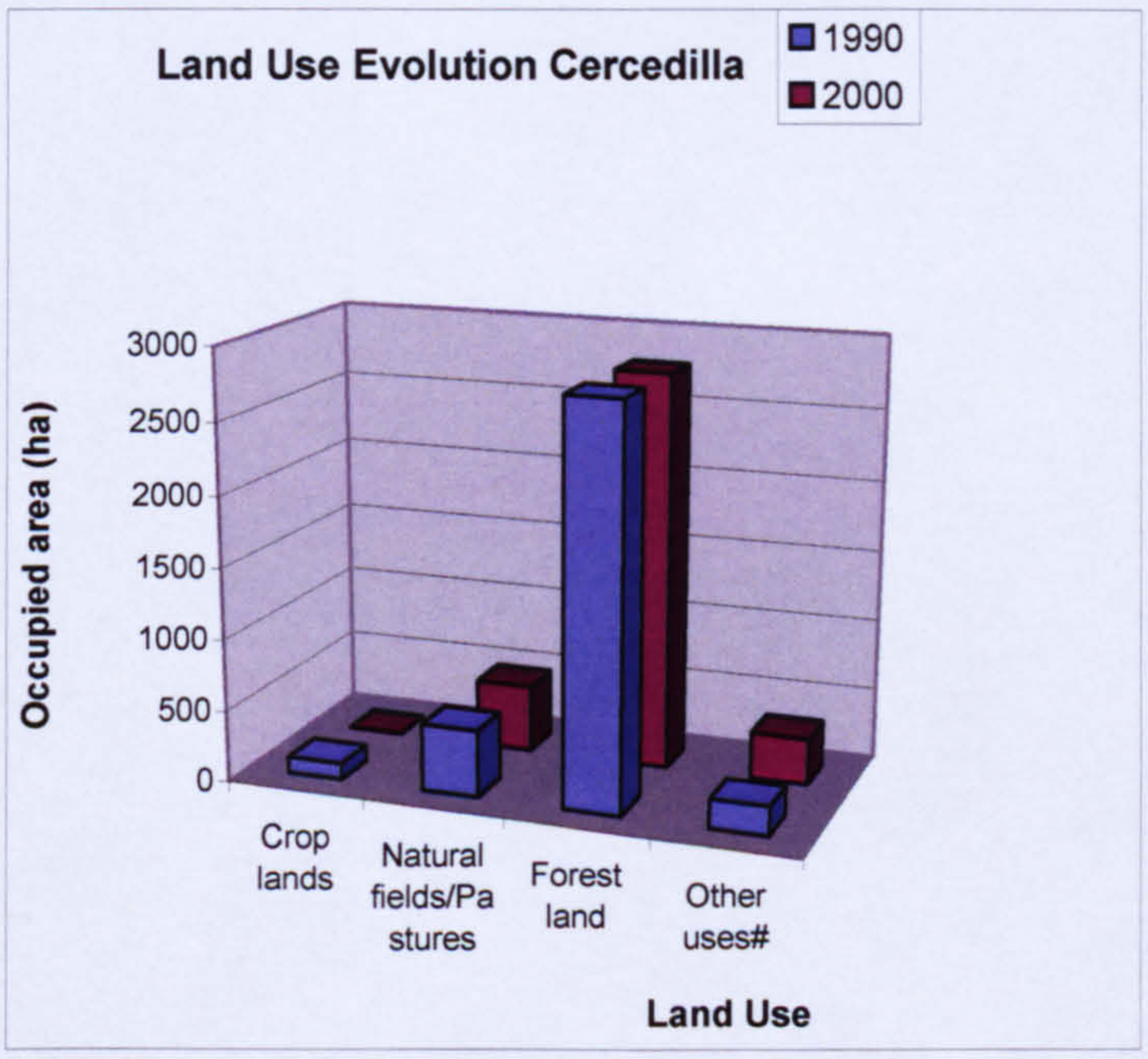
Political situation: Local Government has been socialist (PSOE andIU) since 2003. This situation contrasts to the rest of villages in *Sierra de Guadarrama*, which mainly vote conservative. Development prospects prioritize local industry, improving rural tourism infrastructures (due to its proximity to Madrid) and enhancing the environmental control in all of the Regional Park *"Cuenca Alta del Manzanares"*. According to the politicians, the development in Cercedilla has been stopped because of the protected areas. The Local Development Agent promotes the diversification of local products and the specialization in natural areas conservation. ADESGAM, Rural Development Group - "Sierra de Guadarrama", supports local development projects (PRODER) from the Rural Development Program of the European Union. Technical staff at ADESGAM are also engaged in setting up Local Agenda 21. *Economy:*

Cercedilla is a municipality mainly dedicated to the tertiary sector (74% in 2000). In the last decade Cercedilla has lost agricultural value (livestock), losing areas dedicated to crops and gaining unproductive areas (including non agricultural areas, rivers and lakes). Livestock is a second activity in the majority of cases and it is maintained due to good pastures in common ownership, called *dehesa comunal* and thanks to the support to the milk sector. It is also necessary to highlight the loss of brushwood areas and the increase of wood forest, while the rest of the crops are maintained.

Legislation concerning Land Planning: Local Land Planning Regulation, 1985. In process Land Use General Plan (Urbanism). Use and Management Plan "Regional Park Cuenca Alta del Manzanares", 1987. There has been relevant progress on Local Agenda 21.

Land Use Distribution: Cercedilla is mainly covered by several kinds of forestland. These forests have been used for cattle husbandry and native breed have existed here for centuries. Pastures are open forests to increase husbandry productivity. See the figure below (Figure VI.1).

Figure VI.1. Land Use Distribution: Cercedilla



Source: Normas Subsidiarias Municipales (1985)

SAN SEBASTIAN DE LOS REYES

Geography: It is located in Metropolitan Area of Madrid (18 km. from the city centre), in the foothills north-east of the Region. The Jarama river flows through part of its territory in a very bad state of conservation of water and riverbanks. The only natural area is called *Dehesa La Boyal* and belongs to Regional Park *"Cuenca Alta del Manzanares"*. Area: 59.39 km².

Population: It is approximately 65,000 inhabitants. Population in *San Sebastian de los Reyes* is mainly composed of young children and mature adults: 5/49 years old are the representative ages. So the regeneration in this municipality is safeguarded. With regards to infrastructure, new motorways occupy a big part of its territory as well as the extension of Madrid-Barajas airport and industrial buildings.

Political situation: There is a political tradition of support of left-wing parties. A coalition of left wing parties (PSOE, IU and IS) has been in power since 2003. The development prospects include programmes for young people: employment, training and supporting to small and medium enterprises (SME).

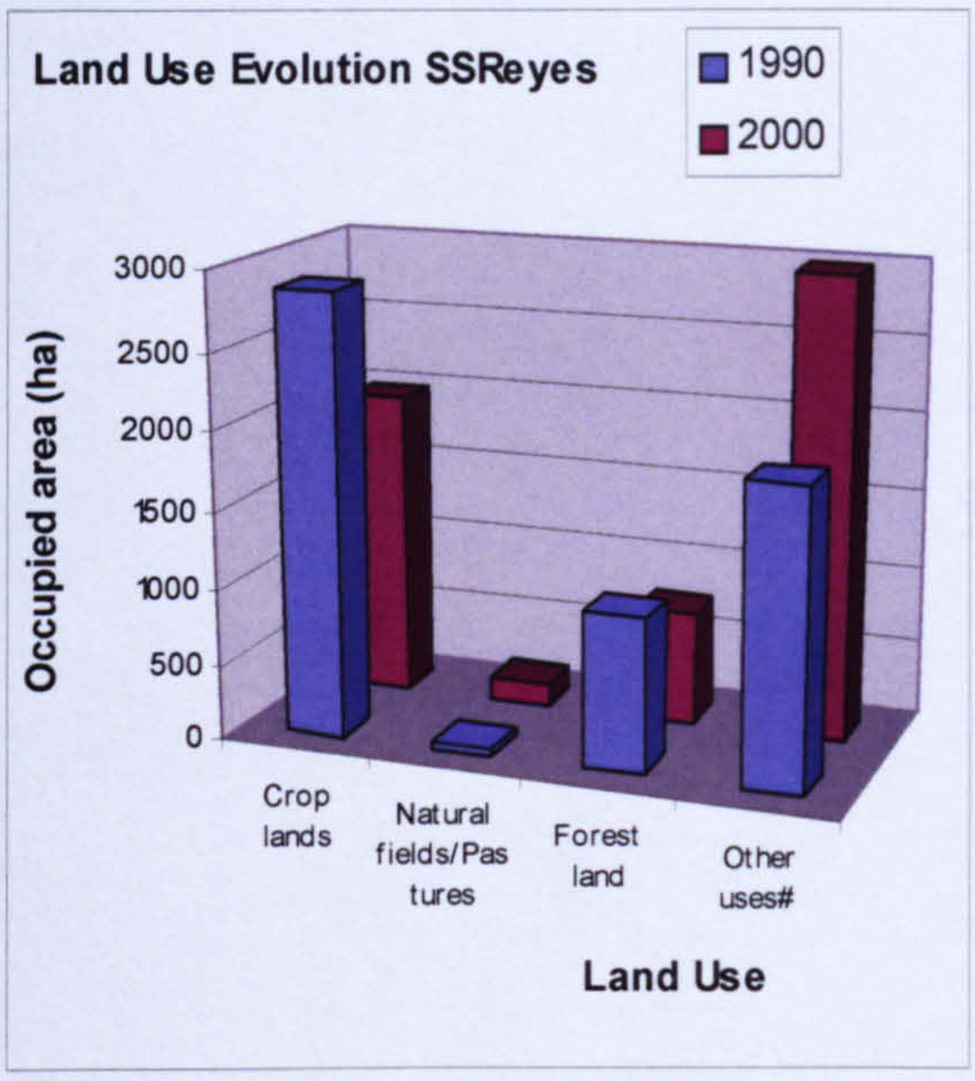
Economy: The main economic sector is the tertiary (66% in 2000). The agricultural sector is absolutely marginal (0,7%). These farming systems are currently undergoing a modernization process (new markets, new activities, new crops) to be able to maintain a few farms in this area.

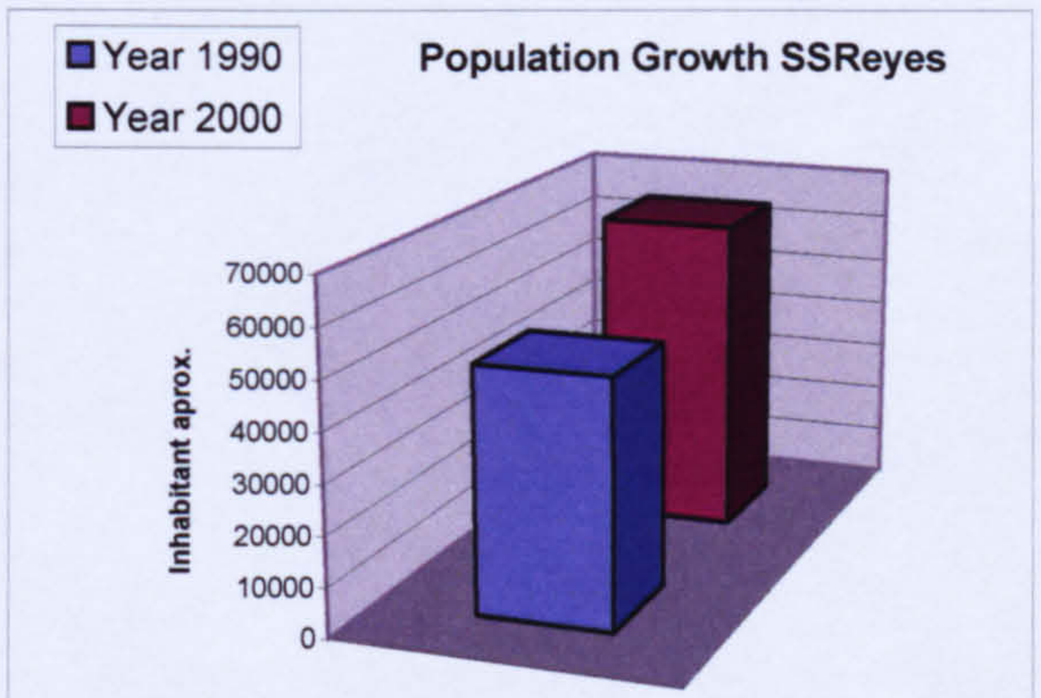
Current legislation: Land Use Plan 7/11/2000. Use and Management Plan "Regional Park Cuenca Alta del Manzanares" since 1987.

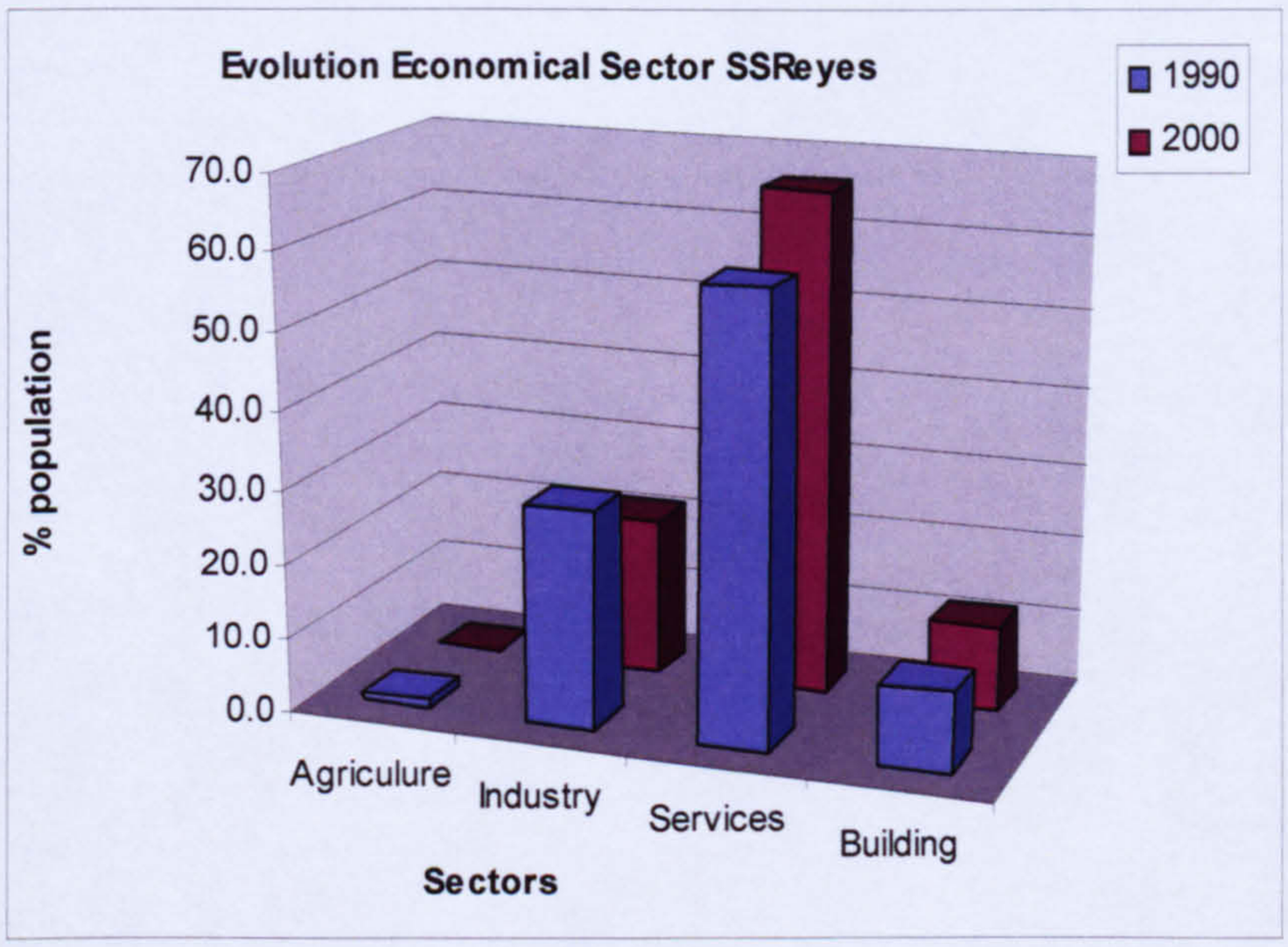
See the figures below (Figure VI.2): the first of the following set of comparison graphics shows how, during the last decade, the growth of population is observed in parallel to the loss of cropland areas and an increase of unproductive areas. Not by coincidence, these processes are also parallel to the percentage of population dedicated

to the tertiary sector. Land uses have changed, increasing urban and industrial areas while crops and forestlands are decreasing. It is therefore easy to recognise the impact of urbanization process.

Figure VI.2. General Information: San Sebastian de los Reyes







Source: Normas Subsidiarias Municipales (1985); INE (2006)

BELMONTE DEL TAJO

Geography: It is located in the plains in the south of the region. This municipality is in the *Comarca de las Vegas,* which is one of two rural comarcas of the Madrid Region. It is one of the most representative municipalities in Madrid due to its agro-ecosystems (vineyard, cereals and hunting). However, it has the worst communications of the three case studies, which is affecting the development of rural tourism and local businesses. Area: 23.7 km²

Population: It is approximately 1,152 habitants. The rapid ageing of Belmonte's population is a characteristic of this municipality. The majority of the inhabitants are 65/75 years old and another significant portion of them are 35/40 years old. It conditions the different development programmes and, at the same time, the low participation of the population. In the last decade, the number of residents remained constant. The younger ones are moving out and older people are coming back to their village.

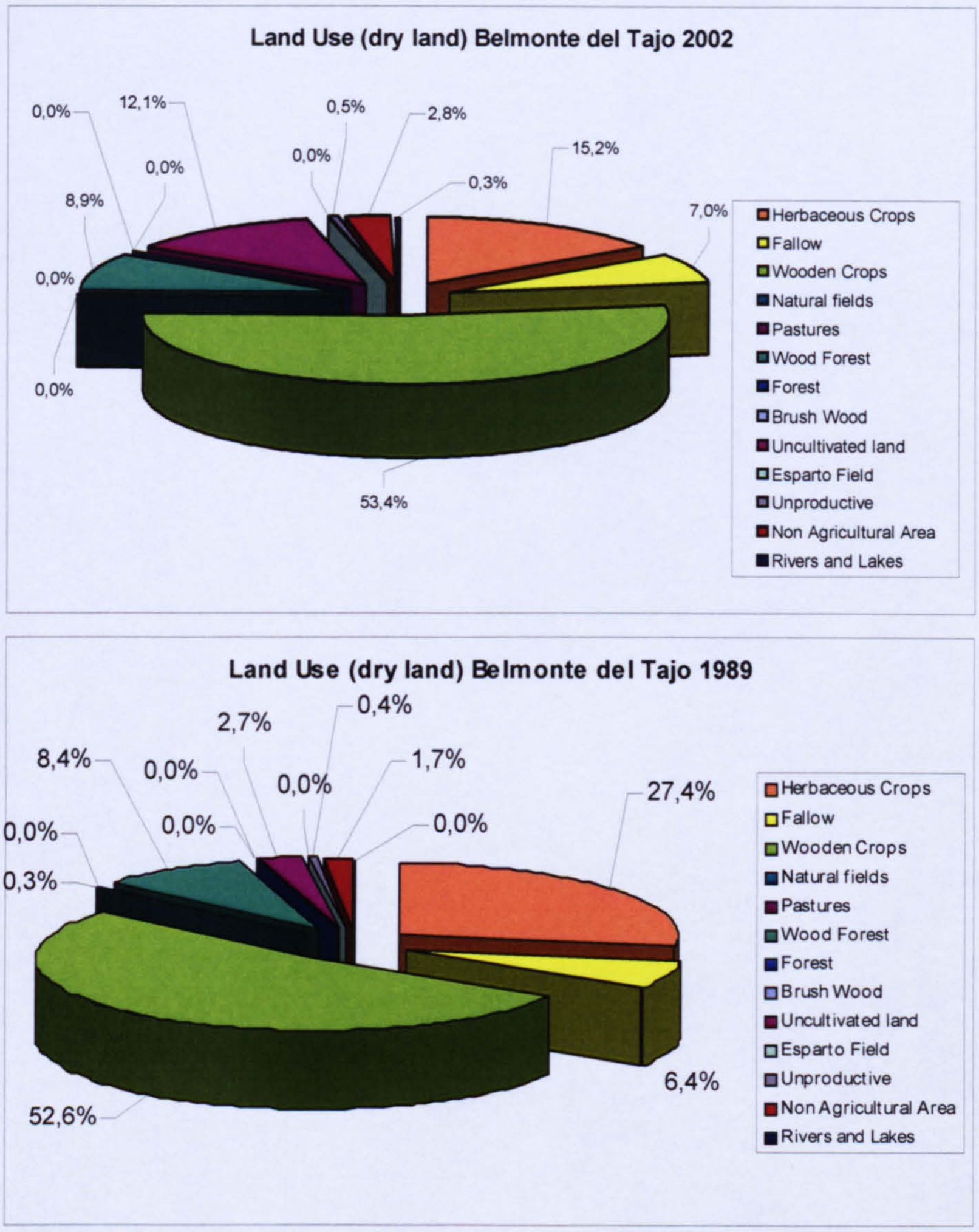
Political situation: The Town Council has been controlled by socialist party (PSOE) from 2003. Some of the projects that are promoted are encouraging the population to promote their traditions and local products as a way to attract population and rural tourism. The Local Development Agent MISECAM also promotes the diversification of local economies. ARACOVE, Rural Development Group "Comarca de las Vegas" manages LEADER+ and PRODER Rural Development Programmes of the European Union. Its guideline is 'valorisation of local products' as a way to develop.

Economy: The main economical activity in 2000 was industry (42.1%). In the last decade, the loss of importance of Agriculture (5.1%) and the increase in Building (28%) are the significant trends, together with the loss of crop lands. In respect to the evolution of crop lands, vineyard and olive tree have been maintained, but herbaceous crops are decreasing. In this area, the industry is dedicated mainly to the production of wine.

Current Legislation: Land Use Plan, 1985. There has not been relevant progress on Local Agenda 21.

Land use distribution: The use of its territory is mainly for hunting and agriculture, with some areas protected for archaeological use. The average farm is 0.5 ha. in size (according to Land Registry, 2003) and is a typical characteristic of this agro-ecosystem.In the figure below (Figure VI.3) , the crop evolution in *Belmonte de Tajo* can be observed. Wooden Crops refers mainly to vineyards and partially to olive trees.

Figure VI.3. General Information: Belmonte de Tajo



Source: Normas Subsidiarias Municipales (1985)

VI.2. THE RECONNAISSANCE PHASE - STAGE 1 OF FIELDWORK (WINTER 2003/2004 AND SPRING 2004)

A reconnaissance phase of research was directed towards two stakeholder communities, each operating on a different scale. These were municipal (so-called local) and regional policy makers. The desk-based study provided useful background information about land use change, population growth, the economic sector and environmental and planning regulations. The landscape model (on Chapter V) suggested that these different stakeholder communities would be able to provide information on different aspects of the planning process. See Table VI.2.

Table VI.2. Preliminary list of Stakeholders (First stage of the fieldwork)

Relevant stakeholders in the local community	*Relevant stakeholders in the regional community*
3 organic farmers in *Cercedilla, Belmonte de Tajo* and *San Sebastián de los Reyes;* 2 conventional farmers in *Belmonte de Tajo* and *San Sebastián de los Reyes;* 1 cooperative livestock farm in *Cercedilla;* 1 forestry agent in *Cercedilla;* 2 small and medium sized enterprises (SME): *"bodega"* and nursery garden; 1 leader of the Organic Farming Association -*APRECO* 2 Mayors: *Cercedilla's* and *Belmonte de Tajo*'s Mayor;	2 technicians and planners in the Departments of Rural Development and Environment within the Regional Directorate; 1 natural protected site's manager of the Site of Communitarian Interest (SCI) *"Curso Medio del Rio Jarama"* in *San Sebastián de los Reyes;* 1 leader of the Regional Committee of Organic Farming -*CAECM;* 2 farmers trade unions: *COAG* and *Plataforma Rural;* 4 local action groups and rural development groups: *MISECAM* and *Cercedilla*'s town council (ADL-*Agentes de Desarrollo Local*) and *ARACOVE* and *ADESGAM* (GAL-*Grupos de Acción Local*)

There were two set of interviews in this first stage of fieldwork. The initial set of personal interviews was tape-recorded. They took place in a wide variety of locations: farms, cooperatives, *bodegas*, town councils, horticultural nursery garden or headquarters of regional government. Qualitative techniques were used to gather the data in order to understand the stakeholders' opinions about the land use changes set in the territory. The aim was to establish contact with the stakeholders related to the

chosen municipalities and those stakeholders that indirectly influence the landowners' decision. The conversations derived from the interviews helped the writer becoming integrated into the decision-making process during the next stages (Chambers 1992; Pretty 1995b).

At the *local level*, the writer consulted stakeholders from farm level to the municipality level such as farmers, cooperatives, associations and small and medium sized enterprises (SME) and the mayors. The questionnaire mainly dealt with the following themes:

- The chronological evolution of land ownership, land consolidation, agrarian practices, types of production and marketing in the community.
- What are the main causes of conversion to organic farming; environmental awareness, social tradition or profit from the final price?
- What is the knowledge gained through the European policies such as the Common Agriculture Policy (CAP) and the Initiatives LEADER and PRODER?
- Does the multi-functionality of farming (rural tourism, cultural value, traditional practices, conservation of natural areas, etc.) solve the issue of the development of rural areas?
- The evolution and subjective assessment of the social movement; cooperatives, associations and the like. Which would be the aims and political prospects to enhance a participatory process of development? What changing role would they have in the local community?

The first set of interviews carried out was addressed to relevant stakeholders in the *local community*: key conventional and organic farmers, cooperative farms, associations' leaders and small and medium sized enterprises (SME). The areas of questioning in the first set of interviews are shown below and they cover specific issues about the role of the different stakeholders in farming evolution throughout the last decades taking into account from policies to practices.

- The key farmer's historical evolution: crops, practices, production and cooperativism. Which role do they have within the local community?

- Land ownership. Evolution and Conflicts.

- Conversion to organic farming. Why did you convert to organic farming? Do you think that is it beneficial to the environment? Is it beneficial in the economic-social aspect?

- What kinds of policies, such as subsidies, are being promoted by the European CAP (Common Agriculture Policy), LEADER+ and PRODER II initiatives, agro-environmental measures and plans for Organic Farming? What is the knowledge gained through these policies?

- Agricultural practices.

- Livestock. Do you realise how important livestock is in organic farming despite the difficulties?

- Marketing. Could marketing improve, increasing the consumption of organic products?

- Former cooperatives. Evolution and evaluation of associative movement. Which are the aims and political prospects to enhance a cooperative work?

- To diversify activities around agriculture: rural tourism, cultural value, traditional practices. Are these useful methods?

- Protected areas. What is the relation between organic farming and the protected areas, such as Regional Parks and the Natura Network 2000?

- What is the position of the agricultural sector in the community? How did it evolve? How does it evolve?

- What is their opinion about their changing role in society?

10 tape-recorded *interviews* were obtained. These *semi-structured interviews* ended up in 10 *informal conversations* (non-tape recorded) in semi-structured format. The results were analysed using qualitative methods, specifically NUDIST 6 a computer programme for text analysis for data coding. The writer classified the topics mentioned by stakeholders and recorded their relative frequencies to gain an understanding of how significant these concerns were.

The results of this pilot study at *local level* suggested that organic farmers and conventional farmers had very different perceptions, behaviours and needs. The following tables (Table VI.3. and Table VI.4.) show a few results not yet processed but relevant, extracted directly from the notes of the recorded interviews and conversations; and a brief descriptive characterisation of case study municipalities.

Organic farmers considered themselves as significant stakeholders and actively involved in the decision-making process related to agriculture, environment fields and regional development. They were concerned with soil health and environment and all were full-time farmers. Some of them are organic farmers who follow traditional practices and are beginning to be encouraged by the new agro-environmental measures in the CAP. Others have converted to organic farming in search of a new way to develop agricultural marketing. A third group of organic farmers are interested in following the philosophy of the neo-rural movement. Conventional farmers were more reactive than proactive. While organic farmers claim important positions in the land decision system, conventional farmers are noticeably inactive stakeholders who are concerned with CAP subsidies to maintain their farms, but were hardly involved in the planning process at all. Most were part-time farmers or employed in other sectors and farmed as a hobby.

Table VI.3. 'Raw' data from first interviews in the fieldwork

	Organic farmers	Conventional farmers
Agrarian practices	- The conservation of the natural properties of soil (soil health) to safeguard the future production. - The maintenance of the agro-ecosystems to conserve the natural and social value both as traditional and modern systems.	- They only dedicate their free time to working on the farms. - Their priorities are not related to conservation issues but to increase of production.
Decision-making process	All are significant stakeholders in agriculture: - Some of these know about organic farming due to practising traditional practices which are encouraged for subsidies. - Others are looking for new initiatives to develop agriculture trough a specialized marketing. - Another ones are interested in the neo-rural movements (the re-settlement of the abandoned countryside)	- They are passive stakeholders in the search for initiatives to develop the countryside. - Subsidies and hobbies are the most important reasons to keep their farms.

The other category of stakeholders we consulted at *local level* was the mayors. Unlike the farmers, these had a more strategic view of the municipalities and provided valuable background information about the relationship with regional government. *San Sebastian de Los Reyes* is an urban municipality where farming is in decline. *Cercedilla* seems to depend heavily on tourism through the Regional Park and *Belmonte de Tajo* displays a strongly rural dynamic with conservation of traditional agrarian practices. From the point of view of the local stakeholders, the current agricultural institutions both regional and national are focused on the management of CAP subsidies; whilst technical support, new strategies of rural development and participation in new plans are abandoned. This is discussed more fully below (see *Results and commentary on the results* in pp. 154).

Table VI.4. Information about the case study municipalities

	Agro-ecosystem	Natural protected sites	Growth of developed areas
San Sebastián de los Reyes	Irrigated crops and new farming systems	A Site of Communitarian Interest and a Regional Park are included within the area	Very-high
Cercedilla	Livestock and pastures	Regional Park as an area covered within the proposal of the new National Park	Medium
Belmonte de Tajo	Dry crops such as vineyards, olive trees and cereals	None legal figures of nature conservation or protection	Very-low

A second set of interviews was carried out with relevant stakeholders in the *regional community*: Mayors, technicians and planners in the local and regional Governments, regional committee of organic farming, farmers' trade union, local and rural development agents (LAG - *ADL* and *GAL* in Spanish). The questionnaire carried out in the second set of interviews is shown below and deals with local and regional development policies and the role of stakeholders towards them:

- Owner attitude and attitude of the rest of relevant actors, to organic farming or conventional farming. Is the current legislation useful?

- Local and Regional land planning process. What is the legislation? Who makes up the planning team? What are their development strategies? What is the participation of the different actors?

- Rural Tourism. Its value in the different regions.

- Administrative structures in Agriculture. Local Development Groups. Who do you deal with in these administrations?

- The process of urbanism in the community. Knowledge about land planning regulations.

- Which actors or interest groups are relevant and participate in land-planning processes and in the policy-making processes? Which are the different actors involved according to each group? How can we improve the "communication" between actors to make the implemented policies successful? At the moment, what is the contribution among different actors in the decision-making process?

- Socioeconomic indicators. Which are the indicators used in land-planning process? Which should be the indicators used in this process?

- Local Agenda 21. The implementation in the community.

- Protected areas. What is the relation between land planning and the protected areas?

The work at the *regional level* was organised differently to take account of the fields of interest of the Government technicians and planners, committees and trade unions, local and rural development agents groups, etc. The aim was to elicit information from these stakeholders that could be worked up into the following deliverables. These questions were chosen to find out about the potential role of farming in land planning and to investigate the information flows among stakeholders involved in this context:

- A SWOT analysis (strengths, weaknesses, opportunities and threats) analysed the attitudes of the stakeholders toward organic farming and its current legislation.

- Answers to the following questions: What potential indicators should be used in land planning? What strategies of development are followed? What is the present situation on land planning regulation?. These questions are prepared considering the Regional land planning processes such as Local Agenda 21, urban planning schemes, conservation management plans, etc.
- Data about the information flows among stakeholders and their role in the establishment of policies. Is there a wide knowledge about the authorities and other groups of development involved? What is the level of stakeholders' participation in the decision-making processes? Which stakeholders are relevant in land planning processes and its policy-making process?

12 tape-recorded *interviews* were obtained. These *semi-structured interviews* ended up in 12 *informal conversations* (non-tape recorded) in semi-structured format. The writer did here likewise in first set of interviews (at local level). The results were analysed using qualitative methods, specifically NUDIST 6 a computer programme for text analysis for data coding. The writer classified the topics mentioned by stakeholders and recorded their relative frequencies to gain an understanding of how significant these concerns were. These early results (see below) guided the subsequent data collection and analysis across the other two stages of the fieldwork in process.

The qualitative procedure of data coding helped identify the core issues from different groups of stakeholders' point of view:

- According to the local stakeholders, the current agricultural administrative structure at both the Regional Government and Ministry of Agriculture is based on the management of subsidies. Therefore, technical support and development of new strategies are abandoned.
- The most important aims for the Regional Government are promoting participation in the policy-making process and the development of sustainable actions.
- The local action groups (LAG) and organic farming associations (as representative stakeholders) are demanding their participation in the implementation of different policies at the regional level. They are also working on the design of rural development actions taking into account indicators, which should be reflected in the planning process.

- There is a big gap between the planner, politician and the end-user.

The results at *regional level* suggested that Government technicians and planners consider participation in the policy-making process and actions in sustainable development as two of the most important aims in the regional institutions. The groups of local action of the region, together with the Organic Farming Association (APRECO) and farmers trade unions are encouraging participation in the elaboration of regional policies, which would facilitate their implementation. The writer elaborated a SWOT analysis of the implementation of a planning tool (the new organic farming plan, specifically) based on the results of this first stage of fieldwork. It provides information about the level of approval of this new plan proposed by the national and regional Governments. See Table VI.5.

Table VI.5. SWOT analysis of organic farming in the region of Madrid

Strengths	Organic farming contributes to a better local and rural environment through the conservation of natural resources and the development of local industries
Weaknesses	Lack of internal resources within farmers' associations
Opportunities	Farmer awareness and involvement with organic farming; Organic farming encourages environmentally-friendly practices which are being promoted by ecologist groups and politicians all over the world
Threats	Subsidies for sustainable agriculture are not based on a strategic plan intended to reform agrarian practices and encourage new markets

Source: Own work

IV.2.1.Results and commentary on the results

The qualitative analysis suggests that the topics most frequently mentioned by the stakeholders (and hence most significant for participation) concerned 'the situation of farming' (46%), 'political issues' (31%), 'new development initiatives' (31%) and 'participation' (31%). These were the focus of the first *semi-structured interviews* (55% of the total number) for the local community. The second set of *semi-structured interviews* (45% of the total number) for the regional community handled the following themes: 'landscape multi-functionality' in regional development (44%), 'knowledge of the administrative and decision-making system' (33%) and 'knowledge and/or participation' in land planning regulations (55%).

This work suggested that not two, but three stakeholder communities must be considered in order to understand dynamics at municipal and regional levels. These are: farm-level decision-makers; municipal level decision makers and regional level decision makers. Farmers and municipal politicians were sufficiently different to justify the separate treatment below.

The coding procedure used to analyse these data drew different core categories with each decision-making community. These referred to the awakening of interest in sustainable land planning: *agro-ecosystems, environment-friendly agrarian practices, traditional practices, organic farming, landscape multi-functionality, Common Agrarian Policy (CAP), decision-making processes* and *social networks.* These core issues have also been cross-checked with the evidence that was collected through the desk-based study. The participatory observation, based on re-reading notes from the typed recorded interviews as well as cross-checking with some field decision-makers, provided the insights gained from the last activity of this stage.

The writer emphasized that the stakeholders identify three different and representative territorial dynamics in the region:

- *Cercedilla,* which belongs to the *"Sierra de Guadarrama"* mountainous area is maintaining livestock farming (the most traditional activity) as a specific production of quality labelled meat, as well as a secondary activity. There was a general feeling of the Government's abandonment of its development policy in this

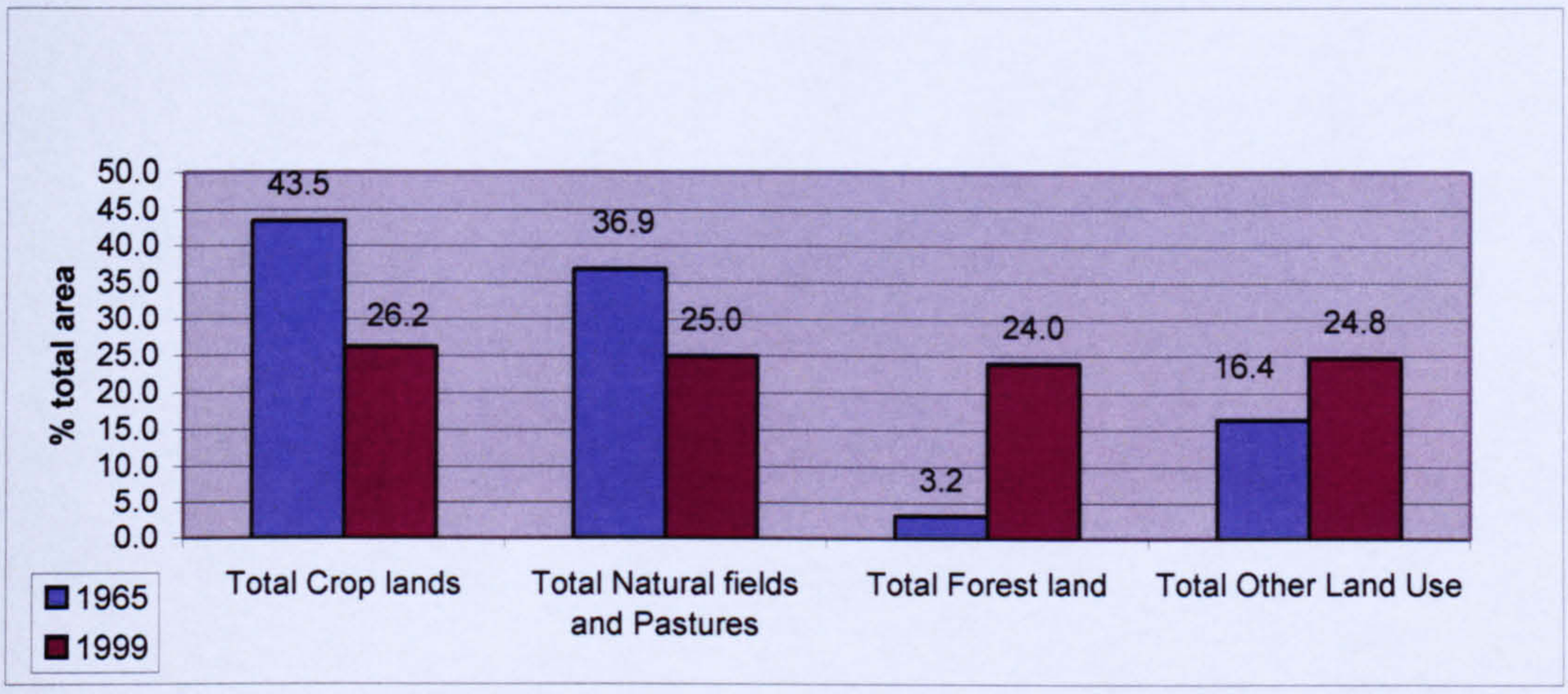
area in spite of it being the biggest tourist area in the region of Madrid. Most of the stakeholders suggested that the Regional Government is not trying to improve their participation in the conservation plans because of a hidden interest in keeping them away from the decision system while the proposal for the future national park is in process. In mid April 2006, these developments were confirmed. The president of the Regional Government (Esperanza Aguirre) has already announced the proposal of the "Sierra de Guadarrama" National Park to all the involved municipalities.

- *San Sebastian de los Reyes* is located in the Metropolitan area, also called the peri-urban area, where horticultural farming on the riverbanks of the Jarama River (where some specialized nursery farms are maintained) has been abandoned almost completely. The extension to the Barajas airport, new motorways and industrial parks has occupied the land.
- *Belmonte de Tajo* represents a rural municipality, which has high agricultural value due to one of the most characteristic Mediterranean agro-ecosystems: vineyards, olive tress and cereal fields. However, these sites are disappearing because of land abandonment and the ageing population selling the land to get some attractive profit from building companies. Nowadays, only seven out of two hundred registered farmers are dedicated full-time to agriculture whilst the majority of the rest of them is no longer dedicated to farming. They are actually waiting for a chance to convert their rustic land to urban land.

The agriculture and livestock sector has a very low influence on regional GDP (0.18%) when compared to the national average (1% of GDP in 2002). The land consolidation schemes changed the typical farm structure: the average farm is 30 hectares and the smaller ones are patches throughout the territory. *Belmonte de Tajo* represents one of the old land ownership systems in which the size of the plots is less than half a hectare; the southern agro-ecosystems are actually characterised by it. The figure below (Figure VI.4) shows how farming land in the CAM has been reduced to 13% by 2002 whilst the cropland use was 68% in 1989. The retired people (hobby-farmers), the part-time workers, the immigrants (where the landowner has farming as a second activity) and a small number of landowners and SME managers (full-time workers) mainly forms the farming workforce. This would imply a good opportunity to

strengthen multi-functionality in farming land. The reason is that they would take a risk, as their main incomes usually do not depend on the production. For all this, landowners often appear to be the most conservative of stakeholders who are afraid of implementing changes in their practices.

Figure VI.4. Land Use evolution in the CAM from 1965 to 1999



Source: Own work based on Agrarian Census (MAPA 1999)

New nature conservation measures are being encouraged by EU policies and that is why the number of farmers and standards of organic farming have done well over the last four years. Organic farmers are actually the most progressive in many respects. They are most receptive to policies to safeguard the agro-ecosystems to conserve the natural and social value of both traditional and modern systems, as well as keeping their land in the healthiest state to guarantee future production.

This reconnaissance phase of fieldwork highlights the enormous gap between farmers, planners, politicians and local stakeholders. These results were used to cross-check the provisional outcomes from the interviews in the next stage of fieldwork. This means that the analysis is a dimension of the research present across all stages, rather than appearing only at the end of the fieldwork. Some of the suggestions made in the course of the conversations with the stakeholders and the participatory observation encouraged the writer to establish contact with other local stakeholders, which made the second stage more inclusive.

VI.3. THE LOGICAL FRAMEWORK APPROACH - STAGE 2 OF FIELDWORK (WINTER 2004/2005): EXPLORING THE OPERATIONAL JUDGMENTS

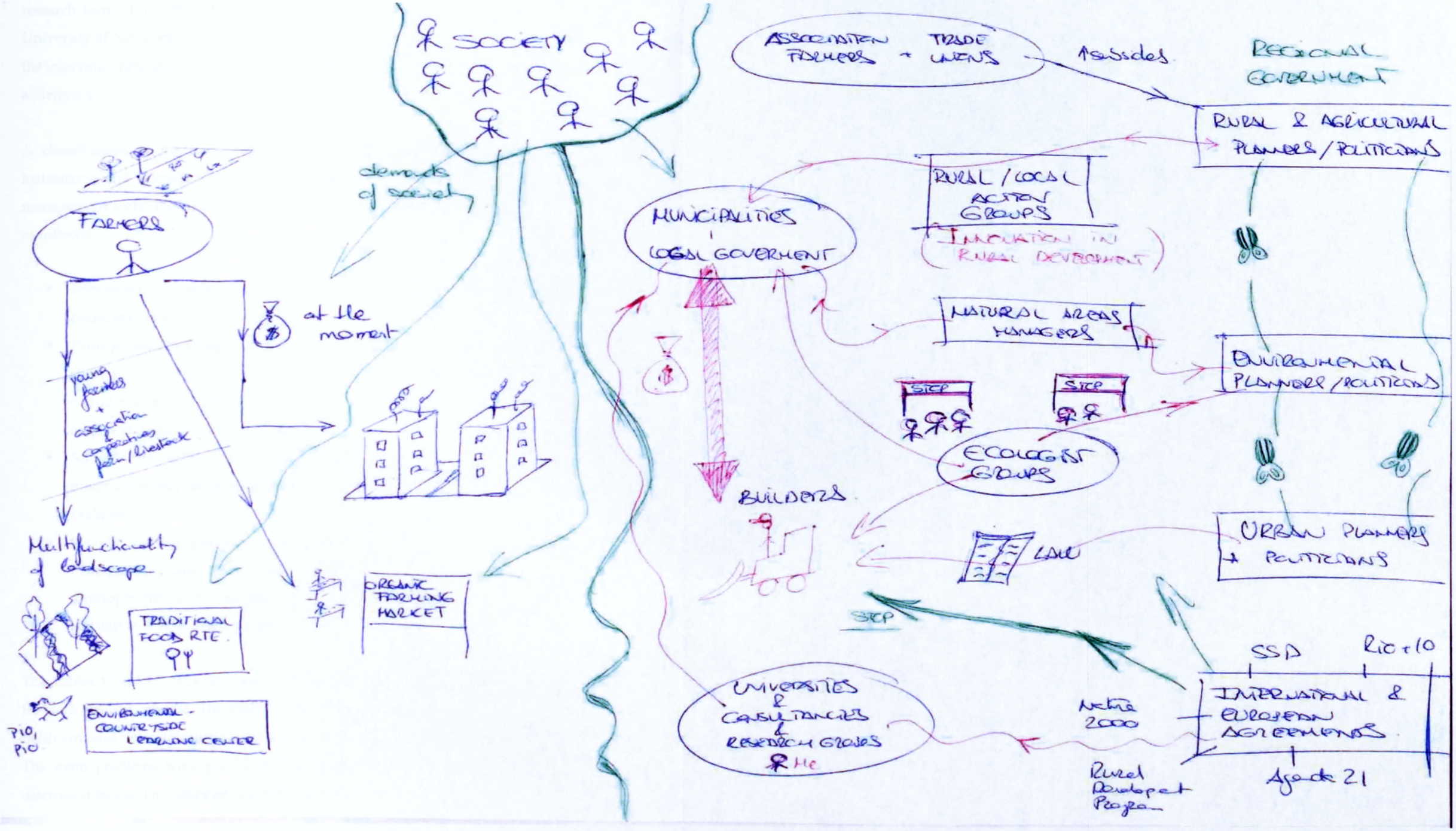
The study of the issues raised by the decision-making system in land planning led the writer to consider the Logical Framework Approach (also referred as LFA) as an appropriate participatory planning method to apply to this stage of the fieldwork. This technique is widely known and frequently used as a problem identification and management tool in the phases of preparation, implementation, monitoring and evaluation in rural development projects for planners and managers (Wageningen University 2004). This approach includes the following chronological steps.

- *Stakeholder analysis.* This provides a picture of the involved and concerned stakeholders.
- *Problem tree.* Problems are defined and hierarchically classified. *Brainstorming* permits the detection of the main problems and then the rest of the problems can be ordered according to their causes and effects in a hierarchic chain.
- *Objective tree.* The problems identified in the previous step are also hierarchically formulated as the future objectives to achieve.
- *Analysis of alternatives.* The conclusions are reached as stakeholders' suggestions to implement the objectives.

VI.3.1. Stakeholder Analysis

New stakeholders and communities have been identified and characterised in the reconnaissance phase (see above, *Stage 1 of Fieldwork*). Thus, the first phase of the LFA has already been completed. However, to clarify understanding, the writer prepared a *rich picture* (Garrido 2003 *pers. comm.;* Open University 2004; Winder 2004 *pers. comm.*). See Figure VI.5.

Figure VI.5. A rich picture



VI.3.2. Problem Tree – Defining value judgments

Brainstorming is part of a group technique which required the writer to work with the research team of TiGrESS-Madrid case study (Universidad Europea de Madrid and University of Newcastle). It was supplemented with the information obtained through the interviews held during the reconnaissance stage and used to sort the problems into a hierarchy.

A classification of the main fields of interest suggested the following themes: institutions and committees, participation, scientific information and planning & management tools. The main problems identified, as the main discussion issues, were as follows:

- *Institutions & committees:* Poor vertical communication between local (so-called municipal) and regional institutions was a significant factor.
- *Participation:* The inappropriate identification of stakeholders, in addition to the short time intervals during which they can participate in the process, are considered as the first problems in the hierarchy. Many opportunities to engage stakeholders are also missed.
- *Scientific information and public accessibility:* The absence of reliable scientific information that can provide an overall territorial perspective is perceived as a problem.
- *Planning and management tools:* There are many tools for territorial planning and management and these have not been kept abreast of international developments. Consequently, convergence with national and international legislation is slow and compliance poor.

The Tables VI.6, VI.7, VI.8, VI.9 and VI.10 show the hierarchical *problem trees* created for each field of interest. The battery of problems, obtained through first results of fieldwork and brainstorming sessions, was sorted out into a hierarchy of three levels. The main problems were placed at the first level of the hierarchy in each of the discussion issues. The tables are accessible below.

Table VI.6. Problem tree: *Institutions*

Level 1	
A. The lack of coordination among institutions on land planning maybe due to the particularities of its decentralised system, failing to implement coordinated actions in horizontal matters: Environment, Urbanism and Agriculture-Rural Development.	*B.* The transfer to the regions of important competences such as Environment, Urbanism and Agriculture implies that planning is done according to the political will of the Regional Government.
Level 2	
A.1. Lack of coordination within the Directorates in the Regional Government.	B.1. Integrated management tools for natural resources are neither elaborated nor implemented.
A.2. Lack of monitoring from the Regional Government once responsibilities are transferred to the Local Government.	B.2. The Regional Government is not interested in implementing a natural protected sites plan.
	B.3. Lack of interest in supporting the necessary accompanying measures to the Common Agrarian Policy (CAP).
	B.4. Land planning is nowadays based on a very basic Land Law (2001), leaving unprotected land in the hands of the market with a pretty sure destination, the building construction.
Level 3	
A.1. Passivity of policy makers and competition between Environment and Agriculture-Rural Development Directorates makes the integrated actions non existent.	B.1. There is no implementation or follow-up at the regional and local levels of available tools such as Natural Resources Planning Guidelines, Local Agenda 21 or Land Planning Guidelines (PGOU).
A.2. Competition for the use and value of the land within the Urban Planning field.	B.2. Legal gaps in protected natural spaces and protection of endangered species issues.
	B.3. Uncertainty about the management of Natura 2000 network in the future.
	B.4. Agro-ecosystems risk disappearing and leaving the region without a potential market of quality products and peripheral tourism.

Table VI.7. Problem tree: *Committees and Commissions*

Level 1

A. Lack of interdisciplinary commissions that can jointly focus on the problems of the territory.

Level 2

A.1. Non existence of mixed Commissions (formed by Agricultural, Environmental and Urbanism technicians) who can analyse and plan the uses of the territory.

A. 2. Lack of knowledge about actions taken by different institutions.

A. 3. Communication is limited to the publication of reports about the projects to be done.

Level 3

A.1. Inappropriate distribution or incoherence of received aid, resulting in, for instance, high revaluation of country land in areas with high ecological value.

A.2. Duplication of activities which involves a loss of human and economic resources.

A.3. Spanish politicians have not reached the principles of sustainability of the Spanish Sustainable Development Strategy that promote common approaches to planning.

Table VI.8. Problem tree: *Participation*

Level 1	
A. Inappropriate identification of stakeholders involved in territorial planning.	*B.* Participation process is reduced to the "claims and discussion phase" which lasts one month, before a new regulation is approved in the Regional Government.
Level 2	
A.1. Unlikely applicability of local stakeholders' suggestions. A.2. Lack of knowledge of the demand of territorial uses from the population.	B.1. Scarce participation of implied actors during the diagnosis of the territory and the elaboration of planning tools, thus basic social problems are not taken into account.
Level 3	
A.1. Disappointment among the population due to the lack of response to its requirements, such as quality products, different tourism options, environmental care, and the like.	B.1. Actors are only involved in the different stages of land planning: diagnosis, management, etc. Therefore its implementation will not be satisfactory and will bring, for instance, the opposition of farmers to the natural protected sites declaration. B.2. Interest groups do not have real lobbying and decision-making capacity in the management of their own space.

Table VI.9. Problem tree: *Scientific Information and Public Accessibility*

Level 1

A. Inexistence of reliable scientific information that can guarantee an appropriate knowledge of the territory from the social, environmental and economical points of view.

Level 2

A.1. The adequate decisions to avoid the negative impacts of implementing certain actions are not being taken because of the lack of knowledge of the territorial impact.

A.2. Inappropriate classification of land uses.

A.3. There is no real perception of the needs of the territory.

Level 3

A.1. The real needs of the territory cannot be determined with such a basic classification of uses (urban, possible urbanization, non-urban, non-classified).

A.2. Lack of cartographic information about endangered species.

A.3. Incorrect distribution of subsidies (agro-environmental measures, organic farming, reforestation of agrarian land, etc.) according to political interests.

A.4. There is no real connection between different areas of high ecological value in the territory.

A.5. Lack of interest in the agricultural use of the territory.

A.6. Unsustainable processes of urban expansion.

Table VI.10. Problem tree: *Planning and Management Tools*

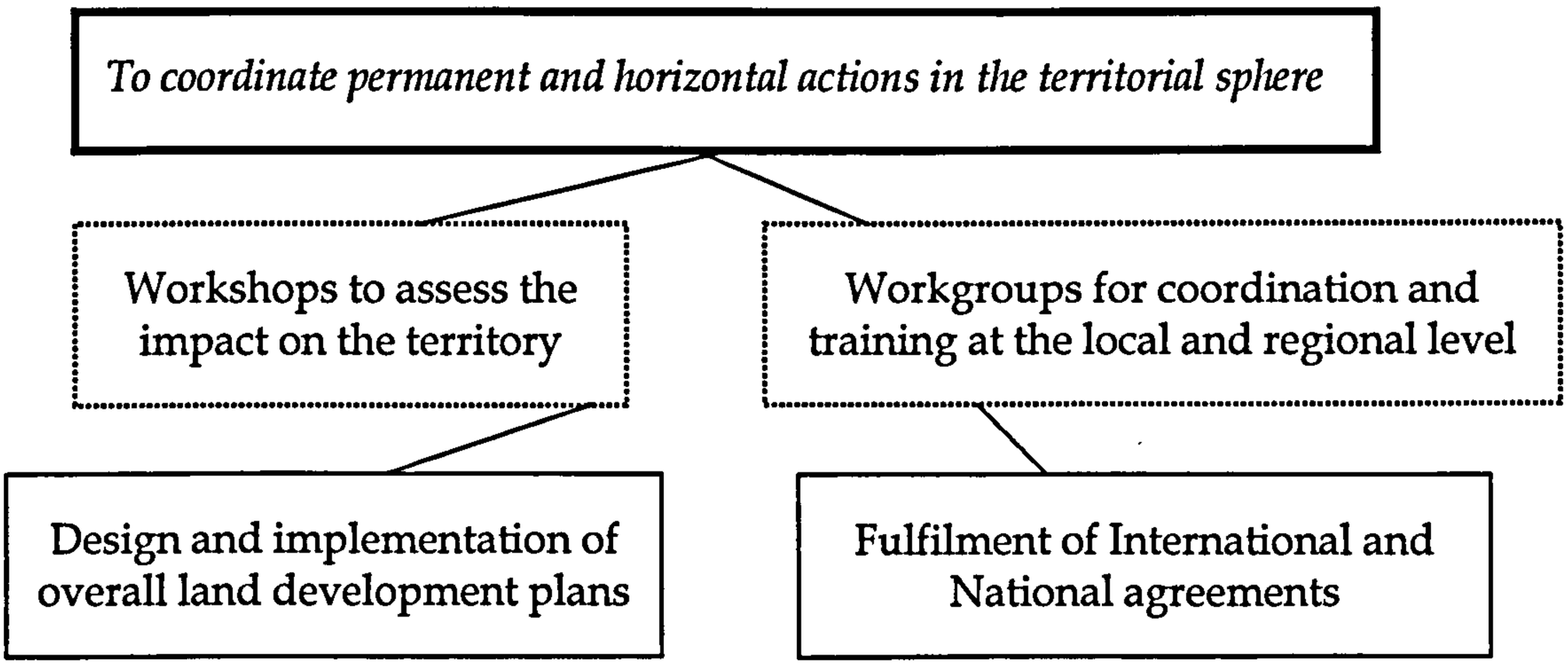
Level 1	
A. Inefficiency and non-updated international criteria planning tools.	B. Existence of multiple tools for territorial planning and management.
Level 2	
A.1. Monitoring of the effective implementation of the development guidelines established in the Spanish Sustainable Development Strategy document.	B.1. Partial use of tools resulting from a duplication of objectives by several independent tools: Regional Strategy for the conservation of biodiversity, Local Agenda 21, Rural Development programme, Natural Resources Planning guidelines and Urban Planning guidelines (PGOU).
A.2. Absence of tools that enforce the existing legislation correctly, such as Land Law (2001) and Protected Natural Spaces Law (1989).	B.2. Low budgets to implement these tools.
A.3. Non existence of legislation that specially protects the agrarian value of the territory.	B.3. There is no infrastructure to coordinate actions taken by institutions on education, tourism, crop control and the like.
A.4. Absence of plans that promote a quality model in agriculture (for instance, organic farming) closer to the demands of the population.	
A.5. Lack of plans on sustainable tourism.	
Level 3	
A.1. Ambiguity in the classification of land is causing the loss of territory with high environmental, social and economical value.	B.1. Isolation of Natural Protected spaces instead of integrating them into the territory, through the Natural Resources Planning guidelines which are applied exclusively to protected natural spaces.
A.3. Agrarian areas of ecological interest as well as basic agrarian activities to maintain the environment are abandoned.	B.2. Planning tools are not utilized within in a hierarchical structure to manage the territory. There is not even a network of environmentally protected areas and not all the natural protected areas have management tools. Also, Local Agenda 21 in its implementation and some PGOU are obsolete for the moment at their common implementation.
A.4. Inadequate control of tourism in areas of high ecological value while there is no promotion of other areas of agro-environmental interest.	B.3. Uncertainty in the implementation of new concepts as Natura 2000 network or Local Agenda 21.
	B.4. Stakeholders act independently. For instance there is no exchange among stakeholders such as farmers and tourists concerning the management of territory.

The definition of problems led us naturally into the exploration of a decision-tree and the options for resolving them.

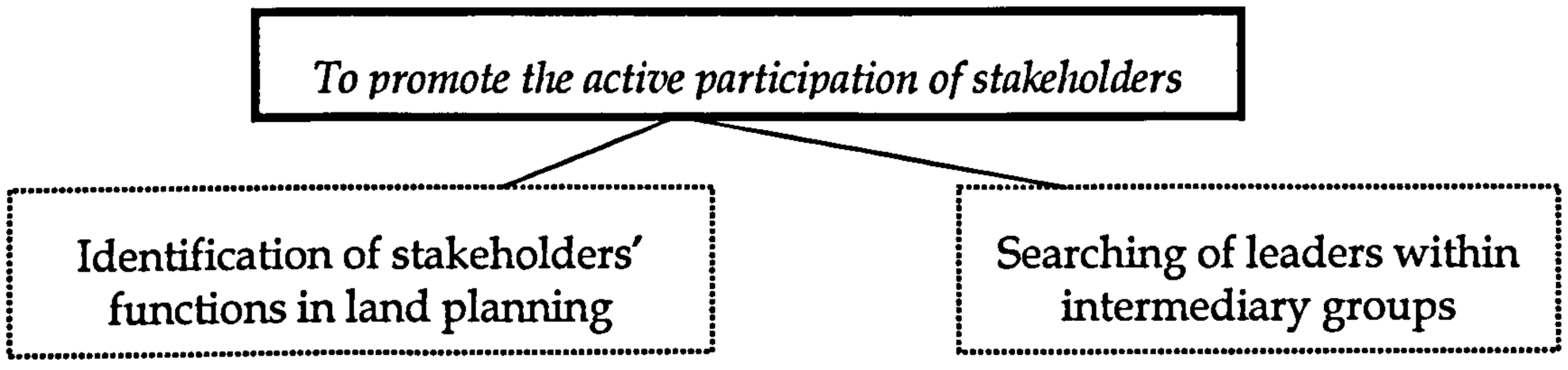
IV.3.3. Objective tree – Exploration of Operational Judgments

This is the exact opposite of the *problem tree*. When we define a problem tree, we are looking for obstacles; when we move to considering objectives, we consider possible solutions. The development of the *objective trees* consisted in searching for solutions to the problems explained before. Likewise, the problem tree, each objective tree will have a main objective and the rest of objectives will be developed in different hierarchies See the objective tress below.

- *Institutions and Commissions*: the institutions are working independently on the territory and therefore their actions over the territory lack coherence and a strategic monitoring. Thus, the objective tree developed as appears below.



- *Participation:* the unsuitable participation process is due to inadequate stakeholder identification and the low levels of participation. The *objective tree* is below.

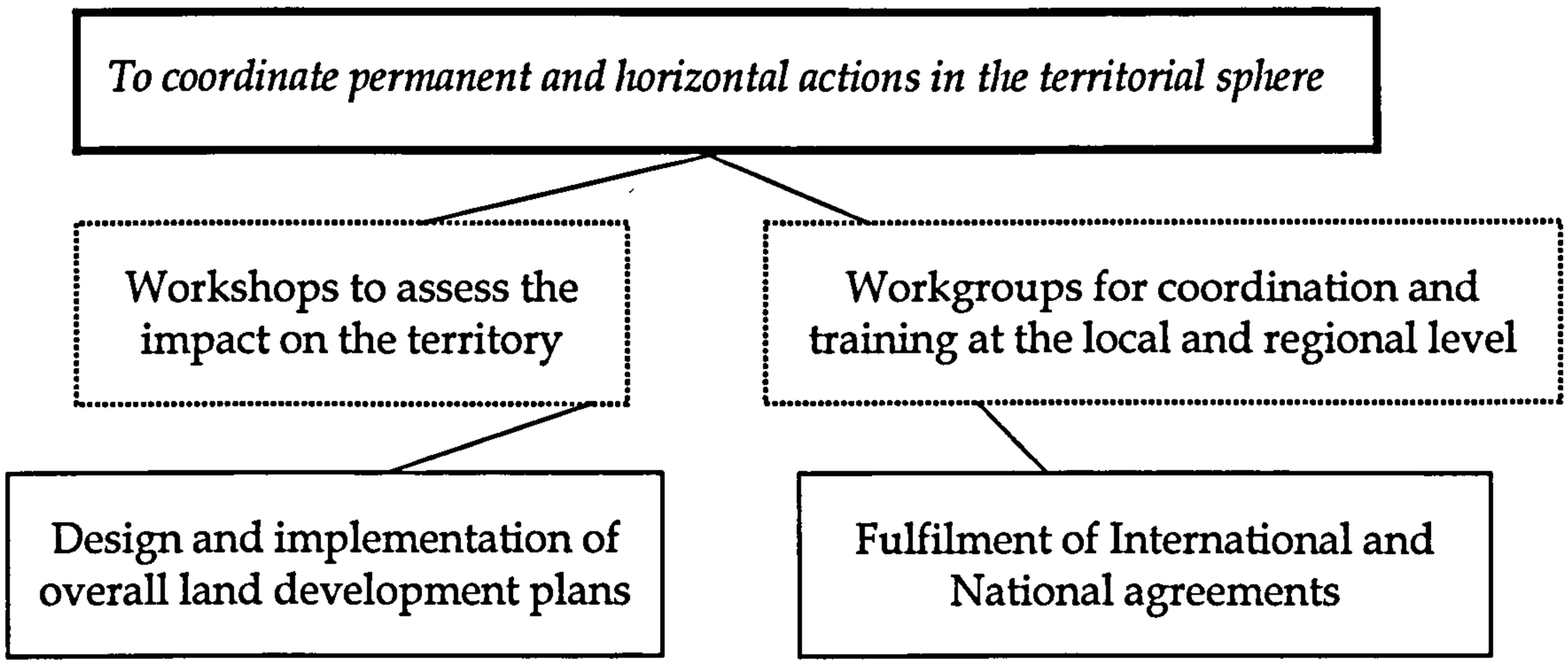


The definition of problems led us naturally into the exploration of a decision-tree and the options for resolving them.

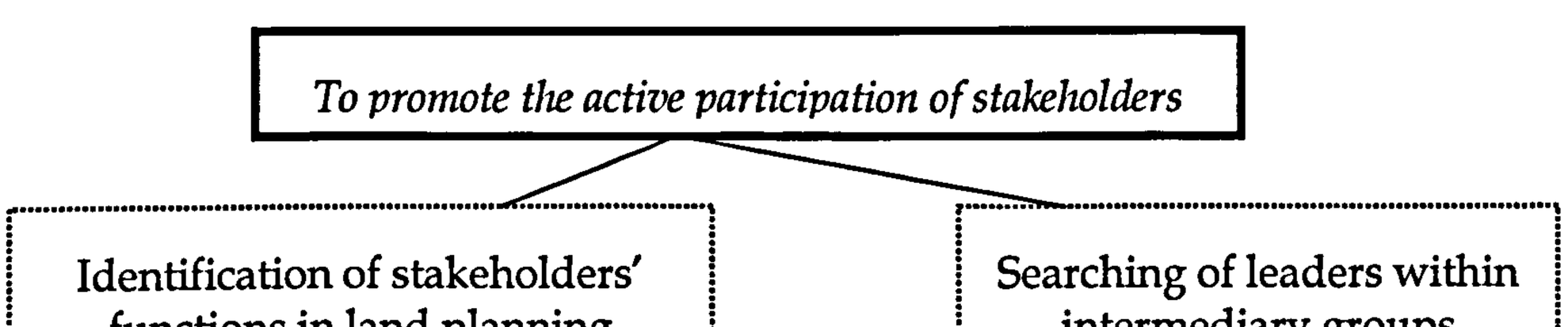
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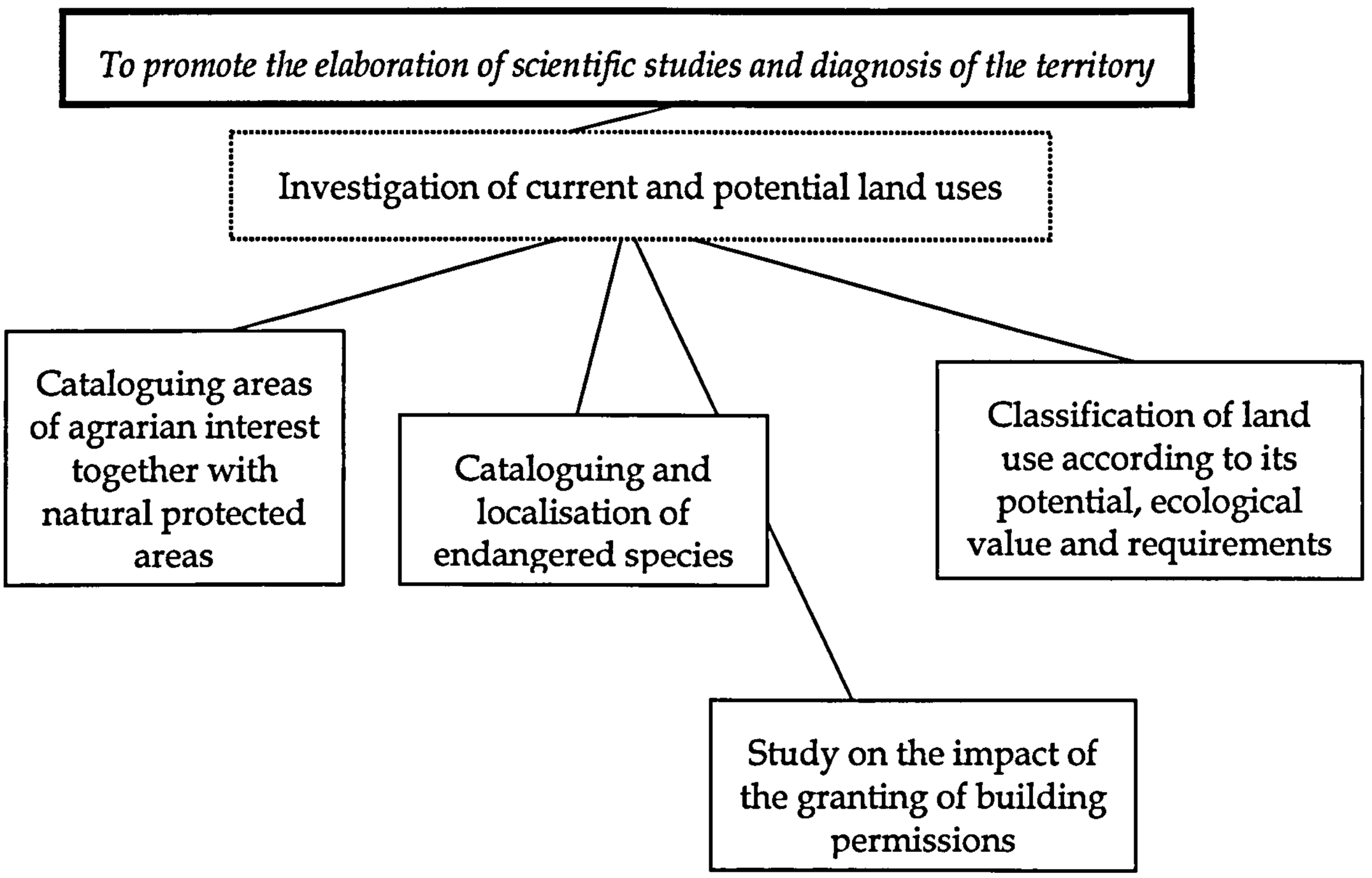
- *Institutions and Commissions*: the institutions are working independently on the territory and therefore their actions over the territory lack coherence and a strategic monitoring. Thus, the objective tree developed as appears below.



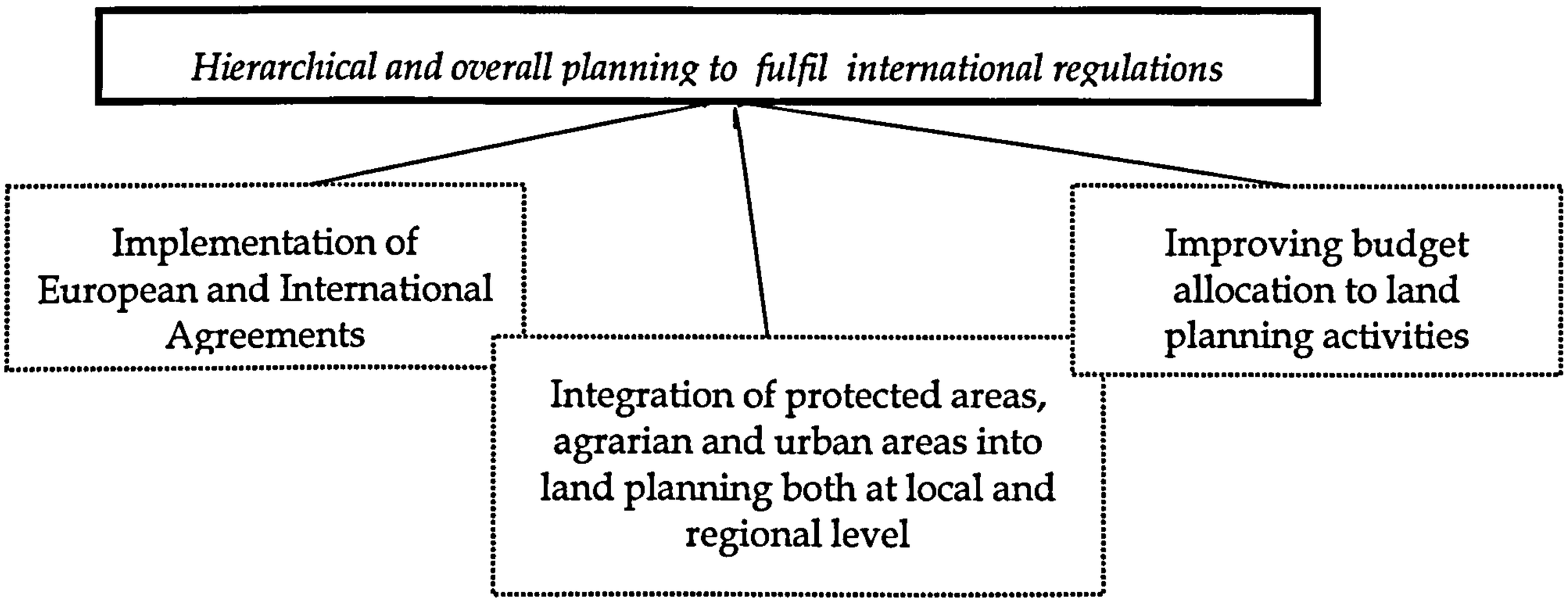
- *Participation:* the unsuitable participation process is due to inadequate stakeholder identification and the low levels of participation. The *objective tree* is below.



- *Scientific Information and Accessibility:* the non-existence of reliable scientific information from the social, environmental and economical points of view developed the following *objective tree*.



- *Land Planning and Management Tools.* The inefficiency to implement land planning tools as well as the incomplete fulfilment of international criteria developed the *objective tree* shown below.



VI.3.4. Analysis of Alternatives: Operational Judgments?

The following figures (Figures VI.6, VI.7, VI.8 and VI.9) show the potential roles of stakeholders and the functions they would have to undertake in order to reach the objectives of an overall land planning strategy. This is the last step of the Logical Framework Approach, which provides the issues to discuss with the stakeholder during the second set of interviews.

Figure VI.6. Set 1: Functions of Institutions and Commissions

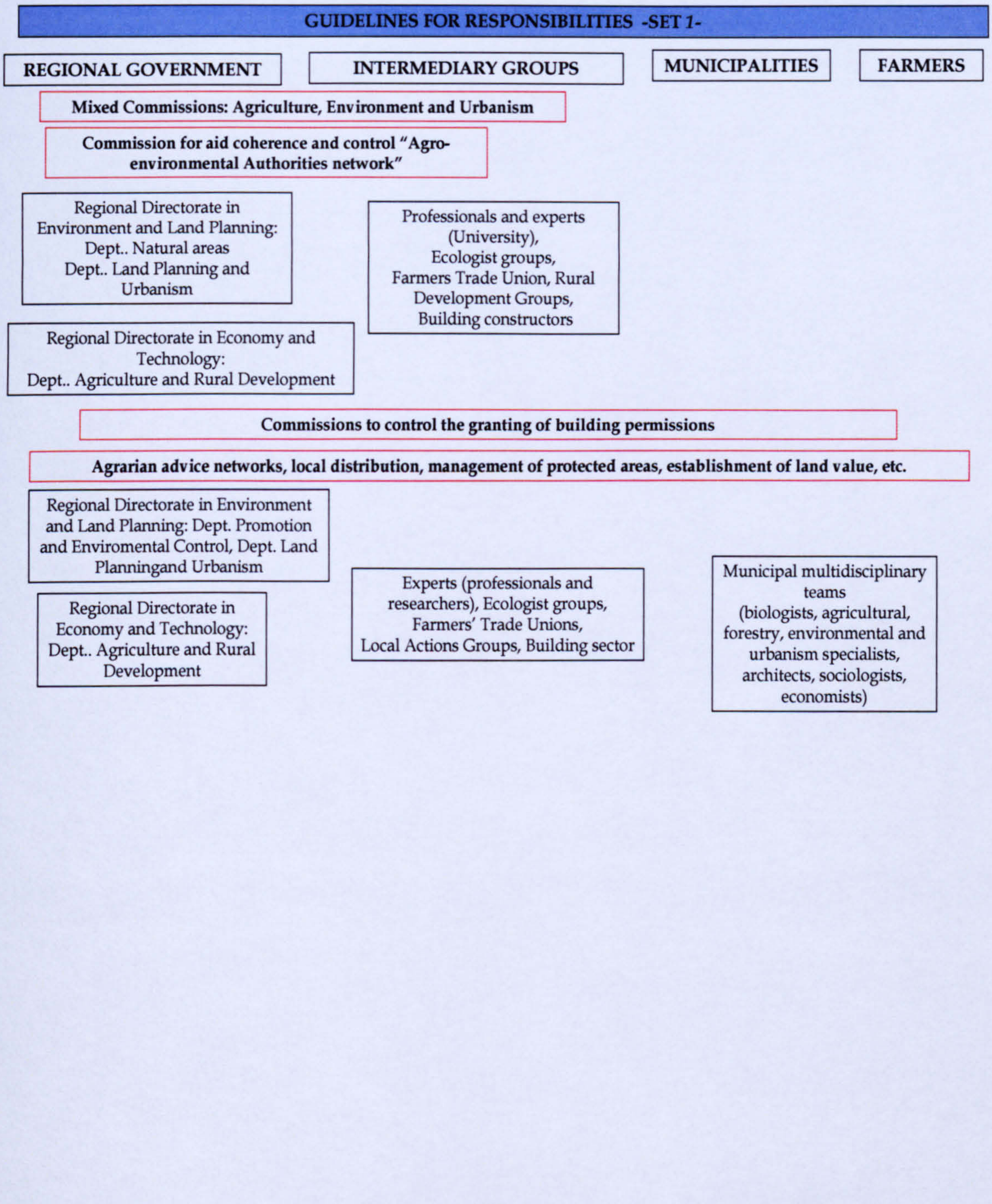


Figure VI.7. Set 2: Participation

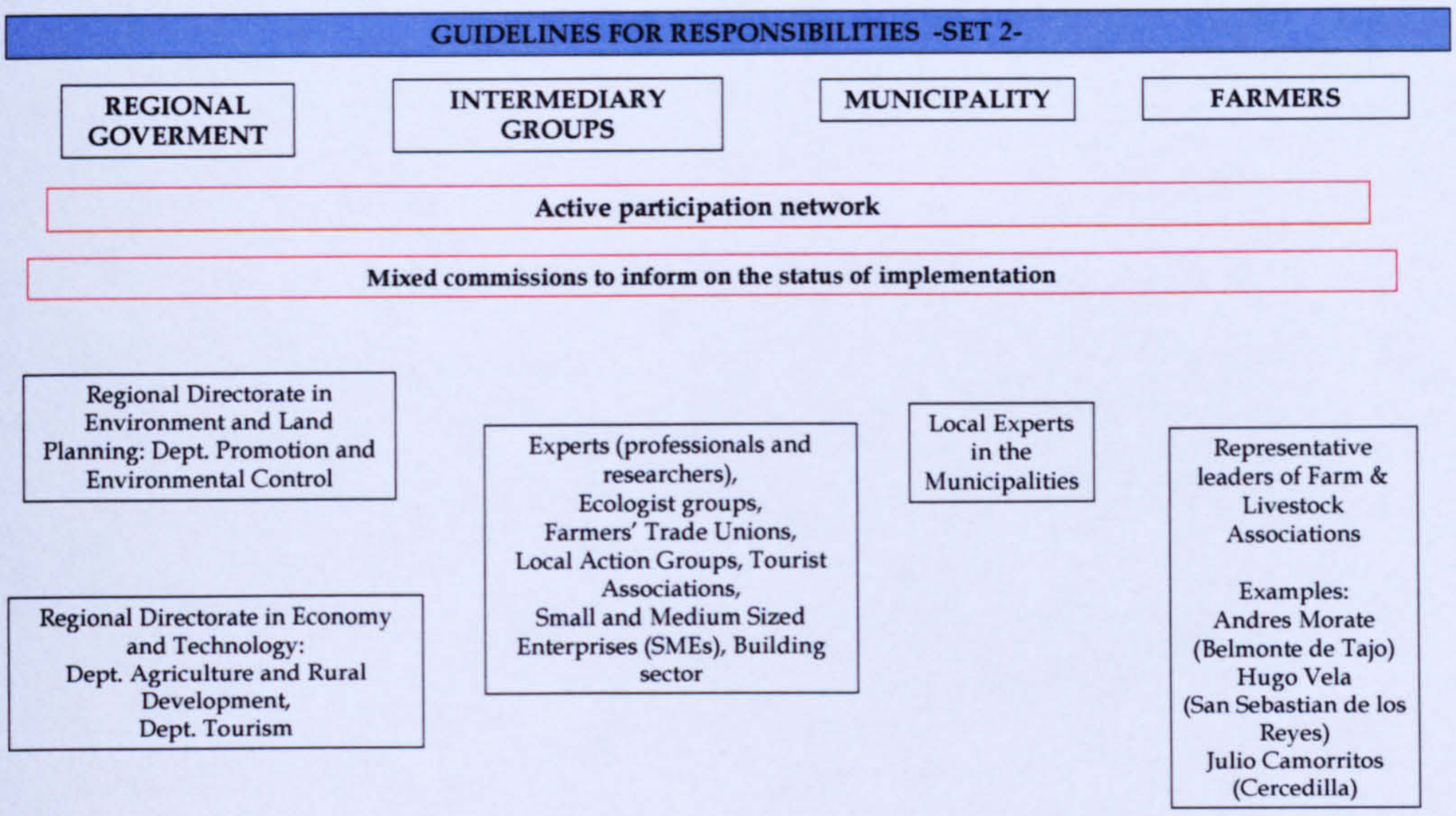


Figure VI.8. Set 3: Absence of Scientific Information and Public Accessibility

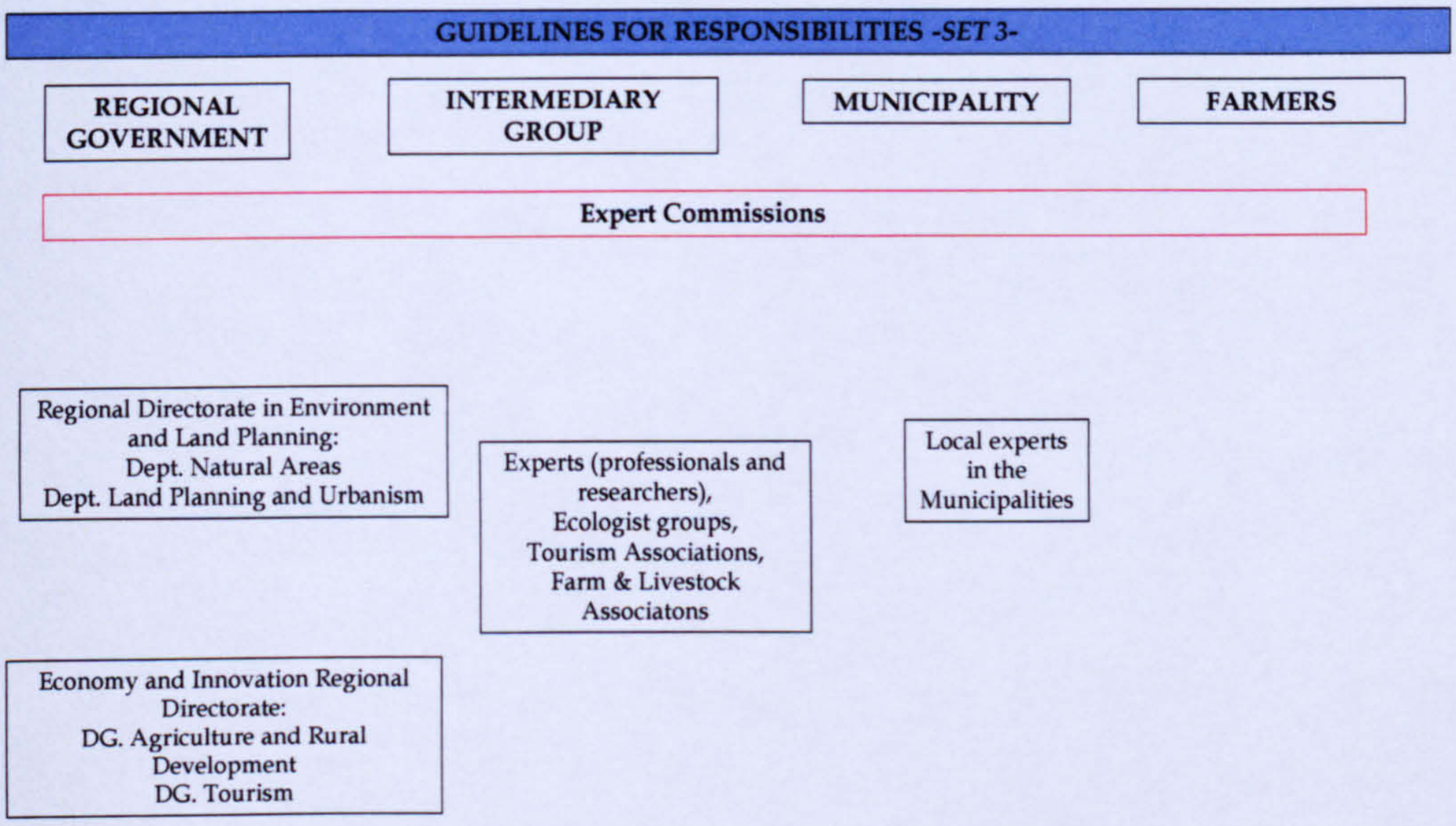
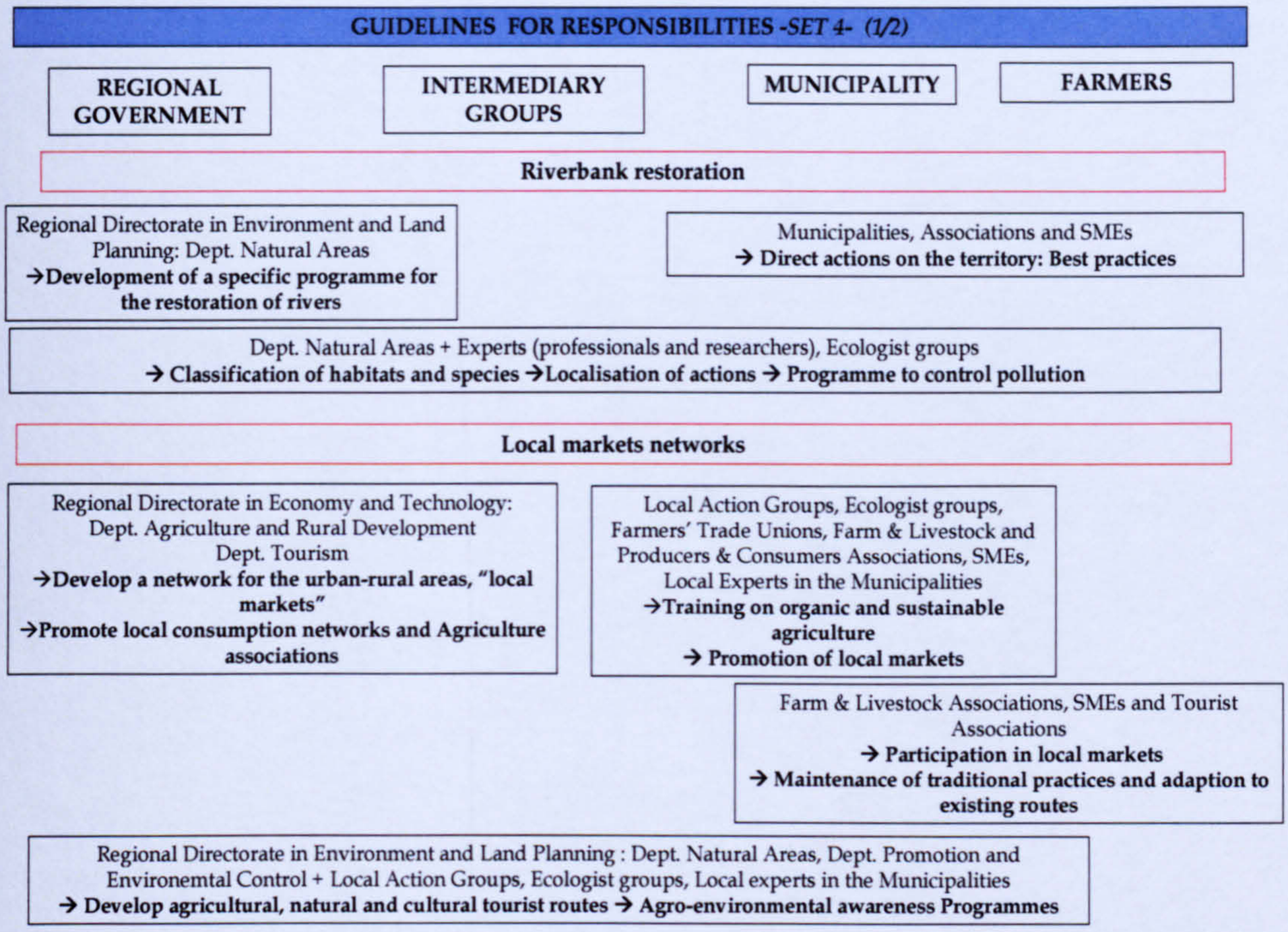


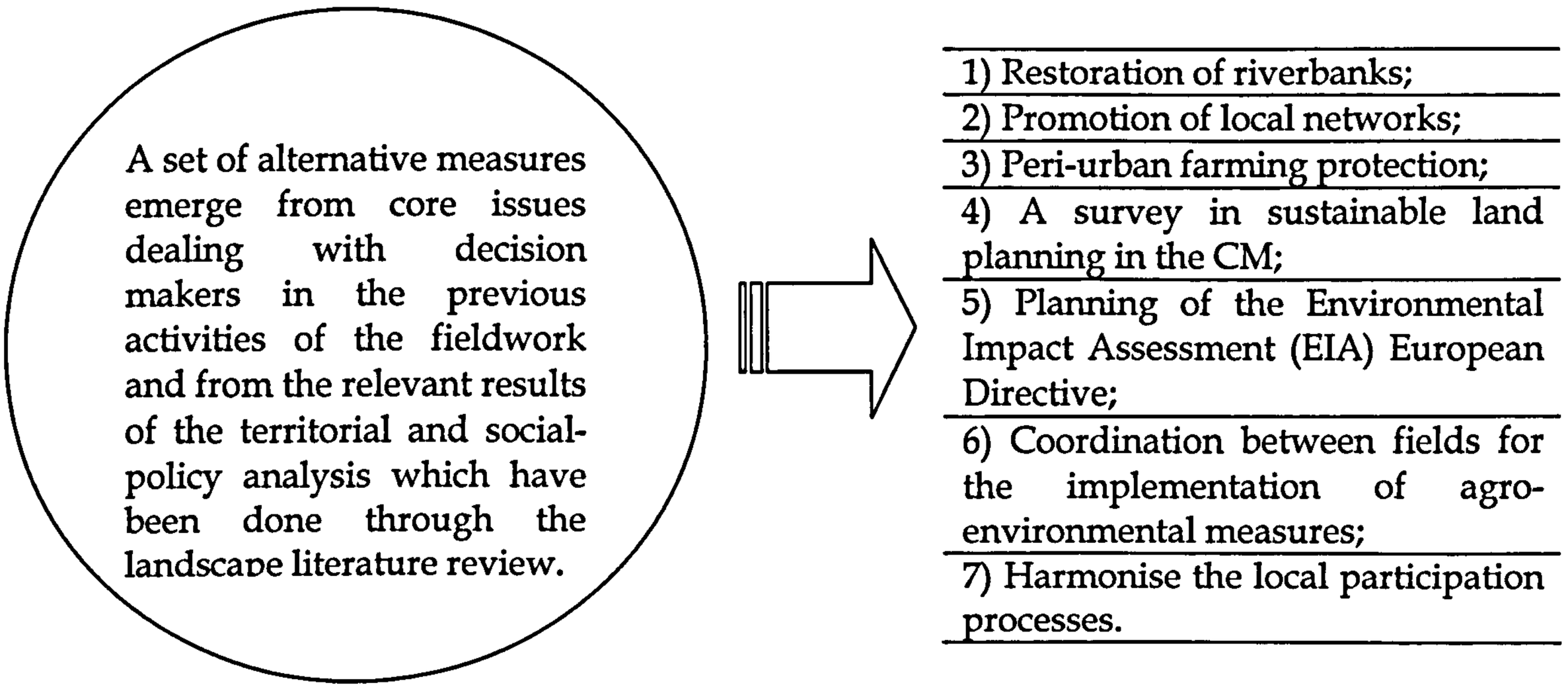
Figure VI.9. Set 4: Land Planning and Management Tools



VI.3.5. Moving beyond the Logical Framework Approach

The LFA highlights issues that seem to suggest landscape diversification as a core issue which must be followed up with further fieldwork. However, these results need to be checked with stakeholders as a guarantee that the writer has drawn conclusions they would endorse. With this in mind, the aim of the next activities of this stage of fieldwork was to find out how the different stakeholders *'were'*, *'are'* or *'would be'* involved in land planning which redefined the actions to take. The stakeholders in land planning have contributed to land use changes and have participated in decision-making in different ways. During the literature review undertaken separately from the fieldwork, the geographical and temporal land use changes as well as the implemented policies had been analysed in the region of Madrid since the 1980's. The information available at municipal level allowed the extension of the analysis back to as early as the 1950's. The figure below (Figure VI.10) collects the emergent measures which provide the basis of the set of policy interventions discuss further in the text.

Figure VI.10. Set of alternative measures



VI.4. DISCUSSION OF POSSIBLE POLICY INTERVENTIONS (OPERATIONAL JUDGMENTS) WITH STAKEHOLDERS - STAGE 2 OF FIELDWORK (SPRING 2005)

The writer re-visited the different stakeholder communities to discuss the possible impact of these seven interventions (see above) on the different levels of the decision-making system. Since our aim was consensus building, it was important to promote an on-going assessment of decision-makers' views carried out through the techniques of discussion and participation observation process. The techniques used consisted in the participatory processes in environmental and planning problems in the Canary Islands (Hernández J.P. 2004) and stakeholders' involvement in European integrative projects (Winder 2005b). The following process was carried out to validate if every interviewee agreed upon the map of stakeholders and the policy interventions proposed for the multi-level decision-making system.

The writer re-visited stakeholders to gather information on the following questions:

- What are the expectations for each of the seven initiatives? (Would they veto?)
- Previous opinions about the alternative initiatives (in favour/against)
- What benefits could they obtain from them? (direct benefits or externalities)
- What kind of resources could they devote to the initiative? (at what cost?)
- What conflict of interests could the initiative create? (negative externalities)
- What sorts of links did the stakeholders recognise between initiatives?
- Given the list of possible initiatives; Had we missed any important stakeholders?

Each session required an intensive explanation of the policy interventions and the multi-level decision makers involved in sustainable land planning. The trust the writer had already built up with stakeholders was particularly valuable here because stakeholders were willing to listen patiently and ask probing questions. The writer wanted to win the hearts and minds of the stakeholders by giving them enough opportunities to discuss what, at this stage, were very tentative suggestions that they could endorse or veto without difficulty. The cost and benefit had to be managed and we wanted to look carefully at the externalities, which do not affect the stakeholders directly. Table VI.11 presents an example extracted from the notes taken during the fieldwork.

Table VI.11. Discussion process with all stakeholders about the implementation of each one of the seven policy interventions (for instance *Peri-urban farming protection*).

Questions / *List of Stakeholders*	*Interest (In Favour/ Against) (Veto)*	*Cost*	*Benefit*	*Externalities*	*Links with other Stakeholders*
Representative of the EU	In favour	To the National, regional and local governments	Quality of life	Avoid the abandonment of farming	National Government
National Government- Ministry of Agriculture and Ministry of Environment	In favour	Elaboration and implementation of the Plan	Farming green belts in urban areas	Maintenance of local production and leisure routes in the urban areas	Regional Government
Regional Government (Political representative)	Against Veto	Loss of land for urban demand	??	??	Mayors in Local municipalities
Department of Agriculture and Rural Development	In favour	Another planning and management tool	Farming belts connected in the territory	Maintenance of traditional farming and improvement of the local market	Mayors, Farming Associations, Local Development Groups, Trade Unions
...	...	...	...	...	...
Ecologist Groups	In favour	??	No urban land	Conservation of Biodiversity	Local associations
Architecture Consultants	Against Veto	Loss of potential urban land	??	Improvement of secondary roads	Planners in Urbanism Dept. and Mayors
...	...	...	...	...	...
Municipalities	In favour / Against - Veto	Loss of urban land to attract population	Attractive areas in towns	Maintenance of local production and leisure routes	Regional government

Source: Own notes from the fieldwork

These were generally friendly, but very business-like meetings. Clear questions were asked, like *"would you support or veto this action?"* and consequently, very clear expressions of opinion were made. The arguments were focused on the stakeholders' conflicts, which break the flows of information among the stakeholders in the multi-layered decision-making system. This was the stage in my fieldwork where the executive stakeholders participated most effectively. For instance, the planners of the different Departments in the Regional Directorate remained diplomatic, merely pointing out that *"the influence that the building constructors companies have over landowners' decisions cannot be forgotten"*. Each took positions on the policy interventions proposed and contributed strongly to the development of an effective planning network.

All the stakeholders consulted believed that building construction companies were the biggest landowners in Madrid, an opinion endorsed by a newspaper article in El Mundo at about the same time[1]. However, their absence from this work was striking. They were naturally invited to participate, but chose not to do so. These companies also have control over the Municipal Land Planning Guidelines (*Plan General de Ordenación Urbanística -PGOU*) in Madrid, especially in the lower budget municipalities. Developers commonly lobby Mayors to win concessions on future planning schemes before the planning zones are fixed, so the level of regulation is often minimal.

Belmonte de Tajo Council is actually elaborating its land planning schemes at the present moment. Although the writer hoped the building constructors (the main economic actor) would be involved in the last stage of fieldwork, the writer was unable to persuade them to become involved at this stage. However, it is clear that developers see they have little to gain from effective, open participation in the planning process.

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[1] El Mundo Newspaper: Who is the land reclassified for? - 29th of April 2005. Urban Planning Department in Architecture University of Madrid (UAM)

As a result of this second stage of fieldwork in which the number of stakeholders consulted increased, the writer obtained a much richer list of potential stakeholders.

Table VI.12. A revised and updated list of Stakeholders[2]

Local level
*Organic farmers in *Cercedilla, Belmonte de Tajo* and *San Sebastián de los Reyes;* *Small and medium sized enterprises (SME): organic wine producers *"bodega"*, organic nursery garden, organic dairy products shop and rural hostel. *Organic and conventional cooperative livestock farms in *Cercedilla;* * *Cercedilla's* Councillors for environmental and urbanism issues; **Cercedilla's* and *Belmonte de Tajo*'s Mayors.
Intermediary Level (Linking local and regional level, i.e. Comarcal level)
*Farmers' trade unions: *COAG* and *Plataforma Rural;* *The Regional Committee of Organic Farming -*CAECM;* *The Organic Farming Association –*APRECO* and *"Bajo el Asfalto esta la Huerta"* – *BAH* a consumer and producer association; *Ecologist groups: *Ecologistas en accion* and *Amigos de la Tierra.* *Local and rural development groups: *MISECAM* and *Cercedilla*'s town council (both ADL) and, *ARACOVE* and *ADESGAM* (both GAL); **CIMAS* a non governmental organization in Local Agenda 21; *Professionals from the Forestry and Agronomy School in the Polytechnic University of Madrid; *Architecture Studio on Urban Planning in the CM; *Local building constructor company *(Thought, there weren't successfully contact yet)*
Regional Level
*Technicians and Planners in the Tourism Dept. and in the Agriculture and Rural Development Dept. within the Regional Directorate in Economy and Innovation; *Technicians and Planners in the Natural Areas Dept., the Environmental Promotion and Control Dept., the Urbanism and Regional Planning Dept. within the Regional Directorate in Environment and Land Planning; *Managers of the Site of Communitarian Interest (SCIs) *"Curso Medio del Rio Jarama"* in *San Sebastián de los Reyes* and *"Curso Alto del Rio Guadarrama"*in *Cercedilla.*
National Level
*Workshop in organic farming development plans and the future programme on rural development held by the Ministry of Agriculture, Fisheries and Food; *Workshop on regional agriculture and environment issues held by the Directorate of Biodiversity within the Ministry of Environment.
European Level
* Representative of the European Commission (FP6)

[2] See the former list of stakeholders from the earlier fieldwork (Table VI.2: pp. 145)

VI.5. THE THIRD STAGE OF FIELDWORK (WINTER 2005/ 2006): EVALUATING THE OPERATIONAL JUDGMENTS

It was decided to move from this consensus to a more concrete set of proposals by preparing a booklet that listed the policy options explored above, revised in the light of feedback from stakeholders. The TiGrESS-Madrid case study group (Universidad Europea de Madrid and University of Newcastle) wrote a booklet that summarised the stakeholders' agreement on the policy interventions. The writer used this booklet as a research tool aiming to involve the executive stakeholders in the land planning process, both at local and regional levels to build a participatory planning tool.

An overview of its structure provides an introduction to the current situation, the proposals and the expected responsibilities of the stakeholders involved. Seventy-five copies of this booklet in Spanish *"Hacia una planificación territorial sostenible en la Comunidad de Madrid: Directrices y Recomendaciones"* and in the English version "Towards Sustainable Land Planning in the Autonomous Community of Madrid: Guidelines and Recommendations" were published in autumn, 2005. The booklet was distributed to the executive stakeholders - planners, farmers and politicians in land planning processes, to inform them about the impact on land use changes in the region of Madrid. Since April 2005, the current regional legislation (Land Law 9/2001) is destined to disappear because of expected changes - "A proposal of modification to the current Land Law" (Law 2/2005). Consequently, the stakeholder engagement process applied in the land planning decision-making system provided a unique chance to influence the regional planning processes over the future land planning schemes and guidelines to be applied in the region of Madrid to tackle the deficiencies in participatory processes.

This cascade of results led to the next section of fieldwork - *discussion groups* - which led subsequently to the modelling exercise in further research (Chapter VII). *Focus or Discussion groups* are another participatory planning technique within the qualitative methods for establishing vital links which encompass local and regional levels of government (Pretty 2003). There were established among stakeholders to facilitate a discussion process based on the guidelines in the booklet. The following seven policy

interventions derived from the set of alternative and emergent measures presented in the Figure VI.10 (pp.171) or also known as *operational judgments* for more sustainable land planning are:

1. *Protection of traditional farmland,*
2. *Support for the development of agro-ecology,*
3. *Promotion of local markets,*
4. *Recuperation of riverbanks,*
5. *Improvement of access, availability and quality of environmental information,*
6. *Coordination between environment, agriculture and planning fields,*
7. *Promotion of participation processes.*

The activity of discussion with the stakeholders, as Healey (1997a) explains, required us to shift from a risky confrontational attitude to a new phase of negotiation, defusing the potential confrontation to create an accurate participatory planning process. The *focus groups* allowed the elicitation of the stakeholders' opinions about the alternative policy options, which later provided the future scenarios required for new sustainable land planning guidelines.

The writer aimed for the widest possible engagement of stakeholders. The circumstances in which this work was undertaken were difficult. The regulations were being modified in the current political time-horizon and this created some political controversy. However, although the stakeholder engagement exercise had been successful, failure at this last, sensitive, stage was a genuine risk. Examples of unsuccessful stakeholder exercises included the Regional Strategy of Territorial Planning - PRET (Madrid Regional Government 1996) and the MADRID 21 (Madrid Regional Government 1993) which focused on the implementation of the Local Agenda 21 at regional level. Both belonged to the last Socialist period in the region. Indeed, this trial of collaboration between levels of governance was based on the *Influence Diagram* extracted from the whole process of fieldwork concerning how the decision-making system works and where the blurred boundaries of the negotiation process lie. The *Influence Diagrams* are used in decision-making analysis and they are a simple representation of a decision problem (Open University 2005; Winder 2005b *pers. comm.* 2005b). See Figure VI.11. below. In this final exercise, the writer divided

stakeholders into four spatial levels: local, intermediary, regional and national levels. See the following Table VI.13.

Table VI.13. The definitive list of Stakeholders and their implication in the current regional land planning [3]

Local level

Belmonte de Tajo: A vineyard organic farmer; the organic wine *"bodega"* and the Tourism Association (Small and Medium enterprises - SMEs); the Local Development Agent (ADL) and the Mayor of the municipality.	*Cercedilla:* A livestock farmer; the dairy organic producer as a SME; Livestock Cooperative; the environmentalist Local Development Agent and the Mayor of the municipality.	*San Sebastián de los Reyes:* A horticultural farmer and owner of a SME- Nursery Garden; *"El Soto"* Ecologist Group.

Intermediary level

Comarcas: Technicians of the rural development group *ARACOVE* in the *Comarca de "Las Vegas"*; Technicians of the rural development group *ADESGAM* in the *Comarca de "La Sierra de Guadarrama"*	*The whole region:* *APRECO*, the Organic Farming Association in Madrid and *CAECM*, the Organic Farming Committee of the Community of Madrid; *San Yago*, the Biodynamic Farming Association; *BAH –Bajo el Asfalto esta la Huerta*, a cooperative of producers and consumers; Building sector, studios of architecture and building constructors; Ecologist groups such as *"Ecologistas en Accion - Madrid"*, *"ADENA-WWF-Spain"*; Experts (professionals and researchers on Local Agenda 21, environmental issues and rural planning through Foundations, Institutes and the Polytechnic University of Madrid).

Regional level

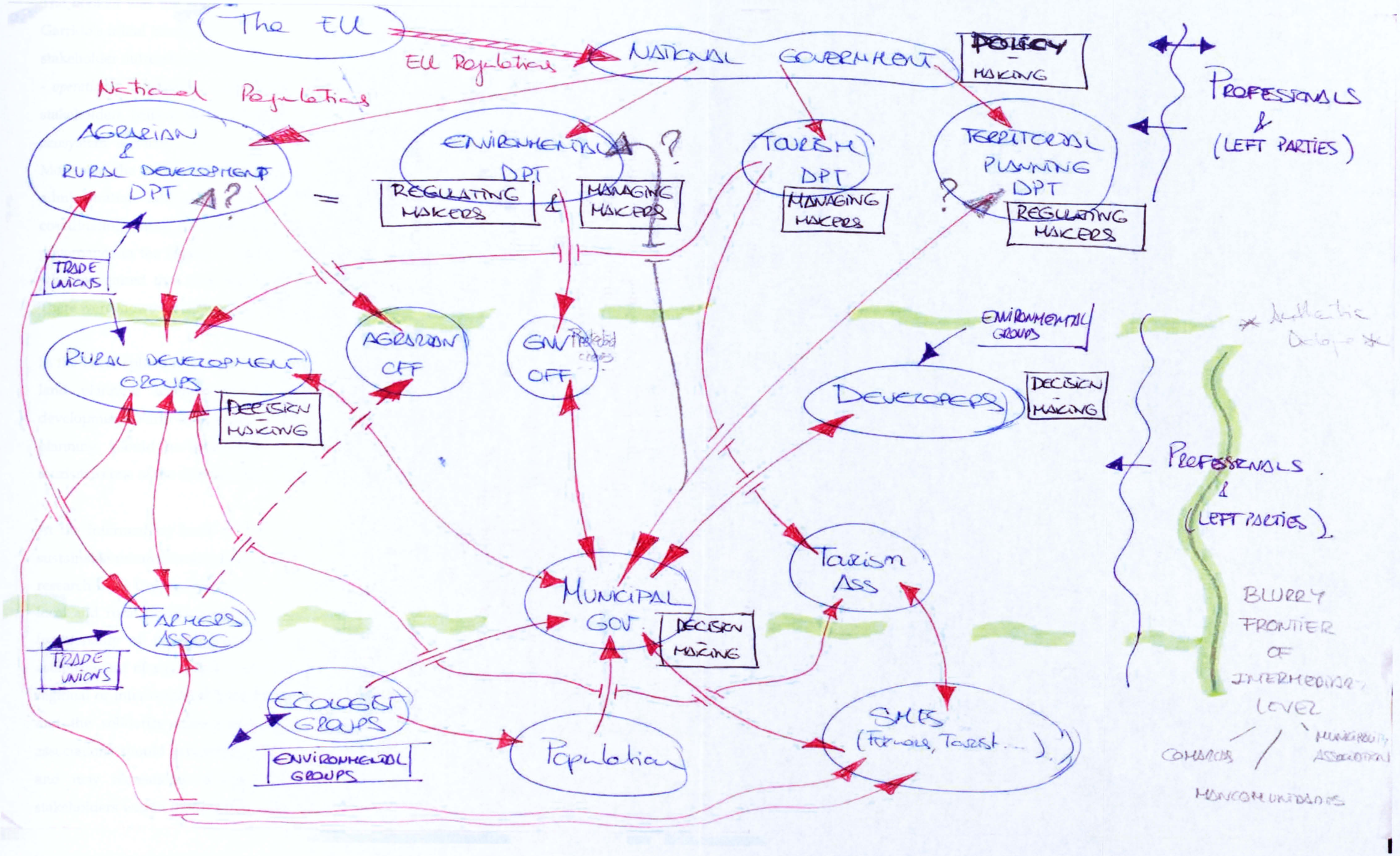
Regional Directorate in Environment and Land Planning: Department of Land Planning and Urbanism; Department of Natural Areas; Department of Promotion and Environmental Control.	*Regional Directorate in Economy and Technology:* Department of Farming&Rural Development; Rural Planning and Development & Organic Farming Sections; Department of Tourism.

National level

Ministry of Environment: Directorate of Biodiversity; Directorate of Water issues.	*Ministry of Agriculture, Food and Fisheries:* Directorate of Rural Development; Directorate of Food.	*National sphere:* Farmers' trade unions: *"Plataforma Rural"* and *"COAG"*; Ecologist groups such as *"ADENA-WWF-Spain"*; Experts (researchers from the Spanish Observatory of Sustainability and EUROPARC).

[3] See the sequence of stakeholders involved from the second stage (Table VI.12: pp. 175)

Figure VI.11 The Influence Diagram



VI.6. THE BOOKLET[4] – A RESEARCH TOOL

The booklet was the main public outcome of TiGrESS-Madrid case study. After Dr Garrido's initial involvement (see pp. 136), the writer took over responsibility for the stakeholder outreach exercises that formed the basis of this booklet. The policy options - *operational judgments* – were based on the possible roles that the wide range of stakeholders believe they can play in generating and sustaining socially valuable ecosystem services, such as recreational, conservational, educational and so on. Moreover, the policy-makers such as government agencies, municipalities, regional administration and other concerned stakeholders, should create incentives for coordinating these associations horizontally and with other levels of vertical governance in the region. In general, the booklet was well received by stakeholders who recognised that they had been influential in shaping these potential policies. There were, however, specific comments made by stakeholders at different levels.

In the Local sphere it was said that the implementation of the compulsory municipal land planning schemes requires us to re-think territorial management and development. Farm and livestock land, which used to struggle with new land planning, should be maintained. The SME businesses that encourage ecological tourism as one of the strategic aims of the Local Agenda 21 must be promoted.

At the Intermediary level, it was observed that the responsibility for controlling a sustainable urban planning policy lies with the building construction companies. The research from Universities and research institutes will support these companies. The local and rural development groups and farmer trade unions will push the multi-functionality of farming land with the new rural development, as well as the establishment of supra-municipal links. These links would exist either at the inter-regional or inter-comarcal level and would facilitate the management of the territory and the solidarity among municipalities. Meanwhile, the ecologist groups and associations should promote agro-environmental awareness, good farming practices and new recreational activities (such as eco-tourism and agro-ecology). The stakeholders within the Intermediary level represent an arena with blurry boundaries

[4] See Appendix 3

and connections to the upper and lower levels. The lack of an inter-municipal mechanism, which links these different local, comarcal and regional spheres, could be worked out with the implementation of a participatory planning network. This network would be formed by mixed committees of local and external stakeholders and would be managed by an intermediary committee to tackle the gap between the development and implementation of land planning schemes at the different levels. As well as the Intermediary level which does not represent an intermediary institution, the *comarcas* are an administrative figure within the region; they gather a group of nearby municipalities with similar geographical and agricultural characteristics, in which there is a main town with the main services for all the area, called 'head of the comarca' *('cabeza de comarca'* in Spanish)

In the Regional sphere it was emphasised that the Natura 2000 network should represent the chance to solve the delay in implementing norms and management plans in the Natural Protected Areas. The promotion of eco-tourist activities, educational programmes, local farming and the native varieties in the rural areas should be a complement to the implementation of this network. The different Departments involved such as Agriculture, Environment, and Land Planning would coordinate these tasks. The regional Land Law as well as the Natura 2000 network are currently issues of special importance. Thus, the process of participation to undertake this reform should imply coordination among the fields already mentioned. The plans for monitoring the municipal land planning schemes will also be taking into account in the said law. Achieving a satisfactory implementation will depend on the stakeholder involvement.

At the National level, the government has relatively little impact on regional land planning. However, the promotion of policies, which consider the multi-functionality of farming land, could have a knock-on effect by encouraging levels below to take account of these factors.

At European level, there is an urgent need to encourage the application of the Sustainable Development Strategy (SDS) through national and regional policies. Compliance and convergence with EU legislation is poor and more effective vertical

communication will be necessary to shift the balance from a purely commercial, to a sustainable, multi-sectorial approach.

VI.7. FUTURE SCENARIOS AGREED THROUGH STAKEHOLDER CONSULTATION

Although the proposed policy interventions seem reasonable, their implications in the natural and social environment cannot be estimated without further research. The issues, which arose during the stakeholder engagement, concerning *Institutions & Committees and Participation* (pp. 160), have been successfully dealt with throughout this process. However, the lack of *Scientific information & accessibility* and *Land planning & management tools* (pp. 160) need a substantial effort of scientific research. For that reason, the writer, as part of the TiGrESS-Madrid case study, lead by Nick Winder – Principal Investigator of TiGrESS (University of Newcastle) and Ascen Encinas and Carlos Hernandez (Universidad Europea de Madrid) decided to build a simulation model that would model the decision-making system.

In the same way, the exercise initiated with the stakeholder engagement -a consensus process to bring together sometimes opposite and critical stakeholders' *value judgments*- that has just been conducted requires the development of the *operational judgments* (see Booklet in the Appendix 3). These will be the potential scenarios created by the implementation (or not) of the suggested policy interventions to recommend strategies for sustainable land planning. Therefore, the use of a modelling exercise to obtain approval and engage key stakeholders with the discussion of the potential constraints on future scenarios was essential. A predictive model based on land use changes will allow the design of the decision support tool (DST). Afterwards, the simulation of different scenarios would give enough information to search for the negotiation process, in the case of being interested in implementing any of these policies. This stage of the research did not involve the use of the model to explore how the policy options might influence land planning. However, a discussion of the effects of these policy interventions would give an opportunity to use the DST to ease access to the different stakeholders. The conceptual model developed in Chapter V was taken as starting position, and supplemented it with research on landscape ecology (Chapter IV and Chapter V; Encinas and Martinez 2006; Encinas and Hernandez 2006)

and social systems (see Chapter IV and Chapter VI). The stakeholder engagement process described above suggests potential policy initiatives that could be implemented in the region. All these results are combined into a simulation model which will be discussed in the next chapter (see Chapter VII).

CHAPTER VII

A DECISION SUPPORT TOOL (THE MADRID SIMULATION MODEL) AND THE ROLE OF THE FACILITATOR

VII.1. THE IMPACTS OF STAKEHOLDERS PREFERENCES

This chapter describes what the writer learned from the stakeholder engagement process and from the exploration of stakeholders' preferences through *focus* or *discussion groups* - as another technique of qualitative and participatory research- (also called *workshops*) using a simulation model. The role of the computer simulation is perhaps surprising. It not only serves as a device for predicting the likely outcome of policy actions suggested by stakeholders, but also serves an educational purpose (making stakeholder communities more aware of the complexity of the problems) and helps defuse potential conflict by shifting attention from other people to the simulated landscape and the material evidence.

This multi-facetted role (learning tool, decision-support tool and integrative facilitator) perfectly reflects what the writer has been trying to do in this doctoral dissertation. What really matters if the simulations are being used as a decision-support tool is the accuracy of the simulations to the real world. However, as an educational and integrative tool the situation is different. Here the purpose of the model is to explore people's understanding and the consequences of the best knowledge they can bring to bear on the discussion. The most striking characteristic of the simulation of complex systems is that it allows us to study the emergence of interesting and unexpected behaviours arising as a consequence of simple rules. The outcomes of the models are not always easy to work out without computer methods. In this context, Gell-Mann (1994) explained the need for defining the level of detail – also called 'coarse graining'- in which the system is described and where fine details can be ignored. This is an advanced stage of systems thinking theory, as well as the multi-scalar T-G theory (one of the approaches in which the TiGrESS project was based on), in which an individual

chooses the right level to observe the system and to solve the problem at hand. However, as we have seen, negotiating a consensus definition of 'the problem' is not a trivial task and the writer has used conceptual models, maps, data and simulation models to facilitate problem definition.

VII.2. RUNNING MODELLING EXPERIMENTS

Stakeholders need to understand the likely impact of the seven interventions (see Booklet in Appendix 3) developed as realistic policy options aimed at sustainable development and facilitating convergence in the region. The writer was in the good position of being assisted by the TiGrESS work, as it had substantial data, including GIS data about the region and about the effects of land use changes. A lot of information was gathered about legislation and the planning process and a coherent model of land-use had been developed, including a strategic understanding of land-use conflict in three zones across the region. All this research seemed to suggest the outline specification for an integrated decision support system that could be used by policy makers and other intermediary stakeholders in order to explore the policy options as a series of simulated 'what if?' scenarios that could be explored using a time-geographical simulation.

RIKS (one of the members of the TiGrESS research team) had considerable experience of building such models using a cellular automaton system to represent the pixels on the map. Other members had been active in an earlier project (Modulus) that developed an integrated Decision Support System for Marina Baixa and the Argolid Plain (Oxley *et al.* 2004; McIntosh *et al.* 2005). Carlos Hernandez Medina (member of TiGrESS-Madrid case study), Inge Uljee and Maarten van der Meulen (members of TiGrESS-RIKS) agreed to co-ordinate the model development. The model was implemented in the METRONAMICA programming environment developed at RIKS at the end of the project. METRONAMICA can be used to construct dynamic land use models that can be integrated with Geographical Information Systems (GIS) data layers.

The Madrid simulation model (Hahn *et al.* 2006) was completed just before the project ended and has been used at the University of Newcastle and Universidad Europea de

Madrid to simulate all seven policy interventions across five distinct scenarios. The aim of this chapter is to describe the modelling environment; to introduce the scenarios; to illustrate them by presenting simulation output in the form of data and dynamic maps; and to show how these data and maps could be used in *discussion groups.*

VII.3. HOW THE SIMULATION ENVIRONMENT WORKS AND ITS IMPORTANCE TO EXPLORE FUTURE CHANGES

METRONAMICA is a decision support system built with the GEONAMICA® application framework. The METRONAMICA simulation environment (Hahn *et al.* 2006) calculates the transition probability for each cell and function at each simulation step. In the normal course of things, each cell will change to the land use function for which it has the highest potential, but less probable transformations are also possible. The transition probabilities determine the likely future pressures on the land. By providing a series of dynamic maps and summary data, the system can be used as a planning tool for those responsible for the design of sound spatial planning policies.

The 'transition probabilities' for each cell (a cell is a measurable piece of land) are determined by four factors that represent exogenously defined demands for land in each category. These factors are: *suitability* (for a given use), *zoning* (by planners), *accessibility* (particularly road networks) and *internal dynamics*. These do not represent all the factors that influence land use changes, but are the ones we have chosen for simulation. Other factors, such as land regulations, demographical trends, and the local and regional decision systems are handled as policy drivers – recognisable scenarios that can be incorporated into the system. There are actually five scenarios explored in this dissertation. The policy drivers are often understood as constraints to the system which frustrate certain types of land use by modifying transition probabilities at the local level. These include population growth, municipal land planning guidelines and the new organic farming market.

The scenarios are based on the territorial analysis and socio-political fieldwork - *reality* and *value judgments*; and respond to stakeholders' suggestions and needs. The writer naturally restricted these to interventions that appear socially and politically realistic

(i.e. represent the action of recognisable policy instruments defined in Chapter IV). Past and current implementation of policies was taken into account, as well as expected developments. There is a wide range of possible future scenarios, each of which is consistent with these circumstances. These scenarios will be explored with the assistance of a computerised model.

Finally, the writer used information about possible interventions, which, although not likely in the current political climate, appeared possible and desirable, at least from the perspective of some stakeholders. These *operational judgments*, which came up in the course of interviews, formed the basis of some scenarios. The aim of this modelling exercise is to provide a new source of information to town planners and decision makers at the different levels of governance. Many of these interventions were already known to them through the booklet "Towards Sustainable Land Planning in the Autonomous Community of Madrid: Guidelines and Recommendations" - *"Hacia una planificación sostenible en la Comunidad Autónoma de Madrid: Directrices y Recomendaciones"* (see Appendix 3), but no impact assessment had yet been undertaken. The simulation model aims to facilitate that assessment by providing information about the expected consequences of seven policy interventions. Consequently, this experience would help support decision-making on the development of Madrid region.

VII.4. MODELLING LAND-USE CHANGE

METRONAMICA can be used to explore and visualize land use change effects of different scenarios tried out for the three key dynamics in the region of Madrid. Each dynamic characterises a landscape pattern of the region: *Dynamic 1* is located in the East, the South-east and the Centre; *Dynamic* 2 typifies the geographical area of the North and the North-west; and *Dynamic 3* is situated in the South, the South-west and the South-east. The model consists of dynamic spatial models operating at two geographical scales: micro and macro-scale. The macro-scale sub-model represents general trends of land use change over long periods and static factors (like geology or geomorphology). The micro-scale sub-model determined the transition potential of the land, cell by cell and it is the micro-scale, which will come first in the chapter.

The Madrid region (CAM) covers a territory of approximately 8,000 square kilometres and six million inhabitants. This area is represented as a mosaic of equally-sized grid cells. All together, they constitute the land use pattern of the Madrid region. Land use in the CAM is classified in nine categories: *Forest unit & riverbanks, Urban, Shrubland, Pastures, Abandonment, Crops, Irrigated crops, Crop Mosaics - vineyards & olive trees, and Water.*

Each cell covers an area of four hectares and makes transitions annually. Micro-scale simulation considers environmental factors as well as interactions between neighbouring cells. The detailed allocation of activities and people within cells are modelled using cellular automata at the micro level. Each automaton represents a small territorial unit – a territorial cell. A mosaic of 199, 920 cells, each of four hectares, represented the area modelled. CAM covers an area around 120 by 150 kilometres, divided into cells of 200 by 200 metres. Some of the nine land use categories are modelled dynamically, although a few remain static in the model. Depending on their dynamic behaviour, cells are organised in the following three categories of land use: 'vacant', 'function' and 'feature' (Hahn *et al.* 2006)

- A 'vacant' land use is one for which the amount of cells in such state depends on the value of its transition potential. This will only change to another 'vacant' state if the transition potential for the other one is higher. i.e. *Abandonment.*
- A 'function' land use will change the number of cells required for that stage depending on which the macro-model determines. i.e. *Forest, Urban, Shrubland, Pastures, Crops, Irrigated crops* and *Crop Mosaics.*
- A 'feature' land use is a non-dynamic land use. They will not differ due to the changes of other land uses or dynamics in the model, although the occurence of a 'feature' land use would influence the location of the 'function' land uses, e.g. *Water.*

The model developers (Carlos Hernandez Medina, Inge Uljee and Maarten van der Meulen) specified the basic information used in the model and the algorithm that determines whether a piece of land (each cell) assumes a particular 'function' or is kept 'vacant'.

At the most fundamental level the model developers and the writer see change effected by sets of *cellular automata transition rules* that represent micro-level dynamics. These rules estimate the probability of change for each cell by examining its own and neighbouring land-uses. A set of rules determines the degree to which it is attracted to, or repelled by a given land use. The forces of 'attraction' or 'repulsion' between the different functions and features are established by a 'negotiation' between neighbouring cells. The rules are modified in a way that takes account of socio-economic and environmental factors and landscape suitability for a given use. This negotiation determines the interaction between the nine land use categories. These rules (the inertia, the attraction and repulsion forces, and certain economies of scale) were determined during model calibration.

The territory as a whole consists of all the cells simulated by automata. As land-use within each cell changes, so does the map formed by putting all these cells side by side. In this way, macro-scale dynamics are determined by the aggregate effects of the micro-scale rules, modified by the synergy between neighbouring cells. The output of this synergy can readily be represented using dynamic maps that contain all the cells.

If this were all METRONAMICA could do, there would have been a perfect 'bottom-up' model in which all macro-scale factors were deducible from micro-dynamics. However, METRONAMICA also allows the influencing of the system on a macro-scale using maps to represent scenarios and drivers. Macro-scale maps represent the top-down constraints; the cellular automata simulate bottom-up 'adaptive' behaviour. It is 'adaptive' because the cellular automata use transition *probabilities* not hard and fast rules and consult neighbouring cells before calculating transition potentials. Emerging patterns and innovations can occur if, and only if, the constraints permit the cells to explore new types of synergy on the micro-scale.

The following are important static maps. They capture many of the distinctive constraints on the decision process at micro-level. They can be used to explore a range of policy scenarios and their possible effects on a landscape populated by cellular automata whose behaviour, though responsive to those constraints, retains a measure of adaptive potential.

- *Suitability maps.* Suitability is represented in the model by one map per land use function. The term 'suitability' describes the ability of each cell to support a particular land use function. It is a composite measure, prepared using GIS on the basis of elevation, soil quality, slope, aspect, etc.
- *Zoning maps.* Zoning or institutional suitability, is based on guideline plans from the local, regional and national authorities which have taken into account ecological protected areas and buffer areas. Three periods of planning were established: 1982-1998, 1998-2002, 2002-2025 and they specify which cells can and cannot be assigned to a particular land use. Zoning is characterized by one map per land use function. There are four zoning states possible and these are discussed in the next section.
- *Accessibility maps.* The accessibility of each cell is calculated within the model relative to the infrastructure networks (roads) and river systems. It accounts for the distance from the cell to the nearest link on each infrastructure element or water resource. An appropriate transport system is very important for new urban developments and a hydrographical system for irrigated crops.

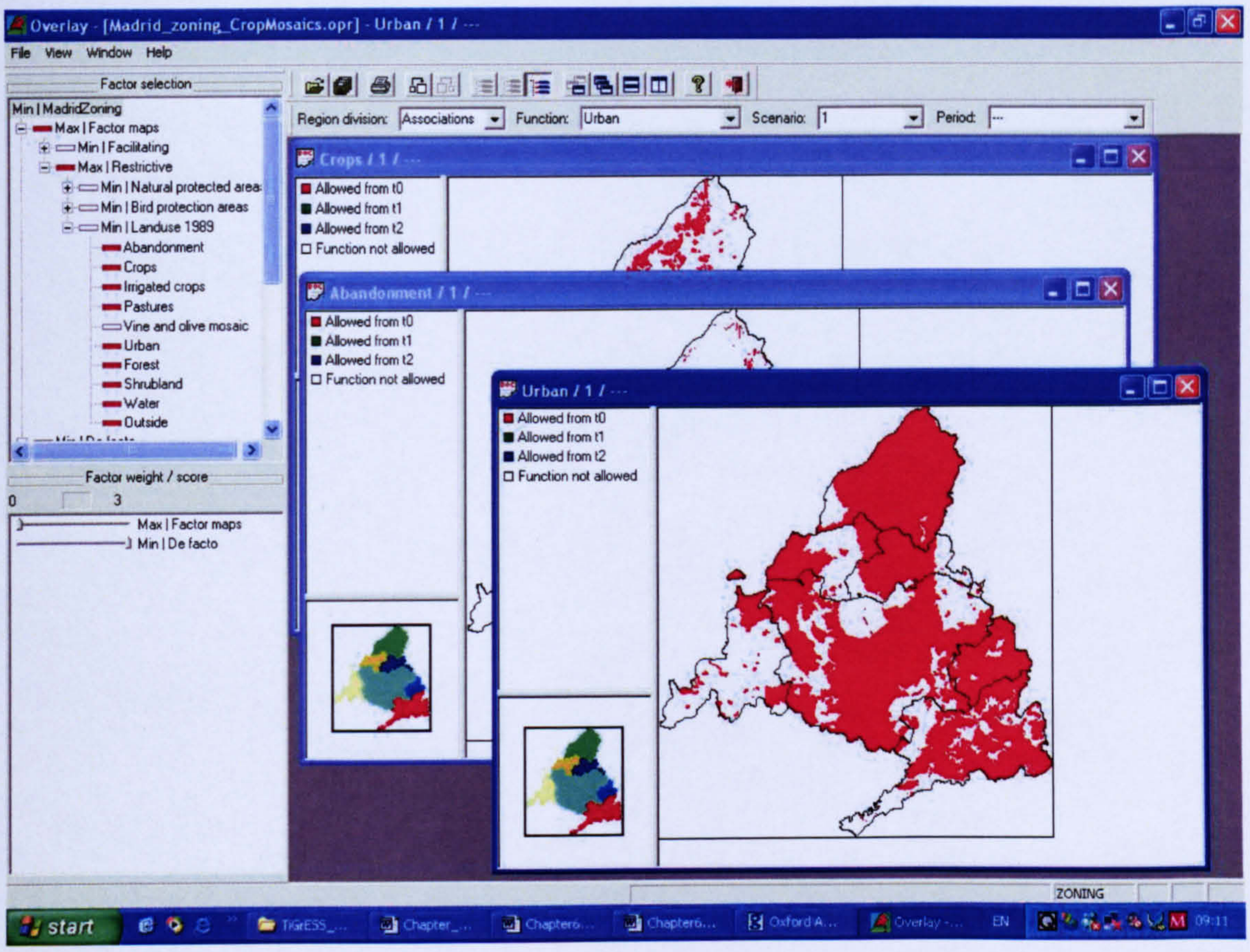
In general, *suitability maps* are static – the soil and geomorphology cannot change. However, both *accessibility* and *zoning maps* can be changed. It is possible to modify planning laws or to construct new roads, for example.

VII.5. CREATING THE SCENARIOS

This section describes the tools METRONAMICA provides for creating scenarios. Input maps (land use maps 1982, 1998 and 2002, *suitability maps* and *zoning maps*) were the work of the TiGrESS – Madrid case study team lead by Carlos Hernandez Medina. The RIKS team calibrated the model by fine-tuning the dynamics of individual cells. The OVERLAY Tool in METRONAMICA was used to prepare the *zoning maps* that represent macro-scale scenarios. These maps may be modified to produce certain types of macro-scale scenario. The tool enables the users (in this case, the writer) to select four zoning states possible for each cell of each land use function: the activity is present from the first period onwards (red box), if the activity is permitted from the second period (green box) or from the third period (blue box), and the activity is never allowed in the cell (white box). However, in this case only two zoning states were

needed, as the following screen caption shows (Figure VII.1). The *zoning maps*, understood as macro-constraints, are used to represent natural protected areas and restriction of land uses.

Figure VII.1. Screen capture, showing use of the OVERLAY Tool



GEONAMICA® is opened after these maps are created and both *zoning* and *suitability maps* are imported. GEONAMICA® allows me to modify rules that operate at the level of the individual cell. These rules are expressed in terms of distance functions that define the interaction between each pair of land uses among neighbouring cells. The micro-scale model is represented in the form of an 'influence table' (see the screen capture below – Figure VII.2) that displays the responses graphically. The interaction of land use categories is defined using a series of projections connected by linear interpolation shown in the graphic on the right-hand side. The distance between cells runs along the horizontal axis and the vertical axis displays the influence between the pair of land uses. For example, Figure VII.2 shows that Forest will not easily change into Urban land. However, as the distance between cells is growing, the effect changes

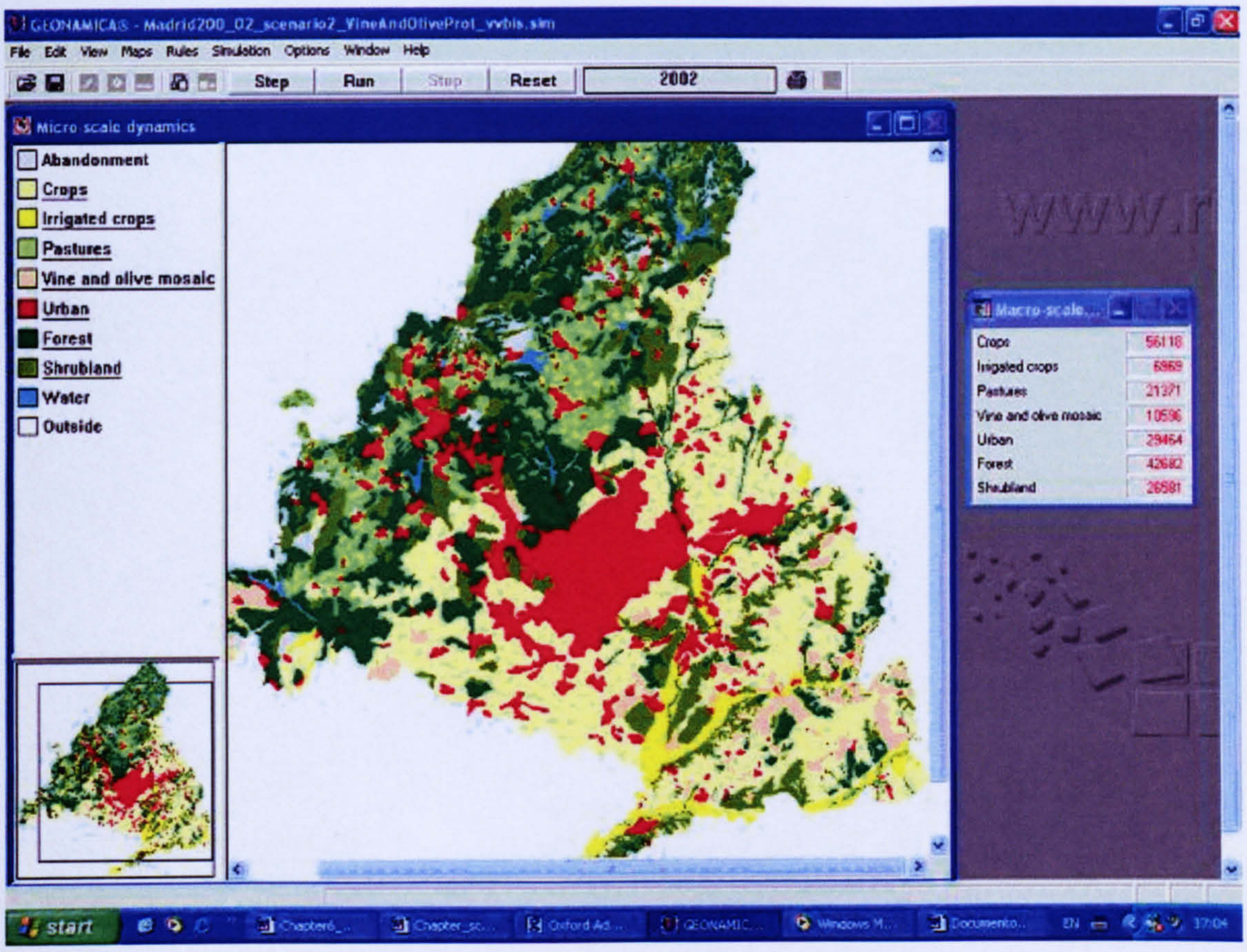
and has a slightly positive effect. This represents the attractiveness to residents in urban areas of nearby natural sites. If the distance is of two cells or more, the influence is nil.

Figure VII.2. Screen capture, showing the Influence Table in GEONAMICA®



The micro-scale and macro-scale dynamics windows are opened as soon as METRONAMICA starts. The macro-scale effects of all these micro-scale processes are visible in Figure VII.3. below, as the land use will change at each simulation step and the window will be updated. The map is updated dynamically to represent the aggregate effects of micro-scale dynamics and the resulting land uses are displayed in the map area which represents of the modelled region. However, the outputs of the macro-model are not directly visible, but are presented in a separate window as aggregate statistics. The user can control the simulation using the following the buttons: *step* (execute one simulation step), *run* (execute the whole simulation) and *stop* (the simulation is paused).

Figure VII.3. Screen capture, showing the micro-scale and macro-scale dynamics windows in GEONAMICA® before running the simulation



After running the simulations, one (who in this experiment is the writer) uses the METRONAMICA Map Comparison Kit (MCK) to analyse and compare output and input maps of the model. MCK allows comparison of the results for each category of land use in a very flexible and intuitive way (Uljee *et al.* 2006).

VII.6. THE SCENARIOS

Each scenario runs from the land use map set for 2002 to 2025 - it therefore simulates both the past and the immediate future. The observation and analysis of the predicted situation in the territory will be helpful, as a basis for negotiation between stakeholders, in what is undoubtedly a sensitive political situation. Local residents, mayors, building constructors, scientific institutions, ecology groups and regional government all have different and sometimes antagonistic perspectives. The

exploration of *operational judgments* formulated in Chapter VI generated a high degree of interest and buy-in among stakeholders. The following scenarios represent a set of the most requested situations and interventions. They also provide accompanying comments about my role as facilitator.

VII.6.1. Scenario 0: Business as Usual – Baseline scenario

This is the baseline scenario established by Carlos Hernandez Medina and RIKS in Madrid and Maastricht. It was validated to simulate land use change between the two periods of planning (1982-1998 and 1998-2002) and then extrapolated to 2025. The RIKS team made manual corrections during the calibration of the model to ensure goodness of fit. See Figure VII.4. The validated model fitted data well and predicted the following main changes between the nine land-use categories. See Table VII.1.

Figure VII.4. Scenario 0: Business as Usual

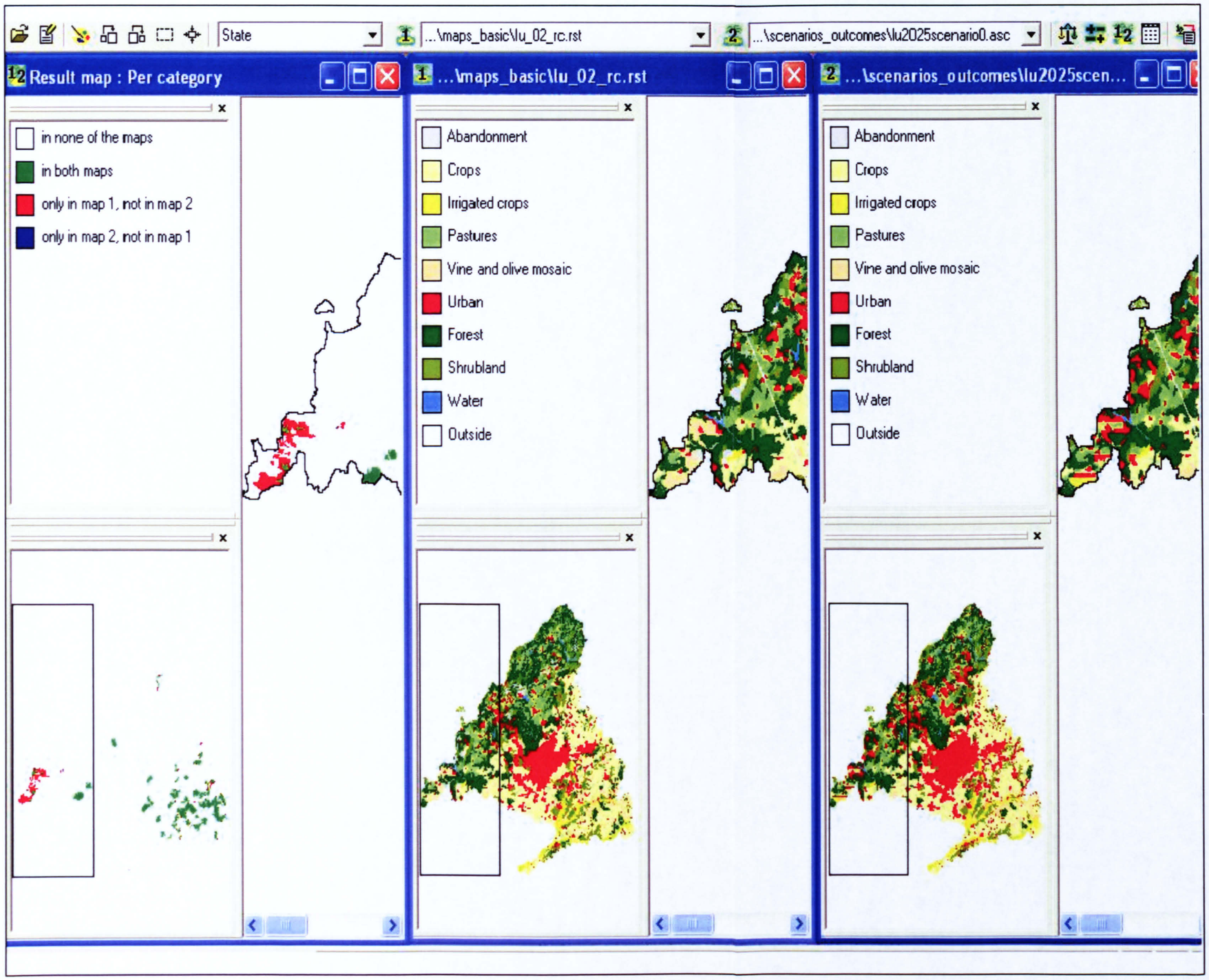


Table VII.1.
Comments on the illustration

Much abandoned land would be transformed, mainly into urban use. Some patches of new urban use are also converted from pastures and shrubland, but in a smaller proportion. The urban expansion is characterised by a spider shape, spreading from the centre of the region, the City of Madrid. However, the greatest urban expansion is mainly controlled by the influence of the mountainous area in the northern region, where the housing demand is currently increasing.

Areas under crops that are surrounded by urban areas, or by forest and shrubland borders, are often converted into urban use.

Cultivation of irrigated crops tends to spread towards neighbouring uses such as forest, shrubland and crops.

See the rectangular area zoomed in the illustration: Most of the crop mosaic patches in the South-West are destroyed as urban use, pasture and irrigated crops take over.

VII.6.2. Scenario 1: Accelerated Urban Development – Forecast based on the current plans of the Regional Government.

This scenario will simulate the perceived increase in demand for urban and residential development, based on the following analysis. A forecast of continued population growth in the region in the next few years suggests a higher demand for housing. According to the current plans of the Regional Government - the amendment of Land Law 9/2001; urban land cover could increase by nearly 18% over the next years. This new regulation is due for immediate implementation according to the current governmental plans, which facilitate the reclassification of the 'rustic land - non protected' and the 'potential urban land - non compromise' categories (17.49% of the land is classified into both categories) into the 'potential urban land' category. The plans will shorten the planning and consultation process and so accelerate development.

Thus, this scenario would block the development of reserves and protected land in the region and strategic land use management. This scenario represents a short-term change concerning to the urban land use perspective. I have simulated it over a period of four years (the life expectancy of a political unit). At the end of this four year period, this temporary acceleration is arrested. See Figure VII.5. and Table VII.2.

The following map (see Figure VII.6.) shows the comparison between Scenario 1 and the Scenario 0 (baseline scenario) for urban land use.

Figure VII.5. Scenario 1: Accelerated Urban Development – forecast based on current plans of the Government

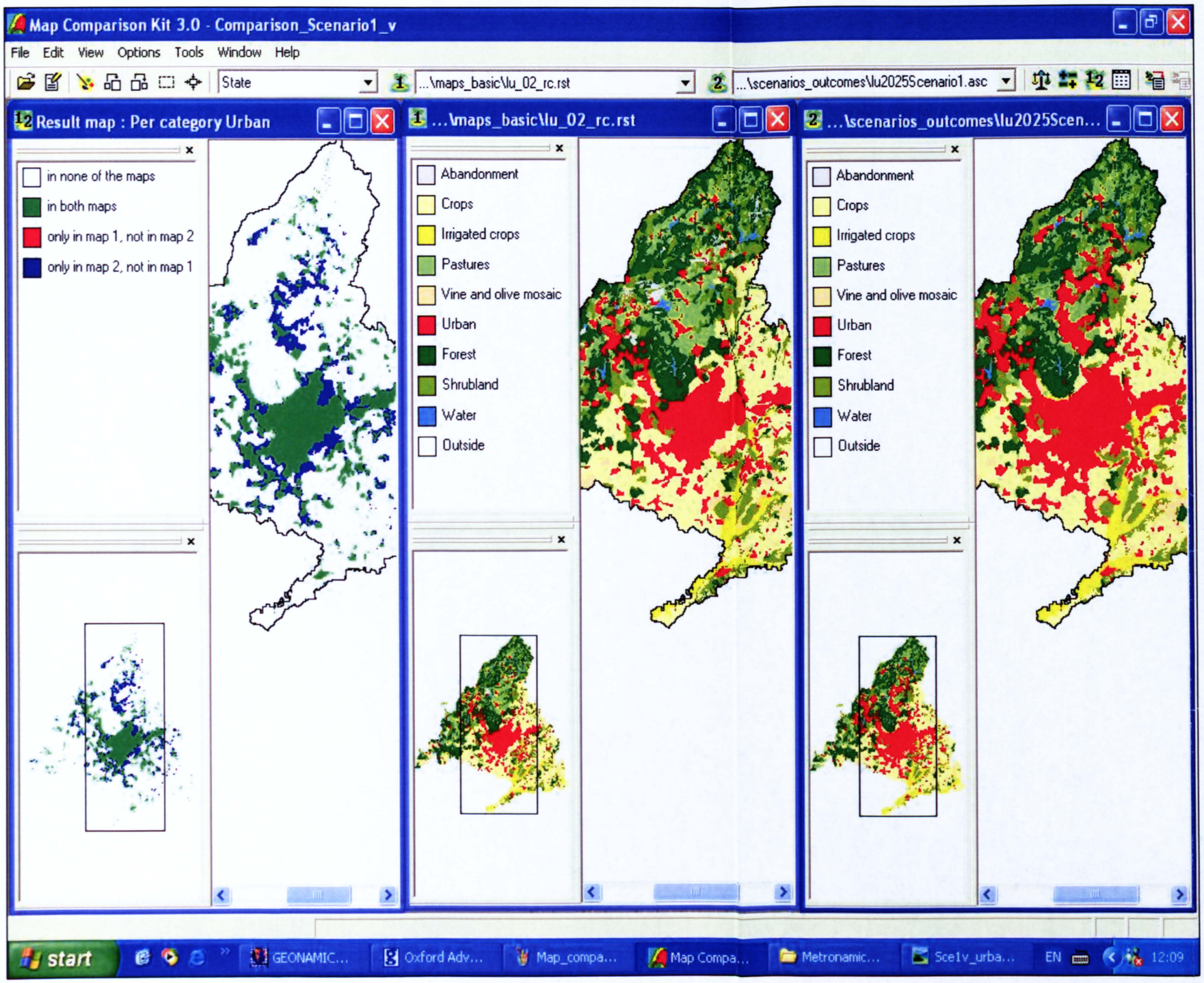


Table VII.2.
Comments of the illustration

Accelerated urban growth.

Urban use covers all the neighbouring areas of the urban centre and spreads over the Northern region in parallel with the infrastructures network. All the land uses on the urban edges are also transformed.

The urban use encroaches on the urban centre faster during the first 4 years (the political time-horizon) taking into account the period from 2006. This date represents the year which the new proposals have been suggested. After an acceleration of urban growth until 2010 (the rules are modified in the micro model), urban growth decelerates so that the final urban area is the same as in the baseline scenario.

Figure VII.6. Comparison between Scenario 0 (baseline scenario) and Scenario 1 (accelerated urban development)

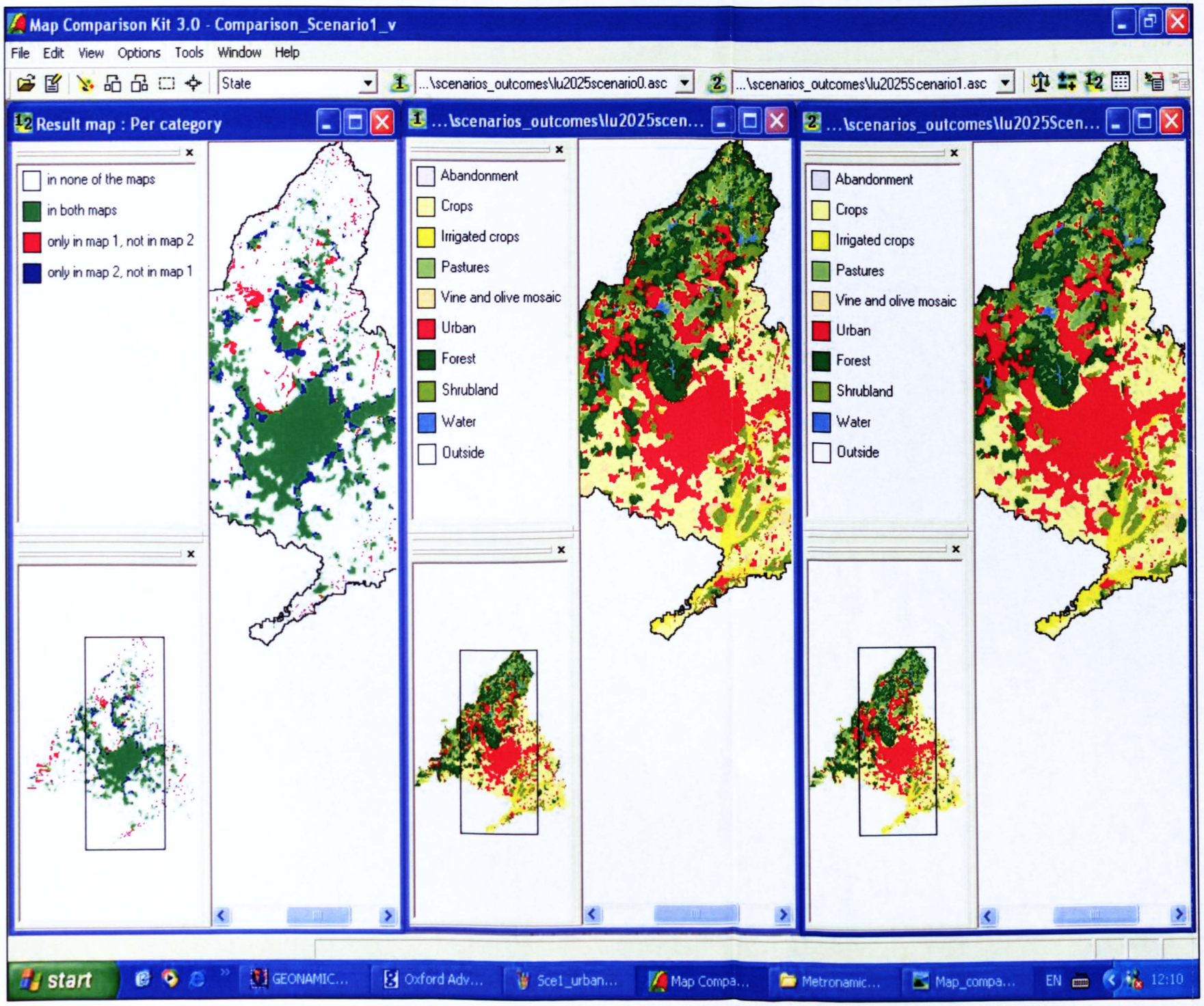


Table VII.3.
Comments on the illustration

The patch of urban land grows differently between both scenarios.

In Scenario 1 (a faster initial urban growth), urban land is occupying all the areas surrounding the current urban ones, except one which is not allowed because of natural protection.

Meanwhile in Scenario 0, urban patches connected the urban centre to the Northern area, occupying much abandoned land and forming isolated spots of urbanization all over the region.

VII.6.3. Scenario 2: Protecting Key Agro-Ecosystems

The booklet described in Chapter VI was used as a research tool in discussion groups with a selected group of stakeholders (chosen to include farmers, experts in the universities and planners in the Agricultural and Rural Development Department within the Regional Directorate).

This group identified traditional farmlands and the strategic farming ecosystems as important sites for protection. The combination of olive tress, cereal crops and vineyards can be found in the southern region (including the southeast and the southwest). This mixture is part of the Southern-Madrid landscape and is well-known as Crop Mosaics. The maintenance of these agro-ecosystems would sustain traditional landscapes and a characteristic structure of land ownership, where the average plot is 0.5 hectares (INE 2003) and land consolidation programmes have not been established yet. If action is to be taken, it is necessary to act now before holdings are consolidated. The management of these protected spaces would create belts of sustainable agriculture. These belts would also encourage sustainable practices and improve the educational and tourist activities, as well as acting as limits to urban expansion. Farming areas would eventually be appreciated for their multifunctional use in the landscape, as the European rural development programmes (2007-2013) require in their future implementation. As the following reference evidence, the promotion of sustainable agriculture is one of the indicators, specifically Indicator 14 of Chapter 40, for land use conflicts established by the Agenda 21 in 'The Principles of Rio' - UNECD (Brouwer and Crabtree 1999).

The writer used the OVERLAY Tool to create areas where intensive farming and urban development would be discouraged. This scenario is then similar to the baseline scenario in every respect, except that a macro-scale constraint that encourages traditional agriculture and conserves these sensitive areas is imposed. See map below (Figure VII.7. and Table VII.4.). The Figure VII.8. in the second following screen capture shows the comparison between the baseline scenario and Scenario 2 in terms of the urban land use category. An animated video of the south-western region allows the user to see (and to show) how this are changes in time and the effects of not applying any figure of protection. To view it, see the CD attached.

Figure VII.7. Scenario 2: Protecting Key Agro-Ecosystems – Strategic Sites for protection of Ecosystems

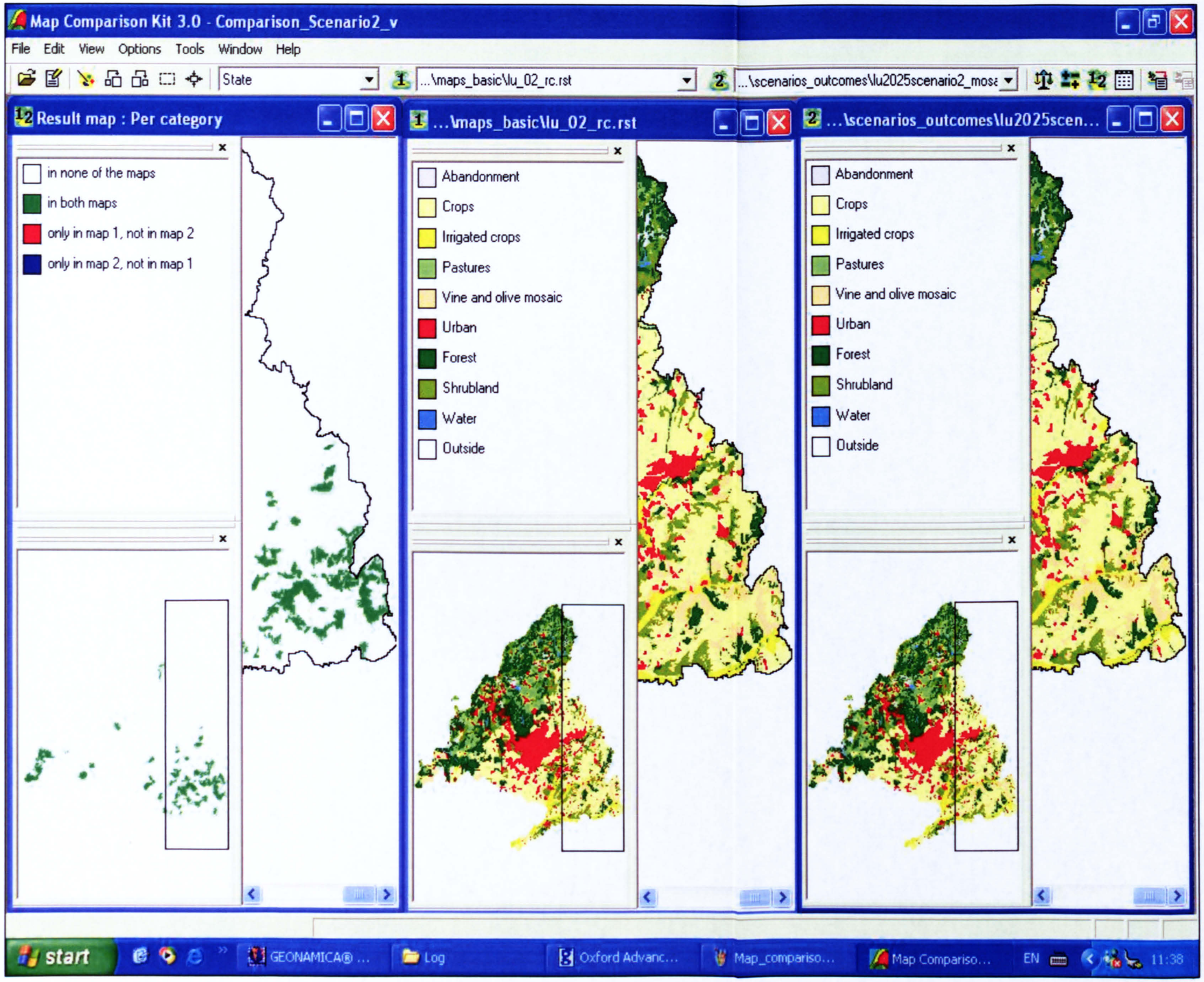


Table VII.4.
Comments of the illustration

The combination of vineyards and olive trees, both typical Mediterranean crops, is the only land use category which keeps a fixed number of cells throughout the simulation.

The situation in the South-West is particularly interesting (Look into the whole region instead of the area zoomed). Some of these sites belong to the Special Protection Area for Birds (SPA) called *"Encinares de el Rio Cofio y Alberche"* (Oak woods in the rivers *Cofio* and *Alberche*). The rest of them are facing competition for the use of the land, tending to disappear under the influence of subsidized farming and infrastructure development. See the animation video in the CD attached.

Figure VII.8. Comparison between Scenario 0 (baseline scenario) and Scenario 2 (protecting key agro-ecosystems)

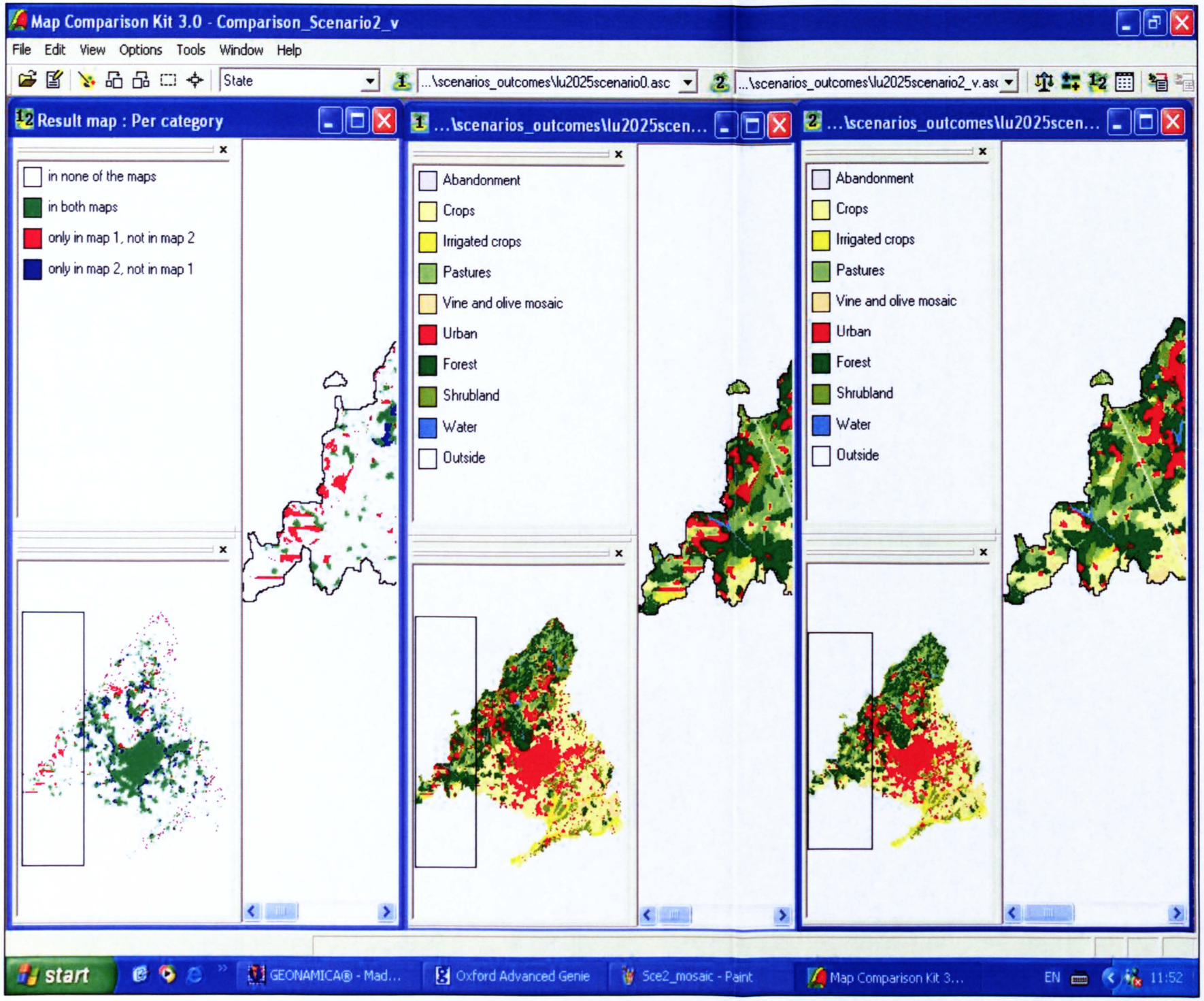


Table VII.5.
Comments on the illustration

This screen capture shows the comparison between scenarios in terms of the urban land use category in the South - Eastern region.

The rectangular area zoomed in the illustration is especially threatened because of the extension of the road networks.

Protecting key agro-ecosystems in the area highlighted would reduce urban expansion and the expansion of other uses associated with it such as irrigated crops.

VII.6.4. Scenario 3: Creating Buffer Zones and Belts around Protected Areas

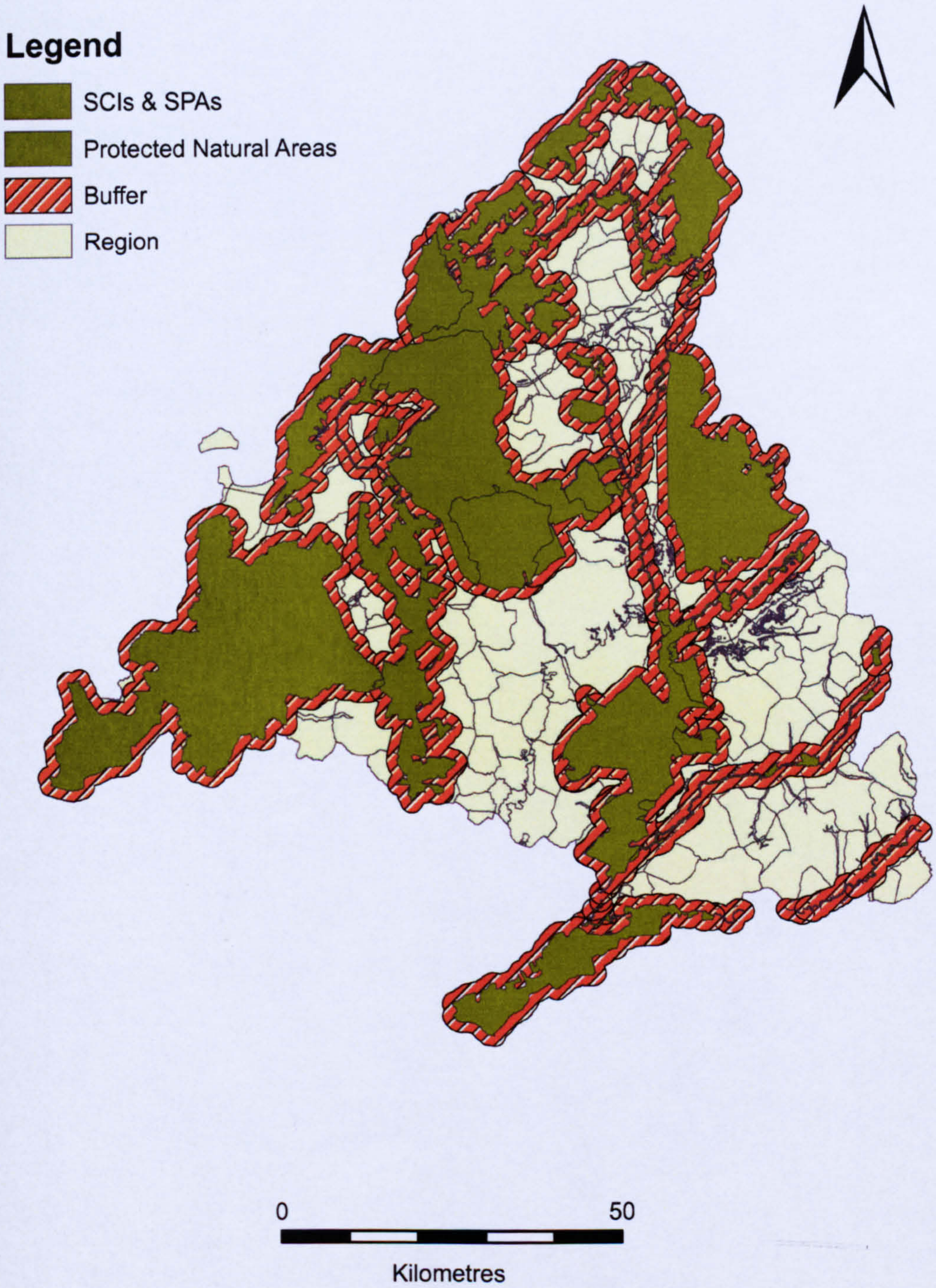
This scenario simulates a proposal made by environmentalists to establish 'ecological and zones of special use' to surround the Natural Protected Areas. These areas would include sites under European regulations such as Habitat Directive (92/43/EC) and Birds Directive (79/409/EC) and sites under National and Regional legislation.

A restraint on specific land uses covering a distance of two kilometres will be established to prevent the influence of external pressures. It was necessary to create new land use basic maps (GIS) which drew the buffer zones (see Figure VII.9). These were imported to the OVERLAY Tool, from which new zoning maps (land uses such as irrigated crops, abandonment and urban were limited within these buffers) were used for the simulation in METRONAMICA.

Belts of sustainable agriculture would be created to mitigate the impact of intensive land use on the most fragile territories. This measure would also favour the creation of ecological corridors between the protected areas. So far, new policy trends are supporting the maintenance of farming and livestock sustainable practices, but always within a network of protected areas, such as Sites of Communitarian Interest – SCI (LIC- *Lugares de Interes Comunitario*), National Protected Spaces (EEPP – *Espacios Protegidos*) and Sites of Special Protection Areas for birds – SPA (ZEPA – *Zonas de Especial Proteccion para las Aves*). In the case of the new European Agricultural Fund for Rural Development – EAFRD (Ministry of Environment 2004) will be implemented within the sites under the Natura 2000 network. Therefore, the edges of the natural protected sites would be endangered if the current trends of the regional land policies do not evolve into the supra-national and national agreements. In other words, those key areas without any sort of protection for ecological conservation would run the risk of vanishing forever.

Figure VII.9. Map of buffer zones around the protected natural areas

Source: Own work based on TiGrESS-Madrid case study data



The following map (Figure VII.10 and Table VII.6.) shows the potentiality that specific categories of land use have to cover these buffer zones.

Using the MCK to compare Scenario 1 and the scenario described here, produced Figure VII.11. (and Table VII.7). Irrigated crops create conflicts over this category of land use, as both traditional and intensive irrigated crops are treated as part of the same category. High water-demanding crops oblige the installation of intensive systems of irrigation near the main riverbeds, and occupy wide areas. However, traditional riverside plots, well known as *'huertas'* because of the horticultural crops, are better distributed all along the riversides and represent part of the typical riverbank ecosystems.

Figure VII.10. Scenario 3: Buffer zones and Belts around Protected Areas

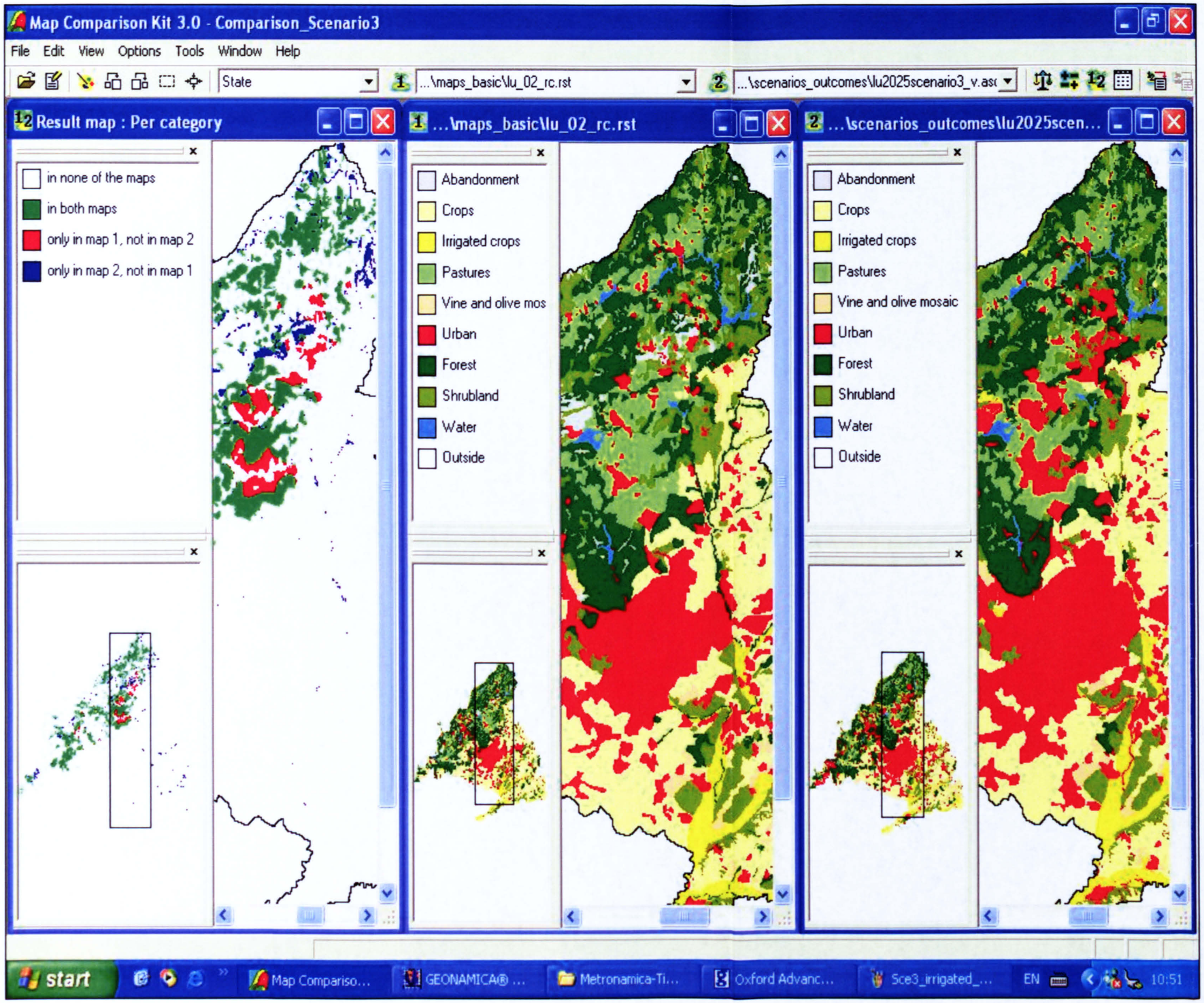


Table VII.6.

Comments on the illustration

The illustration shows the potentialities that certain categories of land use provide to create buffers and belts around protected areas.

For instance; pasture units (the land use category represented in this simulation) are one of these certain categories. These units are strongly related to the forest unit as both represent a typical land use on the mountainous area of the region of Madrid

Figure VII.11. Comparison between Scenario 1 (accelerated urban development) and Scenario 3 (buffers and belts around Protected Areas)

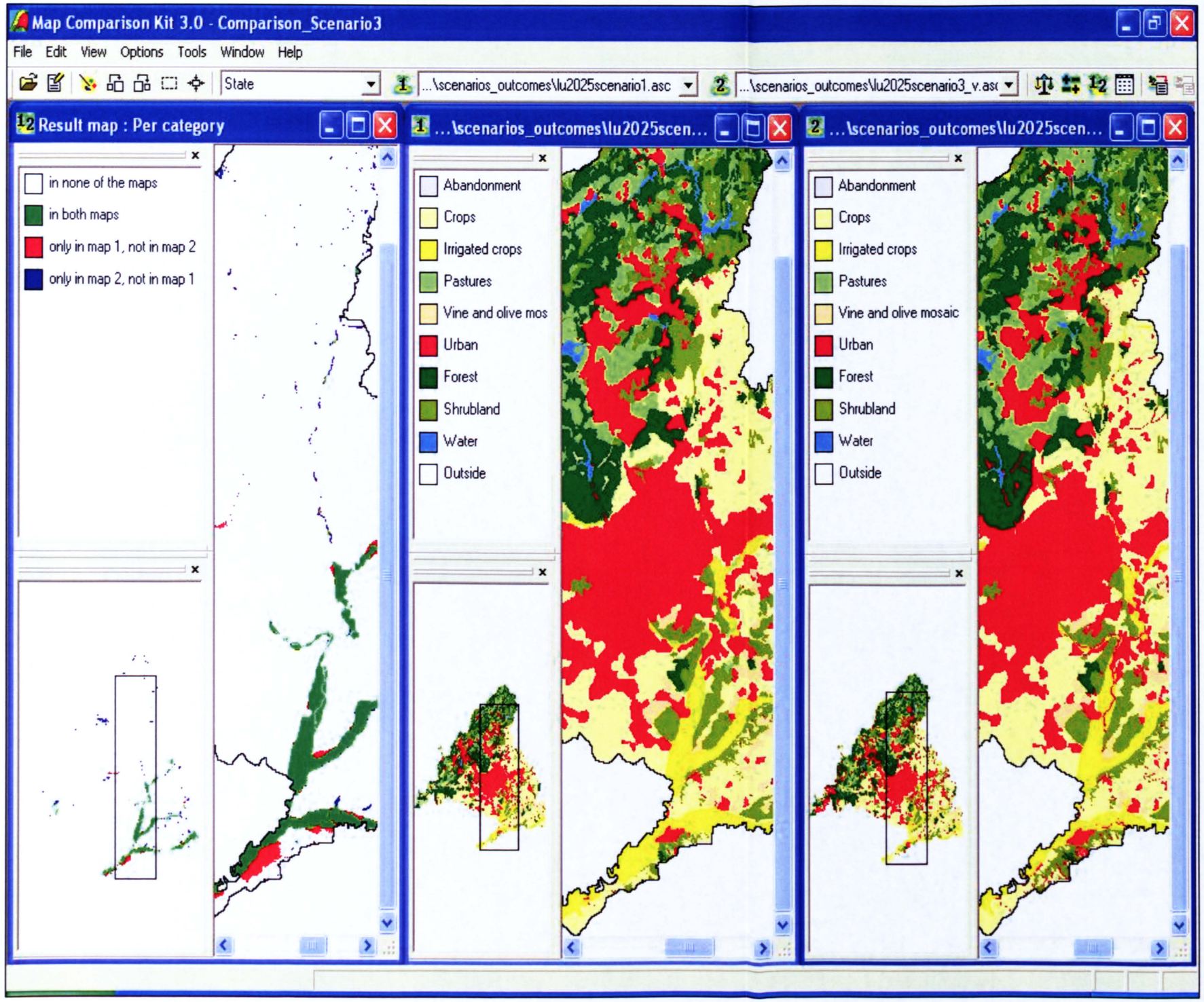


Table VII.7.
Comments on the illustration

The screen capture shows how the land use categories change from an intensive irrigation system to proper riverbank conservation all along the river line.

The scenario 3 generates conflicts because different kinds of land uses -traditional and intensive irrigated crops- are treated as part of the same category. Thus, this restriction could be argued in the case of not having enough capacity to monitor which kind of irrigation crops are planted.

VII.6.5. Scenario 4: Riverbanks and Wildlife Corridors

The MCK results above are relevant to the scenario explored here. Riversides and riverbanks have experienced the most drastic modification of landscape in the whole of the region. The national Water Law (29/1985) claims two restricted sections on each side of the main rivers: the first one, 'track land', is 5 metres in width and the second one, 'vigilance area', is 100 metres in width, where the uses and activities are controlled. Nevertheless, a higher restriction would help to avoid their degradation (Amigos de la Tierra 1998)[1].

New land use input maps were created using GIS, as for previous scenarios. A first strip of 200 metres in width from the river and a second strip extending that distance to 400 metres wide were drawn. Then the OVERLAY Tool was used to restrict land uses within both strips. All the categories of land use are constrained in the first 200-metre buffer zone, except forest. In the second 200 metres, irrigated crops, abandonment and urban categories are restricted. This two-tier buffer zone was established in parallel strips along the lengths of rivers and streams to represent the effects of targeted recuperation work.

METRONAMICA ran the simulation and MCK was afterwards used to develop the following map (Figure VII.12). The result map for the forest category of land use makes it possible to follow the evolution of the forest unit. Again using MCK, Figure VII.13 represents the screen capture comparing the urban category for Scenario 2 and Scenario 4.

[1] Friends of the Earth – Spain.

Figure VII.12. Scenario 4: Riverbanks and Wildlife Corridors

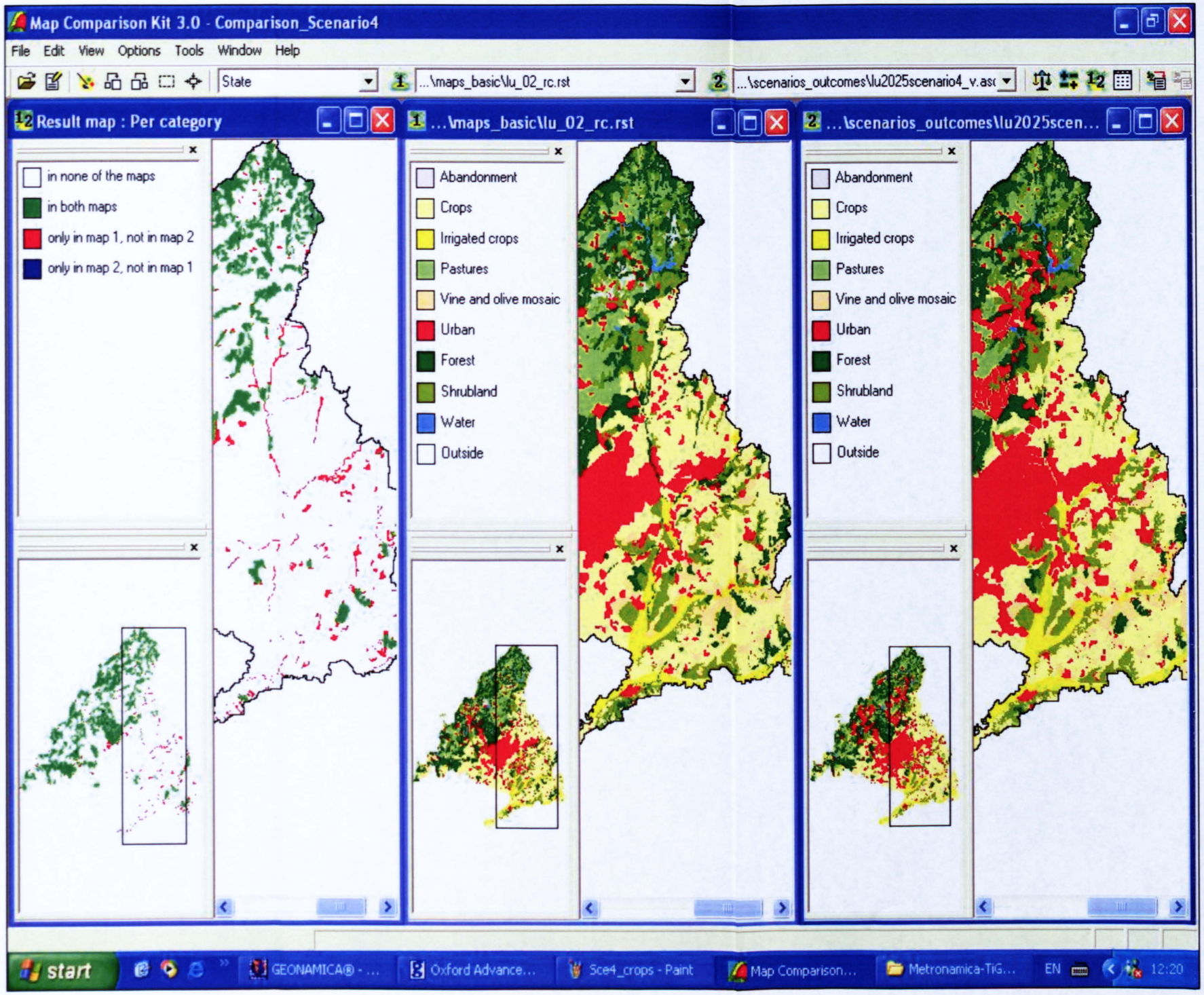


Table VII.8.
Comments on the illustration

This policy intervention is intended to influence the use of land for forestry. The two tier buffer zones are parallel strips along the length of rivers and streams.

The Forest unit adheres more closely to the riverbanks instead of occupying a large area of the riversides of the main rivers.

Irrigated crops, abandonment, and urban categories are restricted under the scenario 4, which is compared in this simulation.

FigureVII.13.Comparison between Scenario 2 (protecting key agro-ecosystems) and Scenario 4 (riverbanks and wildlife corridors)

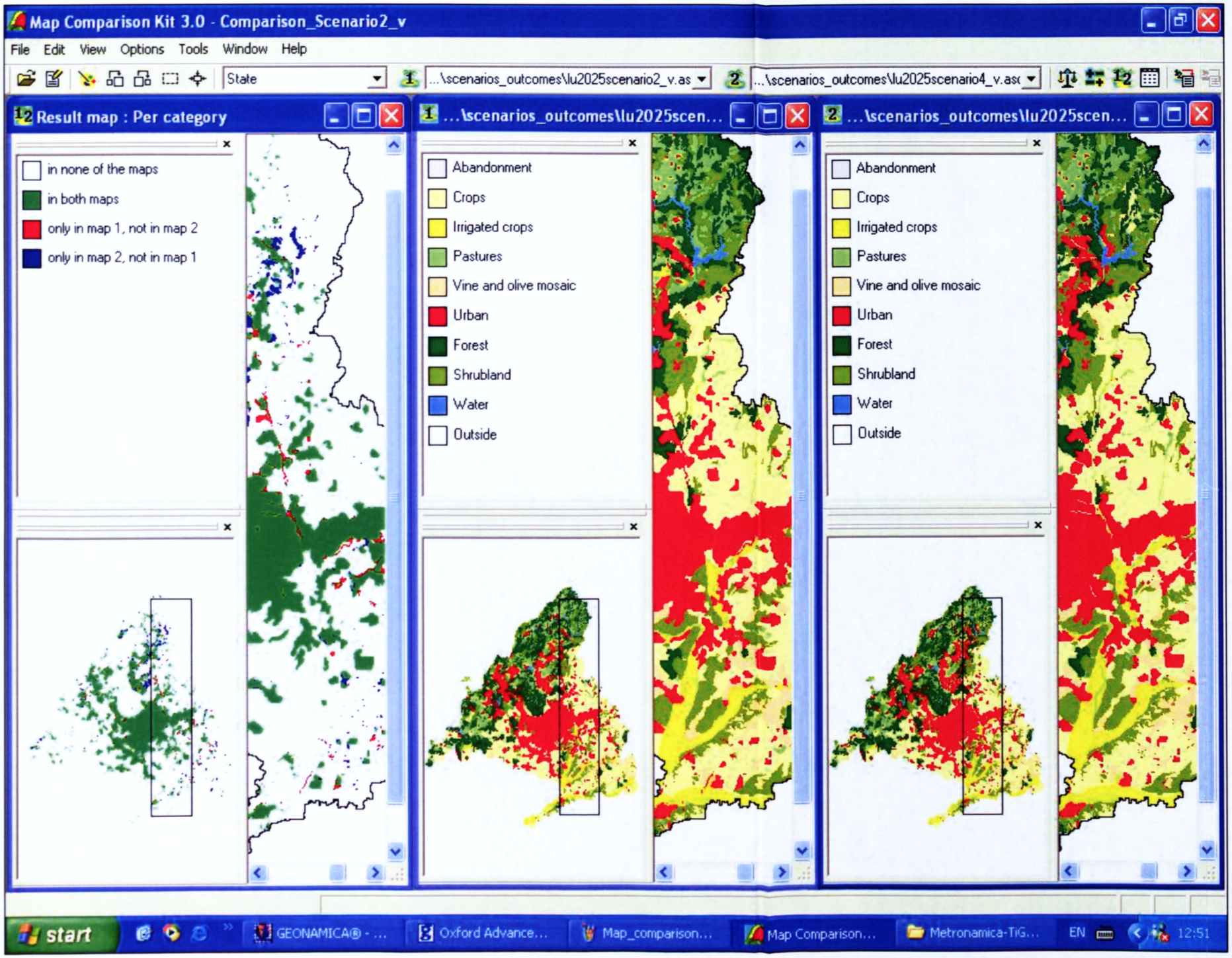


Table VII. 9.

Comments on the illustration

The implementation of these policy interventions (so-called macro-scale constraint in the environment of the simulation runs) that generates the Scenario 2 and 4, would clearly limit urban expansion (the category that is shown in the illustration) near the riverbanks and wetlands, reducing fragmentation.

VII.7. CONCLUSIONS

The Madrid simulation model combined empirical data with knowledge of the transition processes obtained from studies of tendencies in land-use change and fragmentation to build a two-level decision-support system for the CAM. Here METRONAMICA proved particularly useful. It allowed us to turn the static, conceptual model developed using satellite data and GIS into a dynamic model.

The results could be used to explore the likely interaction of macro-interventions at regional scale (top-down constraints) with micro-rules at cell scale (bottom-up responses that condition the transition potential between land use categories). The model was used to predict expected changes in the region that depend on the specific political interventions, legal regulations or market rules to be put into practice. These policy scenarios were suggested by stakeholders active, who were expected to take a prominent role in the adaptive development of the Madrid region.

Synergetic policy actions, which were found, would enhance multi-functional farming and thus, sustainable farming as an action for sustainable development. For instance, scenario 2 – *protection of key agro-ecosystems*, scenario 3 -*creating buffer zones in protected areas*, and scenario 4 -*favouring riverbanks corridors*, are all actions address to search for sustainability in the territory.

The writer implemented and built the scenarios using the excellent technical support provided by Carlos Hernandez Medina at UEM, and by Maarten van Meulen and Inge Uljee at RIKS. This final process, which there were reasons to believe could easily become confrontational, has instead produced a genuine synergy which hopefully will soon encourage other not well-engaged stakeholders (such as building developers) to join the process and be participants. The scenarios were based on suggestions made by stakeholders, who were by now very keen to learn about the potentialities of the Madrid model. The outputs produced by the Madrid model are intuitively accessible. It takes the form of dynamic maps and simple graphics that can be incorporated into Power-Point presentations and shared with stakeholders. These *discussion groups* among stakeholders generated a first attempt at working together with local action groups and mayors (*La Voz del Tajuna* 2006). The model could be used by groups of

stakeholders to search for innovative strategies for managing the region - strategies based on co-operation and trust, rather than on conflict and exclusion. However, it is necessary to highlight the fact that Madrid model simulates uncertain scenarios in an assumption of reality. This is important because different simulation runs give slightly different results.

"When we look into the future, we realize that conflicts and problems may be predictable, but the resolution of those conflicts is not. (We do not know what the future may bring because...) *Socio-natural systems are innovative."* (Winder 2006a:10)

CHAPTER VIII

CONCLUSIONS AND CONTRIBUTION

The writer emphasises in the end of this dissertation the processes of academic learning, stakeholder engagement and policy development in the region of Madrid.

VIII.1. RECAPITULATION OF AIMS

The research described here was undertaken to help local and regional stakeholders move to a more participatory configuration in which power-politics and 'government' give way to sustainable development and effective 'governance'. To this end, a thorough knowledge about causes and effects of land use conflicts in the region of Madrid was needed.

The landscape model developed by analysing the GIS data suggests that the region of Madrid (CAM), despite its rural nature, is actually an intensively utilised landscape. Regions that currently avoid intensive exploitation do so because they are legally protected or not attractive for development. Regulation in the region is largely competitive and mainly consists of restrictions on certain types of land use. This confrontational approach towards land planning creates strong conflicts of interest and shows in the form of three statistically distinguishable land use conflict zones (referred to 'dynamics' in Chapter V): an upland dynamic, an urban dynamic and an intensive agricultural dynamic. Moreover, the extension of transport infrastructure into the rural areas has produced ribbons of development along the motorways that fragments key landscape units. Although the protected natural areas represent approximately 40% of the territory (Encinas and Hernández 2006), these spaces are considered a limitation for urban development rather than an opportunity for implementing, for instance, sustainable agricultural projects. Attempts to encourage stakeholder participation run into clear political and economic conflicts of interest, sometimes intensified by demographic pressure. An ageing rural population is often very willing to sell land for development. In this environment, it has proven

particularly difficult to move from a conflict-regulated system driven by short-term financial benefit to a more co-operative strategy consistent with national and supra-national laws. It was observed that governmental plans are based on a certainty of urban expansion and a failure to take into account national and international norms on sustainable development. Consequently, compliance, with natural resource legislation has been poor.

The effect of the recent social and economical development of the CAM has been to marginalise the rustic land and push sustainable agriculture so far down the list of priorities that it is hardly mentioned at all in the new legislation. The Corine Land Cover project -2000/1990- (El PAIS 2004; OSE 2006) shows that the CAM is the Spanish region that has lost most agrarian or rustic land during the analysed period. Different institutions from different spheres have emphasised 'the use of farming to maintain a balance in the territory'. These institutions include the Ministry of Agriculture, Food and Fisheries (MAPA 2004), the Catalonia Government along with the local group *Consell Comarcal del Baix del Llobregat* (Xarxa Custodia del Territori 2006; Consorci Parc Agrari del Baix Llobregat 1996) and the Department of Land Planning and Environment in the Basque Country Government (Basque Country Regional Government 2006). This statement on the *role of farming* warned about the impact of these land use changes on key ecosystems and claimed they would bring a loss of environmental quality and abandonment or degradation of agriculture. The 'White Paper on Agriculture and Rural Development for the CAM' (Madrid Regional Government 2005a) makes only a brief reference to protecting sustainable agriculture, and that within the context of the Natura 2000 Network.

The balance between rural and urban ecosystems could be re-established by taking account of the physical, institutional, and political features. The stakeholder engagement exercise (Chapter VI) was important for two reasons. It enabled the writer to build a measure of trust and to elicit concrete suggestions for policy initiatives that would permit the legitimate social and economic interests of stakeholders to be respected while ensuring that key environmental resources would be sustained. It would be absurd to suggest that the CAM should never be developed, but much more reasonable to suggest that the current frenetic rush to urbanisation cannot be allowed

to continue. It seems clear that sensitive urban development may create a ready market for the products of sustainable agriculture, form a mosaic of sustainable farms and protected natural areas, and create opportunities for tourism and recreation that enhance the value of housing (because it is located in a beautiful and attractive area). The housing provides opportunities for pluri-active farmers.

The writer obtained a clear list of seven feasible policy interventions - *operational judgments*, suggested by stakeholders themselves, that were expected to help sustainable development in the CAM. The two Booklets, in Spanish and English (see Appendix 3), that described these options were well received and the writer (as part of the group of researchers in TiGrESS – Madrid case study) found herself in the position of having to explore their expected effects. It seemed unreasonable to argue that developers should undertake assessments, while we should suggest these interventions without doing an impact assessment of our own. Thus, what had been originally planned (the conceptual model of the CAM and the booklet of interventions) was completed with the building and use of a decision support tool – DST (based on a computational system named METRONAMICA) to undertake a pilot study of the most likely impacts of interventions on the region.

VIII.2. CONTRIBUTION TO SCIENTIFIC KNOWLEDGE

This dissertation emphasises the need to rethink the 'problem' specification and to readjust the patterns of work to respond the demands of new approaches to empowerment policy-making by combining *planning* and *governance*, alternating rules and liberating constraints. Some sort of legal and political oversight is clearly required to facilitate and ensure this 'convergence'.

The writer's earlier research on key literatures (see Chapter I, Chapter II and Chapter III) has broadened their potential contribution. This research reflects the relevance of these literatures which allow the writer to consider appreciation as a vehicle for the methodological (a reflective approach), theoretical (utilising theory in new ways) and substantive (the stakeholder reflection and adaptation) contributions.

Each one of the six research questions set up in Chapter I (see pp. 3 and 4) has been addressed throughout this doctoral dissertation:

- **Who are the stakeholders involved in the decision-making process in the regional land planning system?**
- **What role did they have? What role do they play now? and what role could they play in the future?**

Stakeholders involved in the Madrid land planning system were identified during the process stakeholder engagement carried out in Chapter VI. A preliminary list of 21 municipal and regional stakeholders has developed in a final list of key stakeholders divided intro four spatial levels: 11 at local level, 15 at the intermediary level, 6 at regional level, 4 at national level and 1 representative at European level. Their actual and potential roles, are well understood in the policy field. That is why a set of policy interventions with responsibilities for the stakeholders was developed (See Booklet in Appendix 3).

- **How could the scientific community involve the executive stakeholders in land planning and management?**
- **Does integrative socio-natural science have a role to play in the region of Madrid? If so, what is that role?**

Although our understanding of the roles of stakeholders is good, the absence of a supra-municipal or intermediary mechanism for policy-making implies the lack of commitment, solidarity and cooperation, especially between local and external stakeholders. There is a clear need for some institutional structure at this level to take account of the interaction between development and the territory. This intermediary level is also most promising to facilitate communication between different hierarchies and repair the governance structure (managing its resilience) as one of the questions identified before (see Chapter III, pp. 42). The intermediaries would represent a figure that could facilitate the reduction of bureaucracy in new modes of governance.

- **How should this project be organised to fulfil that role?**

- **How could both roles, researcher and practitioner in the participative process, be combined into an evolving and reflective whole?**

This dissertation has explored ways of connecting analytical and discursive approaches and managed to move from a complete disagreement among stakeholders into a common set of values (changing the appreciative settings of the stakeholders) by making new knowledge available. This shift of emphasis from conflict to co-operation, although not yet fully consolidated with the inclusion of key stakeholders, particularly property developers, is a very encouraging development. The decision support tool has been used both to evaluate political interventions and communicate these results. Linkages between stakeholders, from supranational politicians to local mayors, are needed to facilitate the management of the system.

Multi-level governance brings the concept of 'subsidiarity' into this discussion too. Subsidiarity is defined as the principle that matters ought to be handled by the lowest competent authority. It is one of the main principles used to frame policies and solve conflicts among different levels within the European Union context since the Treaty of Maastricht in 1992. The subsidiarity principle is auto correlated with scales. It favours the decentralization of responsibilities at the national, and subsequent levels, in the absence of sound coordination (or tran-sectorial) policies. The Common Agricultural Policy (CAP) is an important example of policies at the supra-national level. So too is the environmental policy, which is a multi-level regulatory policy that has become a major concern of the EU (Caillaud *et al.* 1996). Thus, the constraints between different levels of action (supra-national, national, meso-level, local) which are linked to factors of subsidiarity and space-time are under-investigated. There is a problem tailoring policies about trans-national resources to local needs and preferences. *"A policy that works well on macro-scale may be a disaster on the meso- or micro-level (...) tailoring policy instruments to the spatio-temporal scales on which we work"* (Winder 2005a: 16-17).

The process that began with the stakeholder engagement needing a further intervention (see Chapter VI) to see whether we could facilitate modifications to the land planning system in the region of Madrid. The 'Madrid Simulation Model' (a decision support tool) explores potential scenarios based on past knowledge and

learning experiences. Of course, it must be emphasised that like all impact assessment exercises, its predictions must be interpreted in the light of possible sources of uncertainty (Hernández and Winder 2006), for instance: it is possible that stakeholders will innovate and will perceive opportunities or threats that actually change the way they behave and therefore change micro-scale dynamics again. It is normal to think of these sources of uncertainty as a 'problem' that must be resolved, but another approach considered under the framework of this research would be to think of uncertainty, particularly innovation uncertainty, as part of the solution. *"If it were impossible for humans to innovate, we could hardly hope to change the course of history in a way that facilitates sustainable development."* (Hernández and Winder 2006: 20). Only time will tell if the model is invalidated by uncertainty; we must wait and see how effective the predictions are as the region of Madrid is developed.

If integrative socio-natural science fails, only a miracle will save the rustic land of the Autonomous Community of Madrid:

Figure VIII.1. Saint Isidore prays with passion for the trees of Madrid



Source: FORGES in EL PAIS Newspaper (15th of May 2006)

San Isidro is not only the patron saint of farmers, agronomists and the countryside but also the patron saint of Madrid itself. In this cartoon published in El PAIS (2006) on his feast day, the saint is praying for Madrid's forest.

VIII.3. AND BEYOND THIS THESIS?

It will soon be time to stop simulating and develop institutions and policies to facilitate compliance by creating policy interventions, possibly by developing the intermediary level as described above. This phase will need explicit 'boundary conditions' (indicators of compliance and system health as described in Chapter III, pp.13). If the boundary conditions are satisfied, we proceed with the technical intervention. If not, we must enter a new discursive phase.

"When 'engrained habits' or 'culturally embedded beliefs' are challenged, we may even become indignant or defensive, forming alliances to force others to make behavioural adjustments that sustain a familiar process" (Winder 2006b)

VIII.3.1. An Exit Strategy: Integrative Systems and the Boundary Problem

Following the success of this research, the writer has just joined a new project titled 'Integrative Systems and the Boundary Problem' (ISBP). It is a direct spin-off from the TiGrESS project including the work described in this thesis.

ISBP *"...will study issues in cultural and natural resource management to understand how negotiating new institutional and epistemic boundaries can reduce tension between antagonized stakeholder communities (...) and (...) will explore the ways of characterizing problems in natural science ... to search for boundary judgments that help make problems tractable"* (Winder 2006b: 2). It is going to help negotiate the boundary conditions of the technical phase that will follow this dissertation, the implementation of the policy options referred to in the booklet (See Appendix 3).

The negotiation of substantial 'buy-in' from key stakeholders at the different levels of the governance hierarchy (municipal, intermediary, regional, national and supra-national) are supplemented with the achievement of a breakthrough in the form of proposals to establish a sustainable planning observatory in the region. The 'Integrative Systems and the Boundary Problem' proposal is being funded under the NEST (New and Emerging Science and Technology) – Pathfinder, by the European Union. See Appendix 4.

The writer, together with other members of the TiGrESS project in a close collaboration with the Polytechnic University of Madrid, will be involved in the study of impact assessments in integrative research. Stakeholders of the regions of Madrid and Catalonia (which has been chosen for future research because it has better levels of convergence and compliance) would be engaged in this development. The fact that it is a spin-off from TiGrESS will facilitate the work with former stakeholders in Madrid including the Spanish Observatory for Sustainability, the Ministry of Environment, the Regional Directorates with responsibility for Agriculture & Rural Development and Environment & Land Planning, and the local stakeholders taking a relevant role. Moreover, the national and regional future proposals lead the establishment of a *sustainable land planning service* for the region.

The writer hopes that the data, models and other deliverables of this doctoral dissertation and other outcomes within the framework of the TiGrESS project will contribute materially to these developments.

CHAPTER IX

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APPENDIX 1

TiGrESS - DESCRIPTION OF WORK

Time-Geographical approaches to Emergence and Sustainable Societies (TiGrESS)

(Cultural Ecodynamics at different Spatial and Temporal scales)



TiGrESS

June 2002

ANNEX I – Description of Work

Generic Activity

7.3 Socio-Economic aspects of Environmental Change in the Perspective of Sustainable Development

European Commission, DG-XII – rue de la Loi 200, B-1049 Brussels, Belgium

1. PROJECT SUMMARY

Time-Geographical approaches to Emergence and Sustainable Societies (TiGrESS)

Proposed Start Date: September 2002

1.1 Problems to be solved :

Time-Geographical methods provide ways to explore the effects of spatial and temporal constraints on the behaviour of individuals and to understand how qualitatively new socio-economic structures emerge at higher scales as a result of individual activity. The ability to explore and understand the emergence of new and potentially unexpected structures and dynamics in society will be crucial to Europe's success in becoming a sustainable society. Time-Geographical methods are unusual in their emphasis on three obvious truths: the corporeality of the human condition, that humans live in a geographical space–time that constrains their actions, and that they are purposive.

The TiGrESS project will evaluate the usefulness of Time-Geographical methods for understanding the relationships between environmental change and social-economic driving factors. We will undertake three focussed case studies to look at problems of *demographics and water resource planning* (along the M11 corridor in the UK), the *dynamics of the European urban network* (the whole of Europe) and *sustainable agriculture and land-use planning* (around Madrid).

1.2 Scientific objectives and approach :

- We will develop a generic tool for evaluating and analysing the Time-Geographical data. This software tool, the TiGrESS *Proof of Concept System*, will be developed by the Consortium and used to receive, summarise, visualise and explore data from both simulation experiments and empirical studies. The TIGRESS system will be designed for dual use: both as a means of visualising data in real-time and for post-processing using dynamic maps and statistical summaries in an interactive environment.

- We will use the TIGRESS system to undertake three case studies to produce policy-relevant information and to identify potential pathways to sustainable development through the examination of a range of relevant multi-sectoral and strategic issues affecting the study areas.

- We will evaluate the impact upon individual researchers of using Time-Geographical methods to explore the dynamics of environmental change through the socio-economic drivers. Using accepted elicitation methods, a portfolio of data will be collected consisting of verbal *protocols, process tracing*, and *pre-* and *post-process* testing to study the development of scientists' knowledge bases and conceptual maps.

- We will publish and disseminate the results in a series of four high quality scientific monographs, one for each case study and one synthetic volume. These will be distributed to selected university libraries and other interested parties throughout Europe. Relevant regional and national government decision-makers will be involved as end-users for the results of each case-study.

1.3 Expected impacts :

Time-Geography is an open area of research in socio-natural science and the development of integrated tools for Time-Geographical analysis will be a major contribution to European research in the area of sustainable development. The increasing mobility of populations within and between countries, globalisation and the pressing concerns of environmental change and sustainability all cry out for the development of integrated tools that allow us to *make sense* of spatio-temporal data. The success of our project under Generic Action 7.3 will be measured in terms of the way the TIGRESS System makes helpful insights available to colleagues in a range of policy-relevant fields.

We envisage that the TIGRESS system will be of generic applicability and propose to use it extensively ourselves and to promote its use within ERA and beyond.

2. SCENTIFIC/TECHNICAL OBJECTIVES & INNOVATION

2.1 Objectives :

Time-Geographical methods in social science research have been in existence since the 1950's [Hägerstrand 1953, 1961, 1970, 1985] and have either directly inspired or can be closely related to a range of modern individual-based social simulation techniques including micro-simulation modelling and multi-agent simulation [Troitsch 1996, Ferrand 2000]. The past 10 years have shown that an ad hoc approach to individual based modelling may not be productive [Railsback 2001] and we propose that Time-Geographical methods can provide an effective alternative. Time-Geographical methods are unusual in their emphasis on three obvious truths: the corporeality of the human condition, that humans live in a geographical space–time that constrains their actions, and that they are purposive.

TIGRESS will provide the analysis facilities, integrated within a 'state-of-the-art' software environment, that allow scientists within each workpackage to connect with space-time data at both an intuitive and an analytical level. It can be thought of as a specialised "data-mining" tool for spatio-temporal data produced either by direct fieldwork or from simulation models. It is important to reiterate that a variety of 'end-user' organisations (land planners, water companies and urban designers) are involved in each workpackage, the design and development of the TIGRESS System, and as potential users of the final product (see Appendix IB for details).

The production of TIGRESS will provide the key means of investigating the Time-Geographical dynamics of each case study and evaluating the methods overall, and could potentially pave the way towards pan-European use of Time-Geographical methods for sustainable development policy analysis. The research carried out within each case study will both contribute significantly towards a better understanding of the integrated socio-economic and environmental dynamics of each subject area and also towards better regional policy formulation and implementation, particularly with respect to sustainability.

The TiGrESS project will be carried out under Generic Activity 7.3, *Socio-Economic aspects of Environmental Change in the Perspective of Sustainable Development.* The TIGRESS System will be developed and tested in a trans-national workpackage undertaken by two of the TiGrESS project partners. It will then be deployed in each of the three case studies.

The choice of the three study areas will facilitate a comparison of the project findings across different policy problems and domains stretching from the UK to the Mediterranean. This synthesis and comparison of research findings will generate one of the key deliverables of the project: a comparison across space and time of strategies for adaptation to changing socio-economic, environmental, demographic and land-use conditions.

2.2 Innovation :

We occupy a world in which the cultural and natural domains are completely integrated. That world can be modelled as a block of geographical space containing humans, non-human actors, material resources and artefacts. The humans and many non-human actors have knowledge, form plans, migrate through that space and interact with each other and their material world. Occasionally we do things that change the course of history: we create institutions to regulate trade, burn fossil fuels, go to war and so on.

Over the last half century we have become aware that the actions to fulfil short-term projects (going on holiday, building a house, buying cheap bananas) may have unforeseeable and undesirable long-term consequences (global warming, famine and the destruction of Global life-support systems, for example). This has stimulated a debate between those who argue for *mitigation strategies* to reverse current trends and those who believe humans and human institutions will *adapt* to changing circumstances. Adaptation generally involves the spontaneous *emergence* of new institutions or of new uses for pre-existing institutions. Within the European Union, the negotiation of safe pathways to sustainable development will require us to evaluate the relative merits of these views. Yet we have no scientific basis for doing this unless we can come to understand time-geographical systems and the process of emergence.

Many of the social, cultural and natural issues addressed by the Fifth Framework's *key actions* can best be understood by studying spatial pattern: they are problems arising from the uneven geographical distributions of people, resources and opportunities. A substantial subset of these problems also relate to dynamic phenomena.

The historical trajectory of a socio-natural system actually constrains and determines the "possibility space" within which policy can be constructed [Lemon 1999, p161-169].

Time Geography provides a coherent ontological framework within which to explore the nature of integrated multi-scale dynamics and the consequences of different policies for the development of Europe and its regions. Time-Geographical methods provide a means of exploring the effects of spatial and temporal constraints on the behaviour of individuals and how qualitatively new socio-economic structures may emerge at higher scales as a result. Being able to explore, understand, cope with and perhaps even predict the emergence of new and potentially unexpected structures and dynamics in society will be crucial to Europe's success in becoming a sustainable society. As such Time-Geography offers great potential for aiding coherent, multi-scale and cross-sector sustainable development policy formulation.

The focus of our research will be that of *Time-Geography*: an approach to emergence that became influential in the 1950s due to the pioneering work of the Swedish geographer Torsten Hägerstrand. Time-Geography uses many conventional statistical and simulation modelling methods, particularly spatial analysis and spatial micro-simulation modelling, but differs from conventional approaches in its unyielding focus on the corporeality of the human condition.

As humans and resources move through space, their respective trajectories interweave to form a locally dense, three-dimensional fabric with more or less transient *resource bundles* forming and dissolving as time passes. Hägerstrand argued that fundamental space-time constraints (crowding constraints and maximum migration rates) and the nature of human projects must determine the form of the Time-Geographical fabric. By modelling human behaviours in terms of projects, purposive migrations and the formation of couplings and bundles, subject to those constraints, we can learn more about the whole time-geographical fabric and better understand the spatial and temporal dynamics underlying socio-economic and environmental inter-relationships.

The advantage of Time-Geography is not that it provides definitive solutions to the problems of emergence, but rather that it gives us a coherent language within which these problems can be stated and discussed. The task of the time-geographer is to model human decision processes and projects on an individual level and to use life-histories, statistical methods and maps to elucidate the aggregate consequences of these decisions and projects for a whole region.

The TIGRESS System will provide the necessary tools for analysing Time-Geographical dynamics which, at present, do not exist in a single piece of software. Members of the TiGrESS Consortium have previously developed a high-speed micro-simulation engine capable of simulating a nation of 10 million individuals for a single year in less than five minutes on a desktop PC but, effective policy-relevant use demands equivalent state-of-the-art technology to support analyses of the massive databases that would be generated. Another member of the consortium (RIKS bv.) is a leading player in the development of state-of-the-art visualisation and decision support systems.

The TIGRESS System will be capable of visualising and analysing Time-Geographical information at a rate suitable for the operating speed and data generation rate of this micro-simulation engine. This will be achieved by the provision of an integrated set of analytical toolboxes that extend far beyond the capabilities of any single existing GIS technology, which as yet cannot adequately handle temporal change [Halls & Miller 1996]. These toolboxes will allow large volumes of Time-Geographical data to be aggregated and analysed in real-time. The ability to generate temporally and spatially aggregated databases of individual Time-Geographical data simultaneously accessible by multiple clients running the TIGRESS System will increase the analytical possibilities of simulation scenaria.

Figure 1 presents an example of a key visual representation mechanism which the TIGRESS System will provide in real-time. This image incorporates spatial data (background maps etc.), temporal data in the form of vectors (arrows), and a distortion using a lens that dynamically responds to the *intensities* inherent in the Time-Geographical information. This type of representation will be enhanced by including real-time dynamic updating of maps, and the ability to use irregular shaped and multiple lenses to observe the interactions of different Time-Geographical phenomena. Together with classical statistical and GIS methods, such representations and analytical tools will be essential to illuminating and understanding the dynamics of the TiGrESS case-studies over time and space, providing the capability to highlight areas in space and time where potential interactions and/or conflicts may arise.

The TIGRESS System will provide seamless connections between data and analytical applications, presenting the end-user with a single interface for data exploration, analysis and visualisation. The accompanying documentation and on-line "HELP" facilities will enable the user to develop a familiarity both with the data themselves *and* with the key concepts of Time Geography. By taking much of the computational labour out of the work, we expect users will be able to connect more effectively with space-time data both at an intellectual and an intuitive level.

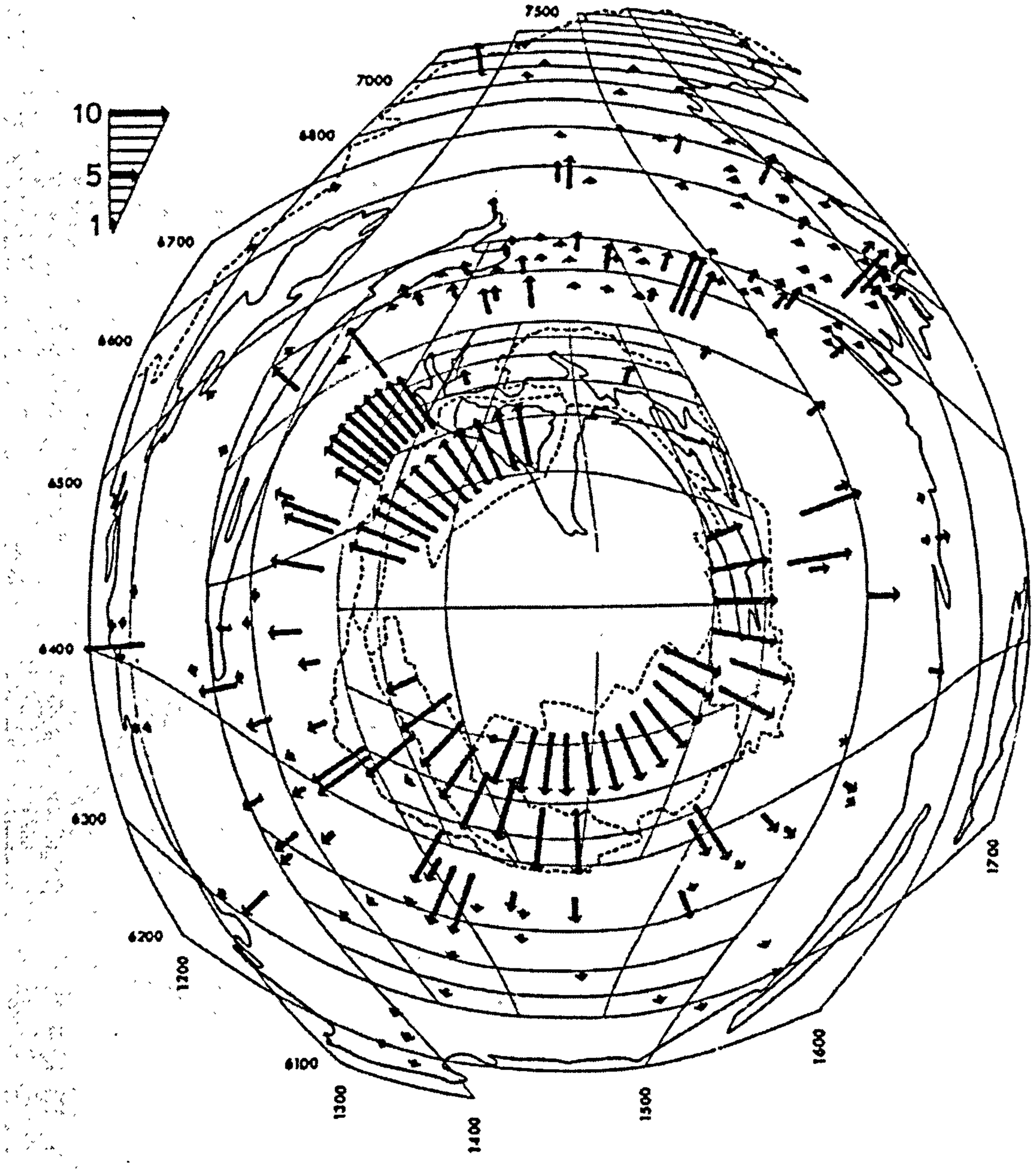


***Figure 1**: A visual conception of Time-Geographical data proposed by Torsten Hägerstrand – incorporating spatial data (background maps), temporal vector data (foreground arrows), and spatial distortions in response to intensities of the temporal data – which the TIGRESS System will implement with real-time and analytical capabilities. Adapted from Pred & Törnqvist (1981)*

2.3 References :

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3. PROJECT WORKPLAN

3.1 Background to the study & research approach :

Time-Geographical (TG) methods have developed rapidly since the 50s and 60s. The modeller's first task, as Hägerstrand tells us, is to delimit "a bounded region, including what is entering and leaving while observation is going on". The classical geographer's map of this region with dots and blocks to represent individual humans and resources can be thought of as a pictorial representation of the "now line", a synchronic section through the time-geographical fabric on which the truncated ends of individual time-lines are visible.

Individual organisms and inanimate objects (including buildings) appear on that map and occupy room to the exclusion of other objects. Mobile individuals (especially humans) move through that space purposively, trying to form couplings and bundlings that facilitate their "projects". Local resource bundles should appear on this map as dense "stations" in contemporary space and may outlive the individuals and projects that pass through to give them their spatial integrity and an observable, internal state.

If we take stations and conventional projects as given and model stochastically in this way, we can easily simulate some of the ways people use certain facilities. However, it is much harder to use such methods to allow new stations to develop spontaneously, or to model innovative ways of exploiting old ones with such conservative models.

The TiGrESS project will evaluate the utility of TG methods for addressing the relationships between socio-economic drivers and the environment by examining three issues of significance for developing pathways towards a sustainable future. TiGrESS will produce a four-volume evaluation of TG methods across a wide range of significant issues which encompass diverse socio-natural environments within Europe.

3.2 Project Structure :

The TiGrESS consortium has prepared the current bid to mount work-packages (WP's) at three sites across the EU. The exact nature of the work at each site will vary but be linked by the common threads of Time-Geography, emergence and cultural ecodynamics in the relationships between socio-economic drivers and the natural environment. The work-packages will also be directed towards regional problems of immediate relevance to the management of vulnerable ecosystems and the search for path-ways to sustainability.

The workpackages described in the following pages maintain the overriding theme of TG methodologies throughout. The primary objective of TiGrESS is to assess TG methodologies and tools in relation to their utility for the formulation of sustainable development policies in the areas of water resource management, intra-national migration patterns, and land-planning in environmentally sensitive environments.

The emphasis and complexity of the multi-scalar interactions will naturally vary for each of the study areas. Details of the specific research activities involved are given in the separate workpackage descriptions. Research problems in each of these distinct socio-economic and environmental contexts can be addressed using TG methods, although the populations, pockets of local order ('stations'), projects, constraints and conflicts which emerge from each case study will clearly be context specific.

While this work is underway, a fourth workpackage will be working to specify and implement the TIGRESS System and TG Analysis Tools, and to tailor it to the needs of the individual case studies. These three variants of TIGRESS will form the basis for investigating the regionally generated databases and model output.

3.3 Workpackages :

WP1 is to co-ordinate the project as a whole. WP1 will also evaluate the impact of TG methodologies using a portfolio of knowledge elicitation techniques, and will prepare all the scientific monographs for publication and dissemination.

The TIGRESS System workpackage (WP2) will be provided with a variety of models and/or databases from each workpackage for integration with a state-of-the-art analytical environment and user interface.

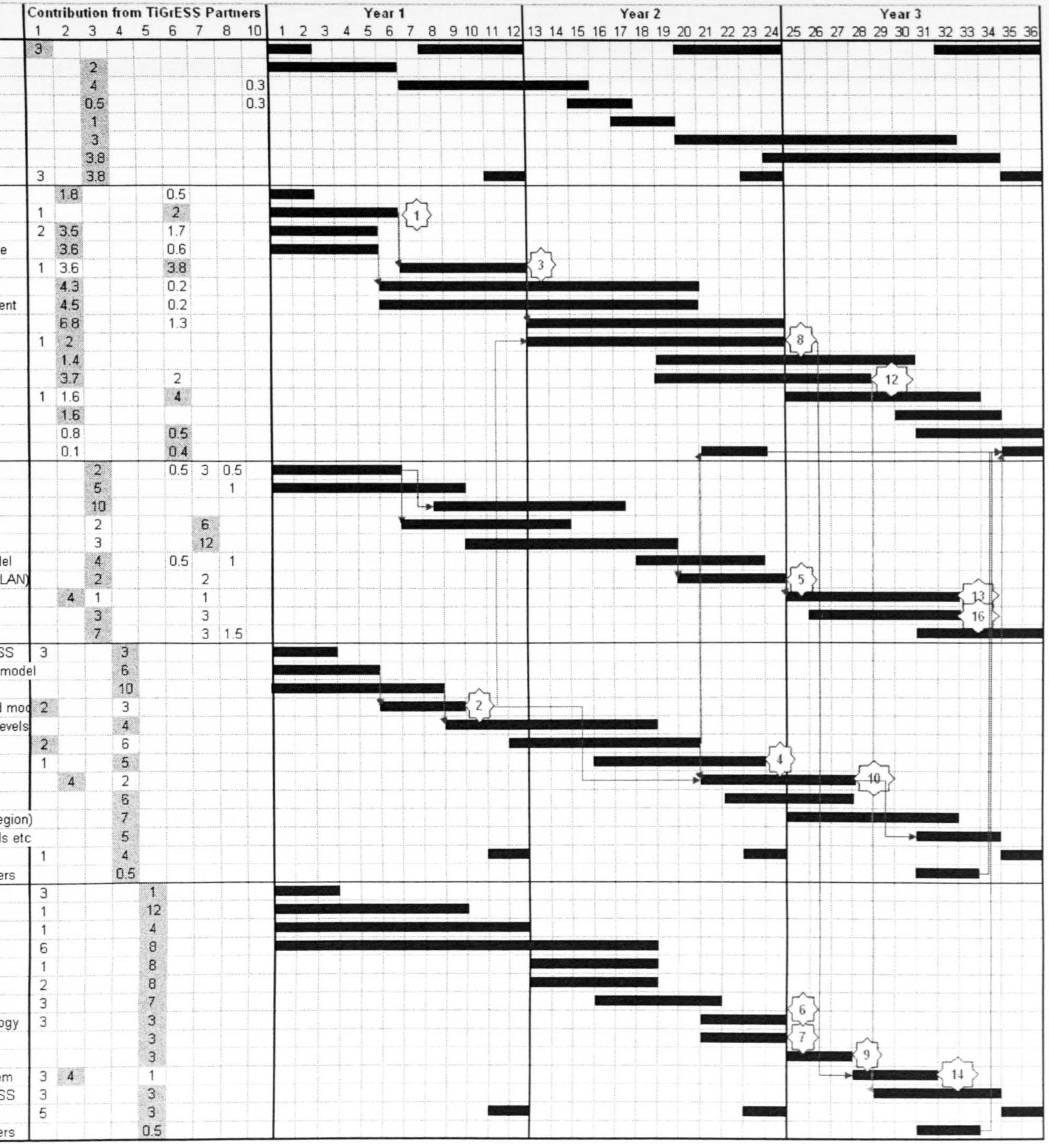
WP3 of the original proposal has been dropped in accordance with reviewer's recommendations. The remaining workpackages WP2 to 5 are substantially unchanged from the original proposal.

Explicit responsibility for individual models or databases will rest with the TiGrESS partners providing the locale for each study or, in the case of WP2 the technical expertise required in software development. Thus, sub-contracted expertise required by individual workpackages will be managed by and report directly to the partner responsible for the workpackage. Specific activities and the timing and nature of deliverables are described separately for each workpackage (below).

A project timetable for TiGrESS showing the main links between different activities and workpackages, together with a matrix showing the contributions of each activity to the various deliverables (see list below) can be found on the following two pages. These two pages fulfil the requirement for a Gantt chart (highlighting the task leaders (greyed), deliverables and critical path of the project) and a PERT diagram detailing the contribution from workpackage tasks and each deliverable.

Upon successful negotiation of contracts we propose a start date of 1st September 2002.

Task No.	Task Details	Contribution from TiGrESS Partners									
		1	2	3	4	5	6	7	8	9	10
1.1	Management & Coordination	3									
1.2	Review of knowledge elicitation (etc) literature			2							
1.3	Design of TG evaluation technique portfolio			4							0.3
1.4	Design TG evaluation framework			0.5							0.3
1.5	Testing of TG evaluation technique portfolio			1							
1.6	Evaluating TG methods for each case study			3							
1.7	Analysis of evaluation results			3.8							
1.8	Annual & Final Reports	3		3.8							
2.1	Requirements Analysis (Software Technology)		1.8				0.5				
2.2	Functional Specification (TG Analysis Tools)	1					2				
2.3	Specify spatial and TG database structure	2	3.5				1.7				
2.4	Specify program interface / graphical user interface		3.6				0.6				
2.5	Specify TG analysis tools	1	3.6				3.8				
2.6	Program Interface (PI) - Design & Implement		4.3				0.2				
2.7	Graphical User Interface (GUI) - Design & Implement		4.5				0.2				
2.8	TG Analysis Tools - Design & Implement		6.8				1.3				
2.9	Integrate & test generic program interface (PI)	1	2								
2,10	Debugging		1.4								
2.11	Validation of TG analysis tools		3.7				2				
2.12	Evaluation of TG analysis tools	1	1.6				4				
2.13	Documentation of TIGRESS System		1.6								
2.14	Documentation of evaluation of TG analysis tools		0.8				0.5				
2.15	Working Group (Technology Inplementation Plan)		0.1				0.4				
3.1	Formal specification of model functionality			2			0.5	3	0.5		
3.2	Data preparation (water demand & demography)			5					1		
3.3	Simulation algorithms for water demand			10							
3.4	Development of supply side model			2				6			
3.5	Optimisation of water supply network expansion			3				12			
3.6	Validation of integrated demography/demand model			4			0.5		1		
3.7	Integrate supply & demand side models (INFRAPLAN)			2				2			
3.8	Implementation within TIGRESS System		4	1				1			
3.9	Sensitivity analyses			3				3			
3,10	Stakeholder engagement			7				3	1.5		
4.1	Negotiate communications protocols with TIGRESS	3			3						
4.2	Specify cities & demog. mechanisms for general model				6						
4.3	Data collection				10						
4.4	Prototype generic TG driver (EuroSim background mod	2			3						
4.5	Build/Test spatial vars. at different neighborhood levels				4						
4.6	Design & implement EuroSim model	2			6						
4.7	Model validation over the period 1960-2000	1			5						
4.8	Implementation within TIGRESS System		4		2						
4.9	Construct trajectories at the city level				6						
4,10	Empirical analysis (Franco-German transborder region)				7						
4.11	Simulation of scenaria with differing border controls etc				5						
4.12	Annual & Final Reports	1			4						
4.13	Meetings with national & European decision makers				0.5						
5.1	Specify GUI and TG database requirements	3				1					
5.2	Review of land planning regulations (Municipal)	1				12					
5.3	Evaluation of habitat fragmentation	1				4					
5.4	Soil health evaluation	6				8					
5.5	Socio-economic analyses	1				8					
5.6	Indicator relationships (spatial & temporal)	2				8					
5.7	Development of an integrated TG database	3				7					
5.8	Verification & validation of TG database methodology	3				3					
5.9	Spanish report on land planning issues					3					
5,10	Spanish booklet					3					
5.11	Integration of TG database within TIGRESS System	3	4			1					
5.12	Scenario generation and simulation within TIGRESS	3				3					
5.13	Annual & Final Reports	5				3					
5.14	Meetings with national & European decision makers					0.5					



CONTRIBUTING WORKPACKAGE ELEMENTS	DELIVERABLE REFERENCE NUMBER (see below)																
	1	2	3	4	5	6	7	8	9	10	12	13	14	16	19	22	28
1.1 Project Management & Administration																	X
1.2 Review of knowledge elicitation (etc) literature			X														
1.3 Design of TG evaluation technique portfolio			X														
1.4 Design TG evaluation framework			X														
1.5 Testing of TG evaluation technique portfolio							X							X	X		
1.6 Evaluating TG methods for each case study																	
1.7 Analysis of evaluation results																	
1.8 Annual & Final Reports																	X
2.1 Requirements Analysis (Software Technology)		X															
2.2 Functional Specification (TG Analysis Tools)	X		X								X						
2.3 Specify spatial and TG database structure		X	X														
2.4 Specify program interface / graphical user interface		X	X														
2.5 Specify TG analysis tools			X								X				X		
2.6 Program Interface (PI) - Design & Implement								X		X							
2.7 Graphical User Interface (GUI) - Design & Implement								X		X							
2.8 TG Analysis Tools - Design & Implement										X	X				X		
2.9 Imtegrate & test generic program interface (PI)								X		X	X	X	X				
2,10 Debugging								X		X		X	X				
2.11 Validation of TG analysis tools											X	X	X		X		
2.12 Evaluation of TG analysis tools							X							X	X		
2.13 Documentation of TIGRESS System																	X
2.14 Documentation of evaluation of TG analysis tools															X		X
2.15 Working Group (Technology Implementation Plan)																X	
4.1 Formal specification of model functionality	X		X		X												
4.2 Data preparation (water demand & demography)					X							X					
4.3 Simulation algorithms for water demand					X												
4.4 Development of supply side model					X												
4.5 Optimisation of water demand network expansion					X							X					
4.6 Validation of integrated demography/demand model					X							X					
4.7 Integrate supply & denamd side moels (INFRAPLAN)												X					
4.8 Implementation within TIGRESS System												X		X			
4.9 Sensitivity analyses														X	X		
4,10 Stakeholder engagement															X		
5.1 Negotiate communications protocols with TIGRESS	X	X		X													
5.2 Specify cities & demog. mechanisms for general model		X															
5.3 Data collection				X				X									
5.4 Prototype generic TG driver (EuroSim background model)		X		X				X			X						
5.5 Build/Test spatial vars. at different neighborhood levels				X													
5.6 Design & implement EuroSim model				X													
5.7 Model validation over the period 1960-2000				X						X							
5.8 Implementation within TIGRESS System										X							
5.9 Construct trajectories at the city level																	
5,10 Empirical analysis (Franco-German transborder region)															X		
5.11 Simulation of scenaria with differing border controls etc															X		
5.12 Annual & Final Reports																	X
5.14 Meetings with national/European decision makers																X	
6.1 Specify GUI and TG database requirements	X		X														
6.2 Review of land planning regulations (Regional & Municipal)						X											
6.3 Evaluation of habitat fragmentation						X	X										
6.4 Soil health evaluation						X	X										
6.5 Socio-economic analyses						X	X										
6.6 Indicator relationships (spatial & temporal)						X	X										
6.7 Development of an integrated TG database						X							X				
6.8 Verification & validation of TG database methodology									X				X				
6.9 Spanish report on land planning issues							X		X								
6,10 Spanish booklet									X								
6.11 Integration of TG database within TIGRESS System									X				X				
6.12 Scenario generation and simulation within TIGRESS							X								X		
6.13 Annual & Final Reports																	X
6.14 Meetings with national/European decision makers																X	

WPL Workpackage list

Work-package No[1]	Workpackage title	Lead Participant No[2]	Person-months[3]	Start month[4]	End month[5]	Deliverable No[6]
1	Project coordination & synthesis	1 UNEW	24.5	0	36	D28
2	The TIGRESS System: a Generic Time-Geographical Analysis Tool-kit	2 RIKS	66.4	0	36	D1, D3, D8, D12, D19, D22
3	Dynamic water demand and supply along the M11 corridor	3 SWS	80.7	0	36	D5, D13, D16
4	Dynamics of the European urban network	4 CNRS	75.4	0	36	D2, D4, D10
5	Land Planning and pathways to sustainable agriculture in Madrid	5 UEM	103.5	0	36	D6, D7, D9, D14
	TOTAL		350.5			

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[1] Workpackage number: WP 1 – WP n.
[2] Number of the contractor leading the work in this workpackage.
[3] The total number of person-months allocated to each workpackage.
[4] Relative start date of the work in the specific workpackage, month 0 marking the start of the project, and all other start dates being relative to this start date.
[5] Relative end date, month 0 marking the start of the project, and all end dates being relative to this start date.
[6] Deliverable number: Number for the deliverable(s)/result(s) mentioned in the workpackage: D1 - Dn.

DL Deliverable list

Work-package No	Deliverable No[7]	Deliverable title	Delivery date[8]	Nature [9]	Dissemination level [10]
2	**1**	Functional Specification of TG Analysis Tools	**6**	**Me**	**CO**
5	**2**	Prototype generic TG model	**9**	**Pr**	**CO**
2	**3**	Complete Specification of TG Analysis Toolboxes	**12**	**Me**	**CO**
4	**4**	Validated EuroSim model	**23**	**Si**	**CO**
3	**5**	Integrated supply and demand side model for water along the M11 corridor	**24**	**Si**	**RE**
5	**6**	GIS data and a Time-Geographical methodology for "agri-environmental" land planning	**24**	**Da / Me**	**CO**
5	**7**	Report in Spanish on land planning issues in the Madrid region	**24**	**Re**	**PU**
2	**8**	Implemented & tested TIGRESS Graphical User Interface (GUI) and Program Interface (PI)	**24**	**Me**	**CO**
5	**9**	Spanish booklet detailing land planning issues and TG methodology for agri-environmental land-use planning in Spain, with accompanying CD	**27**	**Th / Re**	**PU**
4	**10**	TIGRESS System with integrated model of European urban network dynamics	**27**	**Si / Me**	**PU**
2	**12**	Implemented and tested TG analysis tools for TIGRESS System	**28**	**Me**	**CO**
3	**13**	TIGRESS System with integrated model of M11	**32**	**Si /Me**	**RE**
5	**14**	TIGRESS System with integrated TG database for agri-environmental land planning in Spain	**31**	**Da / Me**	**CO**
3	**16**	Report on sensitivity analysis and validation of M11 corridor water demand and supply model	**32**	**Re**	**CO**
2	**19**	Technical Evaluation of TG Analysis Tools	**36**	**Re**	**PU**
2	**22**	Technology Implementation Plan (TIP)	**36**	**Re**	**RE**
1	**28**	All Interim and Final Reports, and all contractual obligations to the Commission	**36**	**Re**	**CO**

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[7] Deliverable numbers in order of delivery dates: D1 – Dn

[8] Month in which the deliverables will be available. Month 0 marking the start of the project, and all delivery dates being relative to this start date.

[9] Please indicate the nature of the deliverable using one of the following codes:

Re = Report; **Da** = Data set; **Eq** = Equipment; **Pr** = Prototype; **Si** = Simulation;
Th = Theory; **De** = Demonstrator; **Me** = Methodology; **O** = other (describe in annnex)

[10] Please indicate the dissemination level using one of the following codes:

PU = Public
RE = Restricted to a group specified by the consortium (including the Commission Services).
CO = Confidential, only for members of the consortium (including the Commission Services).

WP1	**Project co-ordination & synthesis**		
Workpackage number:	**1**		
Start date or starting event:	**Month 0**		
Participant codes:	**1 UNEW**	**3 SWS**	**10 BATH**
Person-months per participant:	**6**	**18**	**0.5**

1 Objectives

To co-ordinate the project, visit all case study areas, liase with all academic contractors, facilitate the timely presentation of all deliverables, provide advice and assistance to modellers and fieldworkers, collate, print, bind and present monograph reports. Meet all contractual obligations to the EU.

To provide advice and support on all aspects of Time-Geographical modelling to the other workpackages and to facilitate and strengthen linkages between WP 2 and the three case-studies (WP3-5).

To edit, set and prepare all project reports and draft monographs with the intention of offering them for publication.

To undertake an evaluation of TG methods and the TIGRESS System using a portfolio of knowledge elicitation techniques.

2 Methodology / work description

TiGrESS requires the co-operation of several institutions and end-users in each of four member states. Individual work packages are focussed on very specific deliverables (as specified in the call) which will be organised and integrated in a thematic way by the co-ordination group. The success of each theme is critically dependent on the timely presentation of key deliverables as the deliverables produced by one work package may be required as 'raw material' by others. WP1 will facilitate TiGrESS by defining a number of critical designated milestones and managing the work so that individuals and institutions reach those milestones at the appropriate juncture. These milestones are of two types: reports to the commission and the transfer of critical deliverables between work packages. WP1 will co-ordinate this process.

TiGrESS involves the development of a new software tool and substantial skills and knowledge transfer between consortium members. Each case study must liase closely with software developers and this necessarily involves a substantial investment in computer equipment and in face-to-face meetings. E-,ail contact and telephone conversations are not sufficient for this purpose. TiGrESS meetings will be of two types; bi- or tri-lateral meetings between software engineers and case study teams, and plenary meetings of the whole consortium. Under review it was suggested that the linkages between case studies and software developers be strengthened, though the project's budget has been substantially reduced. We have achieved these cuts by dropping one case study, reducing the project's term from four to three years and only organising full plenary meetings at start-up and on an annual cycle three months ahead of annual reports. Consequently, WP1 has a critical role in facilitating the knowledge-building and technological transfer necessary for a successful outcome.

Each of our case-studies has been chosen because the problem at hand requires us to understand how humans "make themselves at home" in a geographical space. However, they vary in their state of preparedness for TG methods. WP3 is arguably the most mature and readily applicable study. All the scientists involved have wide experience of decision-support tools and the work is clearly focussed on a single, critical question: Is it likely that the repeated use of optimising models on the supply-side will underpin a viable pathway to sustainable water exploitation along the M11 corridor? All the scientists involved are experienced modellers and we envisage that integrating WPs 4 and 2 will be relatively straightforward.

WP4 is a slightly different case. Once again, the modelling question is well-formulated and all personnel experienced in TG method but the model being contemplated is to be used to explore the demographic implications of changing border permeability not to tell politicians how to legislate for sustainability. The policy-relevance of this workpackage lies in its use to explain the likely implications of current processes. Once again, we envisage no substantial difficulties in communicating TG concepts, though a substantial investment of effort will be required to tailor the model and the TIGRESS client to each other (see WP2 below).

WP5 is probably the most challenging of the three case studies because we expect it to involve a double education process. Staff from UEM will educate programmers about the constraints and expedients their work must respect while the developers of the TIGRESS client must assist and guide the UEM team in the use of the system. In order to minimise travel costs and language barriers, the Manager of the Madrid project will be a native speaker of Spanish, fully familiar with the case study area but resident in Northern Europe. TiGrESS cannot afford to have personnel from RIKS and ICL resident in Spain for long periods, so we will train the Manager of the Madrid project in Northern Europe and send her to Madrid to undertake essential fieldwork and liase with UEM personnel directly.

In addition to visiting all partners, the co-ordinator will organise three annual general meetings at which consortium

	members will be required to present their results and co-ordinate their annual reports to the Commission. The co-ordinator will also be responsible for the collection, edition and publication of the final reports. These reports will be of draft monograph quality, the intention being to use them as the basis of a synthetic volume on Time Geographical methods along with three case study specific volumes. The aim is that the project consortium will publish and distribute these volumes after the end of the 3 year TiGrESS timeframe, in a fourth year to be funded from supplementary applications, either to the EU or to external sources. The production of the monographs is entirely dependent on such monies being made available and their delivery is not guaranteed under this contract. TiGrESS will, of course, produce annual reports to the EU, prepare papers for publication and presentation at conferences and maintain a web-site to disseminate its key results and public-domain reports. Finally, WP1 will be responsible for evaluating the utility of TG methods for producing information relevant to sustainable development policy and for increasing scientific understanding and knowledge regarding complex spatial and temporal phenomena. The utility of TG methods will be assessed using a variety of psychological, cognitive and social enquiry methods centred around investigating the dynamics of the interaction between the TIGRESS System and its users. How human understanding and reasoning processes change during interaction with computer-based modelling and analysis tools and how the use of those tools changes as a result is an open area of research. The issues concerned are vital to obtaining a better understanding of how humans explore, learn and make decisions about the world using computer-based modelling and analysis technology. An experienced modeller and a knowledge management expert, both from Cranfield University, will initially work with a sub-contractor to develop and implement a portfolio of knowledge elicitation techniques to explore the impact of TG methods and the TIGRESS System on knowledge-bases and conceptual maps. The portfolio of elicitation methods to be developed will include *verbal protocols*, *process tracing*, *pre-* and *post-process* testing. The data will be analysed using a range of inductive, qualitative and taxonomic methods to document changes in the user's knowledge and conceptual basis. A *framework for deploying* the portfolio of techniques and evaluating the utility of TG methods for different types of activity will also be developed. The interaction between end-users from each case-study (scientists and decision-makers) and the TIGRESS System will be investigated using the portfolio of techniques within the framework developed. For the evaluation process the user and TIGRESS System will be viewed as a single decision 'system' intimately linked through information flows and feedbacks rather than as two separate components with little influence on each other. The use of a domain expert (a scientific modeller) will be essential to the success of the evaluation process as the human-computer interface (HCI) and interaction issues surrounding the task require a deep understanding of scientific investigation, modelling and decision-support activities. The results will be presented as a chapter in the final report. The sub-contractor and the knowledge management expert from Cranfield will make themselves available to the evaluation component of the TiGrESS project. An expert from Bath University (Partner 10) will be available for 4 days per year to help tailor the portfolio of elicitation methods employed and to provide technical support. The actual elicitation work will be undertaken by co-operation with the Cranfield expert, a specialist in technology and innovation with many years experience of inter-disciplinary and integrative research. This expert will stand by to work on average for 15 days per annum, this time to be spent attending meetings and workshops to act as a facilitator of the research. The task list for the WP research is as follows (MM – man-months): **1.1** Project management and administration (3 MM). **1.2** Review of knowledge elicitation, cognitive psychology and social enquiry technique literature (2 MM). **1.3** Design of TG evaluation technique portfolio (4.25 MM). **1.4** Design of TG evaluation framework (0.75 MM). **1.5** Testing of TG evaluation technique portfolio (1 MM). **1.6** Evaluating TG methods via application of technique portfolio to each case-study (3 MM) **1.7** Analysing evaluation results (3.75 MM). **1.8** Annual and final reports (6.75 MM).
3,4	**Milestones & Deliverables** *m1.* Kick-off Meeting (month 1). *m2.* Review of knowledge elicitation, cognitive psychological and social enquiry technique literature (month 6). *m3.* First AGM of consortium (month 9) *m4.* First Year Report (month 12). *m5.* Specification of TG evaluation technique portfolio (month 15). *m6.* Specification of TG evaluation framework (month 17). *m7.* Tested TG evaluation framework (month 19). *m8.* Second AGM of consortium (month 21).

	m9.	Second Year Report (month 24).
	m10.	Evaluation of all TiGrESS case-studies (month 32).
	m11.	Third AGM of consortium (month 33).
	m12.	Analysis of evaluation results (month 34).
	m13.	Third Year Report (month 36).
	D28:	All Interim and Final Reports and contractual obligations to the Commission

WP2 The TIGRESS System: A Generic Time-Geographical Analysis Tool-kit

Workpackage number:	**2**		
Start date or starting event:	**Month 0**		
Participant codes:	**2 RIKS**	**6 ICL**	**1 UNEW**
Person-months per participant:	**40.9**	**19.5**	**6**

1 Objectives

Time Geographic analysis requires the production and manipulation of particular types of information regarding spatial *and* temporal dynamics on a range of scales from the trajectories of individuals to the emergent formation and dissolution of large-scale social, economic and environmental structures. Current technologies for handling and visualising spatio-temporal information (e.g. static and dynamic digital maps) lack the integrated functionality and flexibility required for this task. New tools are required, both to facilitate a proper evaluation of Time Geography and to fully realise the potential that this methodology may offer for investigating complex policy problems.

The objective of this work-package will be to design and implement, based upon a detailed requirements analysis from each case study, a common set of tools for the visualisation and analysis of Time Geographic data and model output. A common TG analysis environment, the TIGRESS Proof Of Concept Demonstration System (**TIGRESS System**), will be developed to contain these tools and act as an interactive user interface and analysis package for Time Geographic models and databases. The visualisation environment will be tailored to each of the case study models based upon their exact requirements.

As part of this task, a common 'Time Geographic' program interface will be developed to permit the TG analysis and visualisation environment to interact with each case study model. The use of a common program interface will permit each case study model to be updated and replaced without a need to modify the interactive user environment, paving the way towards a generic plug-and-play Time-Geographic modelling, analysis & visualisation environment.

The TIGRESS System will be developed for the PC platform and will run under Windows. For its development use will be made to the fullest extent possible of existing application frameworks. Component Based Technology will be applied to develop the program interfaces required. The structure of the TIGRESS System is summarised in Figure 2.

WP2 will also convene a working group to develop a Technology Implementation Plan (TIP) for the TIGRESS system. This group will report in Year 3 on the academic and commercial exploitation prospects for both the TIGRESS System and the case-study implementations.

2 Methodology / work description

The Time-Geographical models and/or databases developed by each of the case-study workpackages, and the tools for analysing and visualising Time-Geographic information will be incorporated into a graphical user interface (GUI) through the use of a common TG program interface (PI) for communication and information transfer (see Figure 2). The GUI will be tailored to suit the requirements of each case-study, whereas the PI will be designed more generically to communicate with all the TiGrESS TG models and databases based upon the different spatial and temporal components of Time Geographical information (e.g. individuals with associated trajectories, stations (local pockets of order), projects (intentionality and goals), and spatio-temporal constraints).

The implementation process will follow accepted software engineering principles (iterative, evolutionary delivery) through an iterative process of functional specification, technology assessment, technical design specification, design, implementation and testing/analysis.

At the outset of the project each workpackage will provide a functional specification of the TG models/databases to be developed for each study area. These functional specifications will involve close collaboration between WP2 and the case study workpackages (WP2-5) specifically through tasks 2.2-2.5, 4.1, 5.1 and 6.1, with the agreed specifications providing the basis for the workpackage tasks detailed below. Ongoing review of the status of model and TIGRESS System development will maintain the interfocus between the workpackages, culminating in the integration of each model/database into the TIGRESS System (see tasks 2.9, 4.8, 5.8 & 6.11).

2.1 Assessment of the Best Available Technology for both TG simulation and visualisation (2.3 MM).

- Requirements analysis for best available simulation and visualisation technologies
- Negotiation of technology most suited to implementation of the program interface (PI)

2.2 A requirements analysis for the TG Analysis Toolboxes, to result in a functional specification of the tools that reflects the need to evaluate TG methods and analyse TG dynamics in each of the case study contexts. It is against this specification that technical evaluation of the toolboxes will be carried out (see task 2.12) (3 MM)

Upon completion of the requirements analyses, and with the underlying GUI requirements identified for each workpackage, the following components will be specified:

2.3 Spatial database and trajectory database structures. (7.2 MM)

2.4 The program interface (PI) between the analysis and visualisation software and the TG models, and the graphical user interface (GUI) for each of the four study areas. (4.2 MM)

2.5 Generic tool functionality for analysing and visualising TG model output and databases. There will be four types of generic analysis tools: (8.4 MM)

i. Pre-processing of spatial and TG information required to prepare input for TG models and the other analytical tools;
ii. Post-processing of spatial and temporal raster and vector information through access to databases generated and used by TG models;
iii. Real-time TG tools for the analysis of qualitative and quantitative changes in user-specified spatial and temporal, raster and vector TG model outputs or database contents;
iv. Real-time TG tools (e.g. the lens shown in Figure 1) for visualisation and detection of emergent patterns, structures and conflicts over time and space in TG model output or database contents.

Software design and implementation will follow directly from the design specification stage.

2.6 Design and implementation of the common Time Geography PI. This task will be carried out concurrently with the development of a prototype TG model (deliverable D2), designed to conform to the PI. (4.5 MM)

2.7 Design and implementation of the graphical user interfaces (GUIs) and user dialogues for each workpackage that will enable control of the TG models and databases. The GUIs will incorporate an interface with selected commercial GIS software to facilitate data input, storage and scenario specification. (4.7 MM)

2.8 Design and implementation of the TG analysis and visualisation tools (pre-, post-processing and real-time). (8.1 MM)

With the common PI and tailored case-study GUI's implemented, WP4 will provide WP2 with a prototype TG model (deliverable D2) that conforms to the common PI for the purposes of testing:

2.9 Integration of the prototype TG model and testing of the program interface using the prototype model together with existing TG databases. (3 MM)

2.10 Debugging will be an ongoing task throughout testing and integration of each WP model. (1.4 MM)

The tasks required for implementation and testing of the case-study models to be developed by each workpackage, together with scenario specification and simulation will be carried out within the relevant workpackages.

In parallel with the implementation of models being carried out in individual workpackages, the TG Analysis toolboxes will be technically verified and evaluated, using both the combined prototype TG model and existing databases, and the implemented models and databases from each case-study workpackage:

2.11 Verification of Time-Geographical Analysis Tools (pre-, post-processing and real-time). (5.7 MM)

2.12 Evaluation of Time-Geographical Analysis Tools (pre-, post-processing and real-time). (6.6 MM)

2.13 Documentation of the TIGRESS System, highlighting the manner in which it can be utilised as a benchmark standard for TG analyses incorporating plug-and-play integration of TG models. (1.6 MM)

2.14 Documentation of the technical evaluation of the TG analysis toolboxes incorporating examples from case-study simulations. (1.3 MM)

One final task will be carried out in Year 2 of the project with the purpose of enhancing the exploitation potential of the TIGRESS System:

2.15 Partners 1, 2 and 6 (Newcastle, RIKS & ICL) will organize a working group to include both scientists working on the three case-studies and invited experts from outside of the consortium in order to carry out a stakeholder analysis and determine the academic and market exploitation potential of the TIGRESS System. This working group will be organized to coincide with tested prototype TIGRESS System at the end of Year 2. The results of this working group will form the basis of the Technology Implementation Plan (TIP) to be presented to the consortium at the Year 3 AGM and to the EU at the end of the Project (see D22). (0.5 MM)

The experts invited for participation in developing the TIP will include both those within the consortium institutions, such as IC Innovations Ltd, and those associated with consortium members through existing EU projects (eg. FUTUREtec, associated with Cranfield University.)

In addition to these tasks, four annual meetings will be attended (2 MM), annual and final reports will be written (1 MM) and a number of bilateral technical meetings will be necessary (1 MM)

3, 4	**Milestones & Deliverables** *m1.* Specification of the generic Program Interface (month 5) **D1:** Functional Specification of TG analysis tools (month 6) *m2.* First AGM (month 9) *m3.* First year report (month 12) **D3:** Complete Specification of TG analysis tools (month 12) *m4.* Implemented PI/GUI (month 20) *m5.* Second AGM (month 21) *m6.* Second year report (month 24) **D8:** Implemented and tested Program Interface and Graphical User Interface (month 24) **D12:** Implemented and tested TG analysis tools (month 28) *m7.* Third AGM (month 33) *m8.* Evaluated TG analysis tools (month 33) **D19:** Documentation of technical evaluation of TG analysis tools (month 36) **D22:** Technology Implementation Plan (TIP) (month 36) *m9.* Final report (month 36)

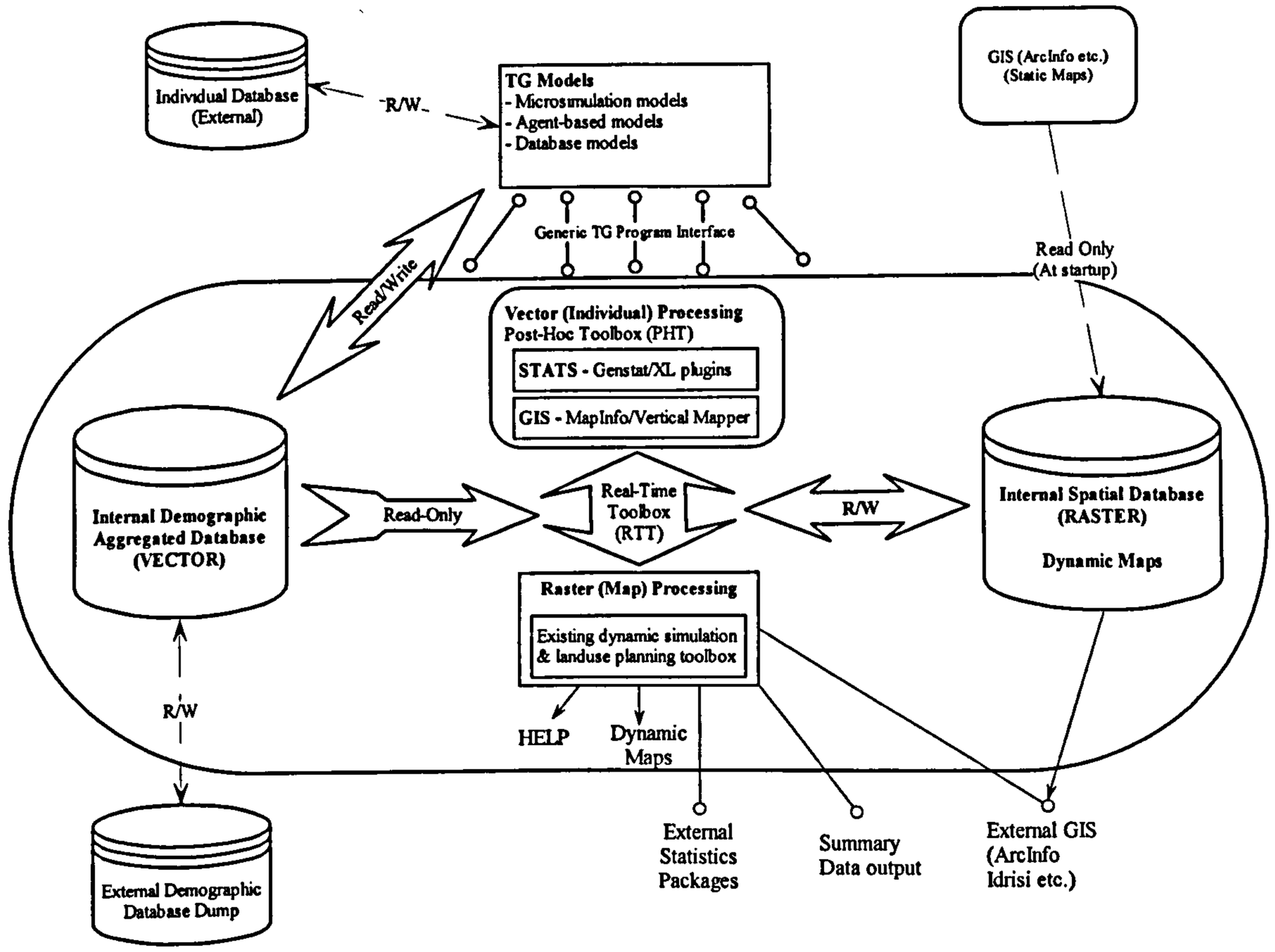


***Figure 2** : TIGRESS System Architecture, highlighting the real-time and post-hoc toolboxes, spatial and temporal databases, and linkages to off-the-shelf statistical and GIS software.*

WP3 Dynamic water demand and supply along the M11 corridor

Workpackage number :	**3**				
Start date or starting event:	**Month 0**				
Participant codes :	**2 RIKS**	**3 SWS**	**6 ICL**	**7 CWS**	**8 DLA**
Person-months per participant:	**4**	**41.7**	**1**	**30**	**4**

1 Objectives

The primary objective of WP3 is to support the strategic planning of water supply infrastructures through development of a spatially discretised strategic water demand and supply analysis tool (hereafter referred to as the INFRAPLAN tool). The tool will support decision making regarding water resources planning for water utilities, but also be useful in support of dialogue between utilities, regulators, environmental bodies, and other stakeholders. It is important to note that the tool to be developed within WP3 is not intended to be generic (at this time). In terms of a user interface, functionality will be limited to providing a set of tools which can be used to explore strategic water resources management within the case study area. However, advanced visualisation and analysis features for the INFRAPLAN tool will be supported through the TiGrESS System, providing the basis of a generic tool for application at a range of spatial and temporal scales. A secondary aspiration of the project is to make the tool generic enough to handle industry standard data sets (see below).

INFRAPLAN functionality will focus on providing the capabilities for the exploration and analysis of:

- water demand profiles at a number of spatial and temporal resolutions; and
- optimal capacity expansion programmes under different demand, climatic, and economic assumptions.

Whilst the treatment and infrastructure networks which provide potable water and treat waste water are largely fixed in space, performance attributes and capacity, the communities and built environments which they serve are constantly changing.

Process treatment and network capacity planning (in terms of both water and wastewater) for the water industry is influenced by a complex range of economic, physical, and environmental factors which serve as both constraints and opportunities. Despite the complexity of interactions between these factors, they all have spatial and temporal characteristics which are amenable to representation and analysis.

In order to move towards a *co-evolutionary* analysis of the relationships between demand and supply, we take a contemporary case study from the United Kingdom. Government plans for the economic development of South East England make provision for large scale commercial, housing and industrial development along a corridor which runs from North East London, along the M11 motorway, to the city of Cambridge. Water resources are already under pressure in this region from the impacts of climate change and competing demands for water as a commodity and as a natural resource (see Annex 2 for additional information). Reliable projections of future water demand are essential for the design of water supply networks. Either over-capacity or under-capacity in the system can lead to significant financial, environmental and economic costs. WP3 will build a dynamic representation of both the supply and demand side processes along the M11 corridor. The model will be used to search for possible pathways to long term, sustainable balances between supply and demand.

2 Methodology / work description

The methodology adopted for this workpackage is structured to support a high degree of collaboration between the TiGrESS partners involved. Our intention is to formalise the model development process in such a way as to promote clear understanding of responsibilities and goals, facilitate communication between the partners, and thereby minimise uncertainty and ambiguity. A large number of workpackage specific meetings and bilateral visits between WP3 partners will support this approach.

In outline, the INFRAPLAN model will comprise three functional components;

1. A land use template allowing specification of the evolution of land use patterns, housing densities/types etc.
2. A demand projection tool.
3. An infrastructure configuration and process plant location optimisation tool.

The land use template will use standard GIS techniques to provide a spatial representation of the case study area. Representation of features will concentrate on those aspects of the physical environment which influence demand for water and infrastructure extension.

The demand side component will allow definition of water demand profiles across a landscape to be characterised in terms of both water quantity & quality. A depiction of water use potentials across the case study area will be generated through allocation of land-use classifications and, within these, water use profiles relating to domestic,

commercial, agricultural and industrial uses. Predicted water demand profiles for user selected zones will be available at daily, weekly, seasonal and yearly cycles. Separate time-series algorithms will be used for forecasting domestic, commercial, industrial and agricultural demand projections. For example, that used for domestic demand will adopt an approach which identifies base line demand through polynomial regression and modifies this as a function of variables such as climate, socio-economic status, and housing type. The impact of a limited set of demand management techniques on demand profiles will also be implemented in this component.

The supply side algorithms will integrate mathematical simulation models (to model the quantity and quality of water delivered) and optimisation models (to achieve cost effective network expansion solutions taking into account required levels of service, sustainability, and other criteria). Simulation models are often used to test "what if" scenarios, or to design water system strengthening and rehabilitation schemes. Water distribution models often involve thousands of interconnected elements, where the decision to alter one element has an effect on a large part of the system. Given the extreme complexity and size of most models, there is almost no chance of the designer finding the "best" scheme using the "trial and error" approach. However, with the simulation model linked to an appropriate optimisation routine, the computer can explore an extremely wide range of possibilities very thoroughly and converge onto the optimal solution. Genetic Algorithms (GAs) have a relatively short but spectacular history in achieving such results. In simple terms, GA uses a computer model of Darwinian evolution to "evolve" good designs or solutions to highly complex problems for which classical solution techniques such as linear programming or gradient-based methods are often inappropriate or sometimes hopelessly inadequate. This project will develop the supply side algorithms based on simulation, which can incorporate all the options for individual system components, and GA-based optimisation to evolve optimal network expansion schemes.

Since the capacity expansion problem can be characterised as having several non-commensurate and often conflicting objectives, this research programme will develop a multi-objective GA optimisation tool, in which the different problem criteria are evaluated separately and each solution is assessed according to these terms. The result is not a single point but a set of points known as a Pareto-optimal set. Each solution of the Pareto optimal set is not dominated by any other solution, i.e. in going from one solution to another, it is not possible to improve on one criterion without making at least one of the other criteria worse. It is clear, however, that there is a need to identify as many solutions as possible within the Pareto-optimal range to ensure that an acceptable solution will be produced. This often represents a problem with standard methods for generating a Pareto-optimal set. By maintaining and continually improving a population of solutions, a GA can search for many non-dominated solutions at the same time, which makes it a very attractive tool for solving multi-objective optimisation problems.

Integration of the demand and supply side elements will be achieved through a series of algorithms designed to convert information from the land-use and demand projections into performance attributes and constraints for the supply side expansion optimisation component which will topologically optimise network expansion (in addition to capacity based optimisation, i.e. to achieve pressure/flow requirements).

The following specific, auditable tasks are included in the methodology:

4.1 Formal specification and documentation of simulation model functionality, interfaces, data exchange techniques, database structures and simulation algorithms. Involving close collaboration between partners 2, 3, 6 and 7, this activity relates to both the specification of the water demand-supply evolution model and the interfacing of this model with the TIGRESS platform (see WP2, tasks 2.2-2.5) (6 MM)

4.2 Data collection and preparation – to include water demand, demography, land use suitability, regional plans and costs for supply side optimisation elements. Several categories and formats of data are required and these are to be defined through task 4.1 above. In addition to requiring topographical and current land use data, we will also secure access to data relating to current infrastructures, anticipated climatic conditions, current water use behaviour in the region, and the development plans themselves. Partner 11 is involved in the scoping of development scenarios for the M11 corridor and will provide much of the required data. Additional data resources include a local water utility and an Atmospheric Data Centre (with which Partner 3 has a data provision agreement). (6 MM)

4.3 Simulation algorithm for changes in water demand – Primarily the responsibility of Partner 3, this task will generate the mathematical representations and computer code required to forecast water demand in the case study area over daily, weekly, seasonal and yearly timescales. (10 MM)

4.4 Development of supply side models for inclusion with the GA optimisation routines. These will include a clean water hydraulic extended to include a supply side costing model based on data collected in 4.2. (8 MM)

4.5 Algorithms for multi-objective optimisation of water supply network expansion will be developed using Genetic Algorithms technology. This will include investigation into: (1) Pareto front generation techniques to ensure good coverage of the non-dominated space, and (2) Internal representation of decision variables (network components) within a genetic algorithm which may lead to the development of specific reproduction (crossover and mutation) operators to suit particular representations. The GA optimisation algorithms will be tested using hypothetical problems and real case studies. (15 MM)

4.6 Water demand projections will be validated against a number of contextually relevant data sets (i.e. relating to contemporary and geographically similar environments). For example, the domestic demand projections will be calibrated against data supplied by the local water company who have been carrying out a detailed demand monitoring programme in the region for over 10 years. (5.5 MM)

	4.7 Integration of demand prediction and supply side optimisation models (including multi-objective GA routines) to form the INFRAPLAN model. (4 MM) **4.8** Implementation of the INFRAPLAN model within the TIGRESS System. – Representing a critical linkage with WP2, this task will involve partners 2, 3, 6 and 7, and will build on Task 4.1, which formalises the programming and functionality of the interface between the two applications. This will involve the development of help files to ensure proper understanding and use of the INFRAPLAN modules and the development of default values for use with the GA optimisation routines. (6 MM) **4.9** Sensitivity analysis - The sensitivity of final demand projections and infrastructure expansion plans to changes in land use suitability and changes in population growth scenaria will be explored. In addition, the influence of key algorithm parameters. (6 MM) **4.10** Stakeholder engagement activity using the integrated INFRAPLAN model to explore how land use planning options in the case study area might impact sustainable water resources management. This task will utilise the role of Partner 8 in the M11 corridor planning process to gain credible access to end-users. The aim is to use the integrated model to support dialogue between stakeholders and this process will be formally monitored and analysed. Following interpretation of the stakeholder process, changes to both the model functionality and the way in which it is presented to stakeholder groups may be recommended. (11.5 MM) In addition annual and final reports will be written (1.7MM) and several bilateral technical meetings will be attended during the lifetime of the project (1 MM)
3, 4	**Milestones & Deliverables** *m1.* Negotiation of the TIGRESS – INFRAPLAN model interface (month 6) *m2.* Statement of model functionalities and data representation formats (month 6) *m3.* First AGM (month 9) *m4.* First year report (month 12) *m5.* Supply side model (month 14) *m6.* Demand side model (month 20) *m7.* Second AGM (month 21) **D5:** Integrated supply and demand side model (month 24) *m8.* Second year report (month 24) **D13:** TIGRESS System with integrated model of the M11 corridor (month 32) **D16:** Report on sensitivity analysis and validation (month 32) *m9.* Third AGM (month 33) *m10.* Final report (month 36) We intend and expect that this project will generate additional publications. However, *no contract will be entered into in respect of this additional work*. We also intend to apply for additional funding from national sources to disseminate and exploit the products of this work package.

4	**Dynamics of the European urban network**		
Workpackage number :	**5**		
Start date or starting event:	**Month 0**		
Participant codes :	**1 UNEW**	**2 RIKS**	**4 CNRS**
Person-months per participant:	**9**	**4**	**62.4**

1 Objectives

The main objective of WP4 is to develop a model to simulate the dynamics of the European urban network in response to demographic change, international and national immigration policies and spatial constraints. Continuing trends towards globalisation and the successive weakening of national border controls can be expected to result in profound demographic changes over the next few decades. Although the effects of these can only be fully modelled on a European scale, their impacts are likely to be felt on a regional scale. This makes the investigation of spatial dynamics on a Europe-wide scale a high priority for policy-relevant research.

The first phase of work will develop a very general model and simulation engine of the whole of the European Urban network. This model, EuroSim, will be based on a very simple representation and designed to conform to the TIGRESS System TG program interface (see WP2). EuroSim will be passed to TiGrESS participant 2 in the first half of the project to act as a prototype TG model and facilitate TIGRESS System development. While this is underway, data will be collected and analysed to parameterise a problem-oriented sub-model. The sub-model will be embedded into EuroSim and used to explore and visualise the possible futures of the urban system in the coming 30 years. It will help to provide an insight into which cities, which sets of cities, have highest potentials of growth; which ones risk an irremediable decline; where one could expect reversal of current trends, and under which conditions.

The integrated EuroSim model will be used to build and explore scenaria, with particular attention paid to:

- the long-term effects of present demographic trends;
- the degree of "freedom of action" of local decision-makers in the face of constraints based on (1) historical long-term trends, and (2) the relative position in the national and European network;
- the impact of different macro-level policies according to immigration from non EU countries ;
- the long-term influence of weakening borders in the European Union, and of extended European integration.

In order to test hypotheses concerning the last issue, research will be developed on a specific cross-border region, France-Germany. A local problem-oriented sub-model will be developed. It will focus on the range and the spatial organisation of cross-border flows (in particular border-commuting people), and the impact of the opening of the border on the change in the regional urban network. Modelling on these scales is necessary because of the need to embed the model of a local issue (in this case migration across the Franco-German border) in a wider model capable of simulating the 'boundary conditions' within which these dynamics are set. Accordingly, the workpackage will undertake two phases of modelling to properly address the relationship between these two geographical scales.

The evolution of the number of inhabitants is a good measure of the wealth of a place. It reflects the dynamics of the age structure (dependent on preceding migrations) and of the migratory attractivity. The ability of a city or a town to be attractive depends on many factors. We propose to emphasize *context* effects of different levels: the *proximity to the core*, the *relative position* hierarchically and geographically, and the *urban forms*. (see Appendix B1 for additional information). The question of sustainability will be analysed at different levels:

- At the local level of the city or the town: Below a certain number of inhabitants, the available information may be insufficient for adopting some innovations, and some services could be over-dimensioned etc. So a reduction in population below a certain threshold may reduce the image and attractivity of the place, causing further decline. This kind of retroaction is clearly a factor of unsustainability at the level of the city or town.
- At the regional, national and European level: Different relative growth and decline induce a *recomposition* of the urban settlement. To a certain extent the decline of some cities will have no impact on the functioning of the whole system, but too important and systematic inequalities inside the system of cities could result in unsustainability of the whole system (increasing costs of territorial management for example).

Therefore it is important that the model can provide future trajectories at the level of cities, types of cities, regions and the macro-level of the European urban system.

2	**Methodology / work description** The aim is to develop a spatio-temporal model of the European urban network: - the model will be *spatial* in two senses. First the rules of change will be developed at the elementary level of the cities and the towns. Second, spatial rules will be inbuilt in the model in order to formalise the different sets of interactions which constitute the driving force in the evolution of places. - The model will be dynamic: the period 1960-2000 will be used in order to validate the mechanisms of change, and the scenaria will be developed for the period 2000-2030. Both steps will be developed at two levels: 1- the macrolevel (total urban growth, rank size distribution at a national level, rhythm of population change for different types of cities); 2- the level of the cities, by following the trajectories of the greater cities and of a number of representative ones (industrial cities, peripheral, smaller near the core etc.). The model will be agent-based, with each town and city formalised as an agent. Information about the urban entities and their surroundings, and the rules of change will be handled at that level. The protocol of communication associated to multi-agent systems will be used in order to model the *interactions* between the urban entities. These interactions, constituting the driving force of the model, follow hierarchical and spatial logics. A sub-model will be developed for the trans-border area where there is access to more complete information on migration flows. EuroSim will be available for re-use in subsequent research projects. By embedding new, regionally specific sub-models into EuroSim, we expect to use the system to address many demographic problems related to globalisation and the relaxation of constraints on human migration. The tasks required for completion of this workpackage are: **5.1** Negotiate model communications protocols for communication with TIGRESS System to provide the necessary interfocus between case studies through the functional specifications emerging from this task (6 MM) **5.2** Specify Cities and basic demographic mechanisms of the general model (EuroSim) (6 MM) **5.3** Collection of data : the number of inhabitants has to be collected at the level of the urban units (depending on the country it could correspond to a commune, to several communes or be included in a commune); statistical data will be used but also data over the spatial extent of the urban units (using Corine landcover). (10 MM) **5.4** Design and build prototype TG model. This prototype model (deliverable D2) will maintain the interfocus between WP4 and WP2, being used to verify the PI/GUI development (tasks 2.6, 2.7) and once integrated with the TIGRESS System (task 2.8), to facilitate its' continued development and testing (5 MM) **5.5** Building and testing spatial variables describing different levels of neighbourhoods (4 MM) **5.6** Design and implementation of EuroSim (8 MM) **5.7** Validation of the model on the period 1960-2000 at a macro-level (6 MM) **5.8** Implementation within the TIGRESS System. The final integration of the EuroSim model with the TIGRESS System represents a shift in the interfocus between WPs 2 and 5 from development to validation and evaluation. (6 MM) **5.9** Constructing trajectories at the city level (6 MM) **5.10** Empirical analysis of the Franco-German trans-border region (7 MM) **5.11** Simulate test scenaria on the effects of opening borders & different policies w.r.t non EU-immigrants (5 MM) **5.12** Write annual and final reports (5 MM) **5.13** Map production and project reports (1 MM) One final task will be carried out in parallel with the development of EuroSim for the purposes of exploitation and dissemination of the WP results: **5.14** National and European decision makers will be approached to present the work carried out in WP4, with invitations to participate in the evaluation and use of the TIGRESS System for analysing intra-EU demographics and the implications of alternative border policies. The outcome of these meetings will be presented at the Year 3 AGM, and will contribute, where appropriate, to the Technology Implementation Plan (see task 2.16 & D22). (0.5 MM) In addition several bilateral technical meetings will be attended during the lifetime of the project (0.5 MM)
3, 4	**Milestones & Deliverables** *m1.* Data collection and basic testing of variables at the European level (month 8) *m2.* First AGM (month 9) **D2.** Prototype generic TG model (month 9) *m3.* First year report (month 12) *m4.* Data collection and basic testing of variables for the transborder region (month 18) *m5.* Second AGM (month 21) **D4.** Validated EuroSim model (month 23)

	m6. Second year report (month 24) **D10.** EuroSim model implemented within the TIGRESS System (month 27) *m7.* Third AGM (month 33) *m8.* Scenarios for 2000-2030 (month 30) *m9.* Final report (month 36) We intend and expect that this project will generate additional publications, including a doctoral thesis and possibly a published monograph after submission of the Final Report. However, *no contract will be entered into in respect of this additional work.*

WP5	**Land Planning & pathways to sustainable agriculture in Madrid**		
Workpackage number :	**5**		
Start date or starting event:	**Month 0**		
Participant codes :	**1 UNEW**	**2 RIKS**	**5 UEM**
Person-months per participant:	**33**	**4**	**66.5**

1 Objectives

We will develop a Time-Geographical land-use planning tool for the following purposes and end-users:

- As a research tool for exploring and providing advice on land use planning regulations. It will be used by scientists within TiGrESS partner 5 institution in their work as consultants in the planning process.
- As an educational tool for students in land planning and ecosystem management courses. These courses will be carried out mainly within TiGrESS partner 5 institution for training at graduate and post-graduate level for professionals involved in the planning process.
- As a tool for the strengthening the democratisation process through making data and information available to the wider public. This will be achieved by writing and distributing a report in Spanish and a CD carrying illustrative material.

The TG land-use planning tool will be based on the development and integration into the TIGRESS System of a Time-Geographical database that will address:

- Land planning regulations: changes in land planning regulations and how these changes could promote sustainable development in general, and sustainable agriculture in particular, in the Madrid Autonomous Community.
- Indicators of sustainable agriculture: soil health, socio-economic and habitat fragmentation indicators. These indicators will aid in the process of designing land management and restoration plans, and land-planning regulations to increase agricultural sustainability.

The TG database will:

- Include a complete GIS summary of regional topography, recent changes in land-use and land-cover.
- Integrate spatial, ecological and commercial data and to summarise their collective impacts on human life-histories and agricultural developments over the last five decades.

The TG land-use planning tool will form a central component of a Time-Geographical methodology for planners to be developed as part of WP5. This will permit the specification and design of policy scenaria integrating social needs, natural resources conservation and the development of sustainable agriculture. The methodology, along with the TIGRESS System-based tool, will incorporate the various relevant strands of evidence into a single coherent data stream for analysis and visualisation.

Based on the use of the TG tool and methodology, a report in Spanish will be produced for a technical and specialist audience, to inform current discussion about revised land planning regulations. The report will be distributed with a CD of the TIGRESS System and TG land-use planning database. In addition, a smaller booklet will be produced and distributed to describe the results of the workpackage in a manner suitable for informing the stakeholders on the ground. This will improve access to knowledge and help democratise the land planning process.

2 Methodology / work description

The research will be carried out at three main scales:

- The first one is at a territorial level that involves most of the Madrid Autonomous Community.
- The second one is at a regional level involving units of several municipalities.
- The third one is at the municipal level. Three pilot municipalities will be chosen as they represent three main agri-ecosystems in the territory.

Land Planning Regulations: Over the last three decades the Madrid Autonomous Community has gone from having no land-planning controls to a well-defined and firm planning system. Most of the planning regulations were drafted by architects whose conception of planning issues was neither representative of nor sensitive to the needs of the wider community and of the natural resources. The system has been particularly damaging in respect of environmental and socio-economic issues. A great deal of valuable agricultural land has been lost to buildings and dams, resulting in damage to the economic bases of rural communities and growing pressure on the natural environment. This pressure has resulted in the tightening of regulations, which has further constrained economic development in rural communities. The result has been a form of cultural exclusion arising as an unforeseen

consequence of earlier water-management and land-planning decisions.

The regulations are reviewed on a ten-year basis and the next phase of review seems likely to result in substantial changes. The changes made must reflect the contemporary situation, including the location of dams and new settlements, while actively searching for viable pathways to economic and environmental sustainability.

Two opposing pressures must be reconciled. Growing popular and commercial pressure is being exerted to relax planning restrictions, particularly in respect of new developments while the statutory requirement to maintain Regional Parks and the demands of Agenda 21 require the maintenance and, in some cases, some tightening of existing controls. The reconciliation of these conflicts calls for a deep understanding of the social and legal contexts in which they arise. We will provide that understanding by a series of documentary and social-science studies.

The different types of current regulations will be reviewed, both those related to land planning itself and those related to conservation of the natural environment. At the municipal level a historical review of land planning changes through time will be carried out along with a socio-economic study incorporating historical and present day data. Interest groups and their needs in the use of the territory will be defined. Questionnaires, discussion groups and personal interviews will be used to elicit this information.

At the same time, work to construct a map of homogeneous agri-environmental units will be undertaken. We will develop a set of GIS-based methods to integrate the possible uses of land, the social needs of the land, and their possible impacts on natural resources, in order to increase agricultural sustainability. This socio-environmental GIS output will provide different proposed alternatives for land use suitability and will be integrated into the TiGrESS System as part of the WP5 TG database.

Three main research topics will be investigated in the context of indicators for use in integrating sustainable agriculture into land-planning regulations.

Soil health indicators: The soil is a complex dynamic system in its own right with a substantial living and organic component. Prior work undertaken by TiGrESS participant 5 has shown that the measurable parameters of soil health and crop productivity are inter-related with each other and with agricultural practice in a consistent and understandable way. At a superficial level, therefore, one might imagine that the key to maintaining soil health and good levels of productivity is purely a matter for the farmer. In practice, however, this is not the case.

Socio-economic indicators: The farmer, who works a specific set of soils in a particular geographical location, is subject to commercial and political pressures in the form of subsidies and advice from marketing organisations. These pressures are seldom sensitive either to the precise location of the land or to soil health. The farmer has personal goals and wishes and is a member of a community with norms and expectations to which he/she must be responsive. Since the Common Agriculture Policy reform in 1992, environmental conservation issues have been emphasised in the agri-environmental policy design and implementation and as such influence the farmer.

Fragmentation of habitats: It is now widely acknowledged that environmentally sensitive farms provide suitable habitat patches ("stations" in the language of Time-Geography) for many animal and plant species, as well as being "corridors" that provide safe migration routes between patches within the landscape. Indicators of habitat fragmentation and biodiversity can be used as measures of land suitability for sustainable agriculture.

We will explore these topics by means of three case studies located on pairs of farms in each of three regional settings: one in the Mountains, one in the foothills around Madrid and one on the Plains to the South. By studying the interaction of locale with commercial, political and personal constraints, we will work to integrate these constraints into a Time-Geographical context. This will be done as follows:

In each case study we will compare organic farms with conventional farms looking for/at indicators of integral farm health incorporating agricultural, environmental, social and economic aspects. These will be used to evaluate and extend existing methods of sustainable agriculture and the science of agroecology, and to develop an integrated methodology to evaluate the health of agroecosystems. These indicators will be used in the planning of management strategies for agricultural land that increase of the general "health" of the region. The research will be done at the following scales:

- *Soil and Plant Health*: field level. This will involve exploring the relations among several properties of the soils related to fertility and soil health including physical properties, chemical properties and biological properties. These parameters will be compared to plant health and productivity.
- *Agricultural Practice*: farm level. At this level the spatial organisation of the organic farms and their spatial relations with other conventional farms will be studied. Agricultural practices and how farmers decide on their use will be compared between both types of farms. The way farmers take management decisions and how they are influenced by the needs and actions of various external actors will be studied. Management decisions are complex activities that involve the farmer's own observations of environment characteristics, soil and plant needs, his/her own knowledge and the influences of various actors (e.g. commercial companies, technicians, other farmers, subsidies opportunities, the farmer's family, etc.). In addition, indexes of fragmentation and biodiversity of farms will be compared between organic and conventional farms.
- *Farmer decision-making and the 'Farmer as Intermediary between the Social and Natural Domains'*: regional level. Decisions made at the farm level will be examined in their regional and political context.
- *Commercial, Political and Social Factors*: national and supranational level.

	The results will be presented in the form of tables, graphs and specified rule systems that will enable us to derive spatially sensitive indicators for the management of natural resources. The social and commercial factors that impact on land-use and planning detailed above all operate on a spatial scale which we will describe using a GIS. The core of this GIS will be a Digital Elevation Model (DEM) overlain with land-use and land cover maps derived from a mix of satellite imagery and aerial photography, maps showing the distribution of environmentally homogeneous units and planning suitability maps. All the work described in the foregoing sections will be edited together to form the background to this workpackage's Spanish and English texts. We will also work with the software development teams from partners 1 and 2 to synthesise the results into a set of dynamic specified rule systems from which to derive spatially sensitive indicators for the management of natural resources. The TIGRESS System will have facilities for visualising dynamic data either from dynamic models of from Time-Geographical databases. In this case we will focus attention on the latter and use TIGRESS as a tool for exploring and communicating data as part of the planning process. All data and synthetic results will be customised for incorporation into TIGRESS, which will be used to prepare the graphics and animations for the CD that is to accompany our final report. The individual tasks which will be carried out to achieve the specified objective are: **6.1** Specification of Graphical User Interface functional requirements and negotiation of data formats and protocols for communication with the TIGRESS System (see WP2 tasks 2.2-2.5). This task (requiring close collaboration with partners 2 & 6 from WP2) will define the nature of the interfocus between the two workpackages which will be maintained throughout the project (4 MM) **6.2** Review of land planning regulations and design of physical environment digital data at regional/territorial scale and municipal scale (13 MM) **6.3** Evaluation of habitat fragmentation and biodiversity at farm and municipal level (5 MM) **6.4** Soil health evaluation at farm and municipal level and relations among indicators (14 MM) **6.5** Socio-economic analyses at farm and municipal level and relations at regional and territorial level (9 MM) **6.6** Indicators relations among time and scales: farm, municipality, region and territory (10 MM) **6.7** Development of an integrated TG database and land-use planning methodology (10 MM) **6.8** Verification and validation of the Time-Geographical methodology (6 MM) **6.9** Report in Spanish for a specialist and technical audience detailing land planning issues for agri-environmental land-use planning in the Madrid region, with accompanying CD (3 MM) **6.10** Spanish booklet describing land planning issues in the Madrid region for a general audience (3 MM) **6.11** Assisting the development of the TIGRESS system and the implementation into it of the Madrid region TG database (8 MM) **6.12** Design, run and analysis of policy-relevant test scenaria for the integrated model (6 MM) **6.13** Annual and final reports (8 MM) One final task will be carried out in parallel with the database development for the purposes of exploitation and dissemination of the WP results: **6.14** National (Spanish) and European decision makers will be approached to present the work carried out in the Madrid region, with invitations to participate in the evaluation and use of TIGRESS for agri-environmental land-use planning issues. The outcome of these meetings will be presented at the Year 3 AGM, and will contribute, where appropriate, to the Technology Implementation Plan (see task 2.16 & D22). (0.5 MM) In addition 4 annual meetings (2 MM) and several bilateral technical meetings (2 MM) will be attended during the project.
3, 4	**Milestones & Deliverables** *m1.* Reviewed of land planning regulations and design of physical environment GIS data. (month 9) *m2.* First AGM (month 9) *m3.* First year report (month 12) *m4.* Definition of indicators to be used in the model (month 18) *m5.* Second AGM (month 21) **D6:** GIS data and a Time-Geographical methodology for "agri-environmental" land planning. (month 24) **D7:** Report in Spanish on land planning issues in the Madrid region (month 24) *m6.* Second year report (month 24) **D9:** Spanish booklet detailing land planning issues and TG methodology for agri-environmental land-use planning in the Madrid region (month 27)

	D14: TIGRESS System with integrated TG database for "agri-environmental" land planning (month 31) *m7.* Third AGM (month 33) *m8.* Final report (month 36) *m9.* Completion of model runs and result analysis (month 36) We intend and expect that this project will generate additional publications, including a doctoral thesis and a monograph after submission of the Final Report. However, *no contract will be entered into in respect of this additional work.*

4. CONTRIBUTION TO PROGRAMME / KEY ACTIONS

Time-Geography has been influential over successive Framework Programmes. However, Time-Geography is, quite properly, a small community of interest and expertise, and the focus of earlier Programmes on *Centres of Excellence* led to a situation in which the role of Time-Geographers was obscured. We believe that the new emphasis on *Networks of Excellence* proposed for FP6 means that the time is now right for a critical evaluation of Time-Geographical approaches to emergence in socio-economic and natural systems.

By restricting our conception of emergence to qualitatively recognisable spatio-temporal patterns in classically quantifiable databases, Time Geographers 'break off' a chunk of policy-relevant research that can realistically be investigated by an international consortium of scientists within the time-constraints of a fixed-term project. We will show that Time-Geographical concepts bear crucially on issues of emergence and adaptation within the relationships between socio-economic drivers and the natural environment which are central to the current EU Framework 5 EESD call under Generic Activity 7.3.

TiGrESS will undertake three thematically coherent case studies throughout Europe, each within a distinct socio-economic and environmental context. Each case study will have a substantial Time-Geographical component and be linked to one or more of FP5's key actions in the field of *Energy, Environment and Sustainable Development*. The evaluation of the utility of Time-Geographical methods in addressing these thematic areas is ideally suited to Generic Action 7.3 since a multi-sectoral and multi-thematic evaluation would not be feasible within the context of any single key action.

Upon the basis of Time-Geographical methodologies and approaches to addressing socio-economic and environmental inter-relationships, and using the analytical and visualisation tools to be built into the TIGRESS System, each case study will follow an evaluative pathway that reflects the components of Generic Activity 7.3:

1. **(Issues & Context)** *Determining the critical relationships between socio-economic development and environmental change.*

   Each of the workpackages will report on the specific context of the Time-Geographical dynamics in relation to the key socio-natural issues, socio-economic driving forces and potential development pathways relating to the study areas. This will clarify the populations, pockets of local order, constraints and conflicts that will be captured by the Time-Geographical models and databases in each socio-natural context.

2. **(Policy Formulation)** *Tools and methodologies to produce information needed for integrating sustainability into policies.*

   Time-Geographical models will be developed to reflect the issues and context of each study area and incorporated into a state-of-the-art analysis and visualisation tool to facilitate scenario generation and the exploration of the socio-economic and environmental effects of selected policy instruments. These models and/or databases will be evaluated to determine their ability to produce policy relevant information which can help to integrate the socio-economic and environmental aspects of policies in relation to the dynamics of each study area.

3. **(Response & Adaptation)** *Key transition paths towards sustainability.*

   The policy levers that emerge should ideally achieve carefully specified objectives on the path towards sustainable development. It is here therefore that Time-Geographical methods will be evaluated to determine the extent of disparity between the policy intent and the emergent macro-response to that policy. These evaluations will explicitly address the temporal aspects of policy development which are often subordinated to the spatial dimensions.

The three case studies have been specifically chosen to address two main complex societal-driven issues, where each case study:

- addresses multi-sectoral issues, sits within a multidisciplinary context, and involves stakeholders both actively within the work program and passively as end-users (for example, urban expansion and water resource management in the UK, or land-use planning and sustainable agriculture in Spain); and

- involves the exploration of pathways through strategic scalar and political problems towards sustainable development and management of the socio-natural environment (for example, the effects of changing border controls and EU expansion on European demography, or the development of eco-tourism in Spain).

Time-Geography has already proven to be a *pivotal* skill within a number of EU funded research projects. Under Article 169 of FP6, such pivotal skills embedded, as they are, within well-defined Networks of Excellence, will soon be eligible for partnership funding between Member States and EU sources. Although TG is typically *regional* in its domain of operation and focus, it bears critically on issues of emergence and sustainability in socio-natural systems.

5. COMMUNITY ADDED VALUE & CONTRIBUTION TO EU POLICY

5.1 Policy Coherence for a Sustainable European Society :

To achieve the goals of sustainable development first set out by the 1987 Brundtland Report, greater attention needs to be paid to the interaction of environment, economy and society and greater emphasis placed on integrating policy across these areas. In recent communications from the Commission setting out the 6th environment action programme such as 'A Sustainable Europe for a Better World' (COM(2001)264) and 'Environment 2010: Our Future, Our Choice' (COM(2001)31), the pressing need for coherence in the formulation and implementation of policy across sectors and scales has been further confirmed. Environment, economy and society must be considered together.

Integrating policy coherently remains a significant challenge but one that must be tackled if Europe is to create and follow a sustainable society model of socio-economic development. Steering the European Union onto a course towards sustainability requires continued investment in furthering scientific understanding of integrated policy problems as well as continued investment in developing effective, validated tools for science and policy-support. TiGrESS will contribute substantially to both activities.

5.2 Individuals and Activities – Action and Effect across Scales :

As recognised by the 5th and 6th environment programmes, the antecedents of unsustainable dynamics in a society can be partially traced to the individuals and other agents who make up that society (Official Journal of the European Communities No C 138/5 1993 and COM(2001)31). Individuals and other agents make decisions and act, and these, when aggregated, can have significant impacts on the environment, economy and quality of life. Identifying pathways to sustainability for European society requires that the nature and dynamics of the agents and activities involved in response to different policy options be understood.

Currently, however, there is insufficient knowledge about the ways individuals make decisions and act in space and time (the micro-scale), what the effect of these decisions is likely to be and how the structure and dynamics of micro-, meso- and macro-scales of European environment, society and economy interact, constrain and determine each other. This lack of understanding can be attributed, at least in part, to the lack of tools capable of analysing spatial *and* temporal micro-, meso- and macro-scale data and the present lack of theoretical framework within which to explore and interpret the results of any such analyses. The TiGrESS project aims to rectify this situation.

5.3 The Contribution of Time Geography :

Time Geography (TG) (Hägerstrand 1953, 1961, 1970, 1985)[11] provides a coherent ontological framework within which to explore the nature of integrated multi-scale dynamics and the consequences of different policies for the development of Europe and its regions. Time-Geographical methods provide a means of exploring the effects of spatial and temporal constraints on the behaviour of individuals and how qualitatively new socio-economic structures may emerge at higher scales as a result. The ability to explore and understand the emergence of new and potentially unexpected structures and dynamics in society will be crucial to Europe's success in becoming a sustainable society.

5.4 TiGrESS - A European Time Geographical Analysis Tool :

The TIGRESS System will counter the current lack of integrated micro- to macro-scale data analysis tools, thereby providing the means to carry out a comprehensive exploration of the utility of TG methods for producing information relevant to sustainable development policy. Policy makers need tools to investigate the possible effects of policies in space *and* time and which also help communicate ideas within and between policy-making organisations. The TIGRESS System will fulfil both requirements by providing improved analytical and pedagogic tools to scientists and decision-makers.

The time is right for such a System in Europe. Geographic information technology is globally dominated by the US commercial sector. Europe currently leads the way in complex individual-based socio-natural system modelling and science and could, if research is funded now, also lead the way in 3D-4D analysis and visualisation technology.

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11 Hägerstrand.T, 1953, *Innovationsförloppet ur korologisk synpunkt*, C.W.K Gleerup, Lund; 1961, *Geographic measurements of Migration: Swedish data*, Entretiens de Monaco en Sciences Humaines, pp61-83; 1970, *What about people in Regional Science?*, Papers of the Regional Science Association, 24, 7-21; 1985, *Time-Geography: Focus on the corporeality of man, society, and environment*, The Science and Praxis of Complexity, The United Nations University

Investment now could substantially strengthen the European Research Area and contribute to European science and policy-making.

The pressing need for better integrated tools for sustainable development policy-support is reflected in several FP5 work programmes. In addition, the potential of individual-based modelling methods for integrated policy support has already been recognised by the EU, as reflected in funding of agent-based modelling within the FP5 ESD work programme (the FIRMA project, EVK1-CT1999-0016) and the social simulation group within the AgentLink European Network of Excellence.

The project will design and implement the TIGRESS System based upon generic open interface and component technologies. Within the ESD work programme, the Key Action 1 'CatchMod' project HarmonIT (EVK1-2001-00037) is also exploring these principles in the context of integrated water management modelling. Within the Information Society Technologies 2001 work programme, the cross-programme action V.1.3 CPA3 'Use of Geographic Information (GI)' recognises that further development of spatio-temporal analysis technology, particularly that concerned with the types of 3D-4D information visualisation and analysis to be provided by the TIGRESS System is required. It also recognises the need to develop such technologies using the interfacing and component technology principles that will be employed by TiGrESS. In addition, the development and evaluation of tools to facilitate sustainable development is an explicit aim of the Quality of Life work programme Key Action 5.

The three case-studies to be carried out during the project will form the basis for evaluating the utility of Time-Geography and the TIGRESS System. They will also contribute significantly to an increased scientific understanding of the integrated social, economic and environmental policy problems specific to each study. The case-study policy problems are all of Europe-wide significance; two are purely regional (WP3 and WP5) and involve integrating multiple aspects of policy, whilst the other (WP4) involves looking at aspects of national and trans-national policy. In addition, the modelling and analysis carried out by each case-study will lay the foundations for future research to more fully explore the issues and problems concerned using TG methods and the TIGRESS System.

The TiGrESS project will contribute substantially towards the development of a sustainable European society by developing, applying and evaluating a TG analysis tool and a variety of TG models for coherent and integrated policy formulation in three important domains of enquiry.

5.5 The TiGrESS Consortium and Project Structure - European Added-Value:

To fulfil its objectives TiGrESS requires substantial expertise and experience both methodologically and in terms of domain-specific knowledge. The TiGrESS consortium is required as the necessary breadth and depth of expertise and experience required is simply unavailable within any single nation state. The project requires the leading-edge methodological expertise in TG modelling and individual-based data handling . The Principal Investigator through the University of Newcastle upon Tyne will provide this expertise. TiGrESS also demands the state-of-the-art decision-support software engineering and modelling possessed by the Research Institute for Knowledge Systems (RIKS bv.). Both partners have previously worked together on an FP4 project that directly bears on the design and implementation aspects of developing the TIGRESS System (MODULUS, ENV4-CT97-0685). This combined experience will prove invaluable for the success of the project. In addition, the domain-specific modelling skills and experience possessed by the remaining partners will be absolutely essential to the efficient and effective execution of the TG modelling work underlying each case-study.

6. CONTRIBUTION TO COMMUNITY SOCIAL OBJECTIVES

6.1 Contribution to Preserving and Enhancing the Natural Environment :

Current modelling and decision-support methods cannot adequately handle emergence – the range of possible structures and dynamics to be explored must be specified to a greater or lesser degree from the outset. This is a real problem, for without such tools the policy-maker may be forced to make decisions without adequate knowledge or understanding of the unexpected effects that can occur in response. The road to sustainable development involves recognising the role of emergence. European environmental policy formulation will benefit from the ability to recognise and cope with the complex nature of socio-natural dynamics offered by the TIGRESS System.

The application of the TIGRESS System to the case-studies (see Table 1) will contribute to a better understanding of how to utilise natural resources and conserve wildlife. The results of the case-study research will address, to varying levels of breadth and depth, some of the identified major threats to sustainable development and long-term priorities for action detailed in the 6th environment action programme (COM(2001)264, COM(2001)31). These include improving the sustainable management of natural resources, combating the loss of biodiversity and habitat fragmentation, combating soil loss and damage, improving the basis for environmental policy, addressing issues surrounding the environmental impacts of individual behaviour and better integration of environmental requirements into other policy and planning areas.

WP3, which complements other FP5 RTD projects concerned with integrated water resource management such as Aquadapt (EVK1-2000-22050), will also contribute to a better understanding of sustainable natural resource utilisation. Planning regional water supply to cope with spatially and temporally changing demand resulting from demographic dynamics is a substantial issue of importance across Europe, particularly in areas of low rainfall. The results of WP3 will contribute towards the aims of the EU 'Water Framework Directive' through exploring the integrated dynamics of water supply and demographics.

In the 6th environment programme the EU is committed to the aims of Agenda 21 with regards to biodiversity and habitat fragmentation and also to improving spatial planning as detailed in the ESDP. Commitment to sustainable agriculture is also a priority as reflected in Key Action 5 of the FP5 Quality of Life programme. By integrating socio-economic, wildlife and agricultural needs WP5 aims to develop a spatial planning methodology based on TG principles that will help preserve regional biodiversity and prevent soil degradation as well as provide a means of ensuring sustainable socio-economic activity. WP5 should contribute to our understanding of how sustainable agricultural practices can provide habitat corridors and islands for wildlife whilst still remaining productive in terms of quantity and quality of output.

6.2 Contribution to Quality of Life, Health and Safety :

The prime focus of the TiGrESS project is the evaluation and validation of TG methods and as such is one step removed from providing immediate benefit to the population of Europe in terms of quality of life. However, investment in this methodology now has the potential to significantly improve the quality of life within Europe over the medium – long term. As the 2001 Stockholm Council of the EU recognised, 'economic growth, social cohesion and environmental protection must go hand in hand'. TiGrESS will provide a means of exploring the consequences of policy for quality of life at the formulation phase. The results of the case-study research will each contribute to the Community's quality of life objectives.

The adequate supply of good quality water to European citizens and businesses is crucial to daily life. Planning regional water supply to meet urban development needs is a problem with significant social and economic impacts. Reconciling supply with current and possible future demand is particularly difficult and a problem to which TiGrESS will contribute through the research of WP3.

The EU is committed to sustainable urban development as reflected in the 1998 Framework for Action and recent decisions by the European Parliament and Commission such as decision number 1411/2001/EC, that seeks to promote co-operation in achieving urban sustainability. As the European population continues to age a range of concerns regarding labour, finance and social care will arise, which, if not explored adequately may hinder the establishment of a sustainable, polycentric and balanced urban network in Europe. WP4 of TiGrESS will contribute to addressing these issues through exploring various spatial and temporal planning scenaria at a trans-national level based on demographic dynamics.

WP5 will contribute towards a democratisation of the regional planning process through the use of TiGrESS as an analytic and pedagogic tool. The main agricultural and governmental stakeholders will be substantially involved in developing a new planning method through participative social enquiry work and intensive results dissemination. The resulting application of the method to land-use planning should provide a sense of empowerment to those involved as well as improving the planning process.

6.3 TiGrESS and ERA – Improving the Human Research Potential :

The recent work programme 'Improving the Human Research Potential and the Socio-Economic Knowledge-Base' (July 2001) and recent communications from the Commission regarding the ERA (COM(2000)6, COM(2001)94, COM(2001)331) all emphasise that the training and mobility of researchers is vital for European innovation and competitiveness. TiGrESS will address both concerns. As a fundamentally inter- and multi-disciplinary project with substantial methodological and empirical components, the potential for cross-fertilisation of knowledge and philosophy between contributing researchers and institutes is significant.

TiGrESS involves researchers tackling a diverse range of issues including human decision-making, population biology, water resource management, urban planning, demographic change and land-use planning. The research will be carried out within a framework of policy-relevant modelling and data analysis, providing the means for scientists and technologists to collaborate and exchange ideas on turning science into effective policy-support. Inter-sectoral interaction and researcher mobility will be facilitated through the collaboration of both public and private organisations in carrying out the research. The project is organised along a north-south transect through Europe, an aspect that will promote the exchange of knowledge and ideas between European cultures with significantly different intellectual and scientific traditions. In addition, the TiGrESS case-study work-packages all involve bi- or multi-lateral collaborative research work, enhancing the possibilities for fruitful exchange of ideas and improving researcher mobility through travel and expanding and solidifying contact networks.

Each case-study in TiGrESS will involve substantial work by graduate students or junior post-doctoral researchers, supervised by internationally recognised experts. By embedding junior scientists in the intellectual environment offered by TiGrESS we will broaden their knowledge, research skills and experience and provide a strongly European dimension to their careers.

	FOCUS	POPULATIONS	STATIONS	CONSTRAINTS	PROJECTS	CONFLICTS
WP3: Dynamic water demand and supply along the M11 corridor	Water resource supply planning, demographics and land use change	People Water companies	Population centres Water companies	Infrastructure Land-use plans Water availability	Meeting demand Making profit	Between water companies Demand vs Supply
WP4: Dynamics of the European urban network	Migration, demography and urban planning	People *EU/non-EU*	Cities Countries Workplaces Homes	Border Controls EU Boundaries Nationality	Migration EU expansion Globalisation	Different controls on different borders
WP5: Land-planning and pathways to sustainable agriculture in Madrid	Land-use planning, habitat fragmentation and sustainable agricultural practices	Farmers Municipalities	Population centres Farms Regional Parks	Land Planning Soil health Environmental fragmentation	Sustainable farming Build houses Making profit	Land-use planning Sustainable development

Table 1: *Time-Geographical Elements relating to the Policy Problems in each TiGrESS Case-Study*

7. ECONOMIC DEVELOPMENT AND S&T PROSPECTS

7.1 Results Dissemination :

Three main end-user groups for the results of the TiGrESS project have been identified – the scientific community, decision-making bodies at international, national and regional levels including public and private organisations and educational establishments. In addition, a range of specific end-users for the results of each case-study in both public and private organisations have been identified and contacted (see Table 10). TiGrESS has formulated a dissemination strategy to meet the diverse needs of the project in addressing its end-users with the aim of communicating the project results within the contexts of advancing scientific understanding, providing practical decision-support and supporting education. In all these contexts two main types of results can be identified for communication – methodological and empirical. The dissemination strategy will ensure that both types of result are communicated effectively.

The main output and means of disseminating the project results will be the production and distribution of a set of four high-quality scientific monographs. The cost of preparing, publishing and distributing a number of TiGrESS monographs will be incorporated into the project budget to reflect the integrated, high quality results dissemination strategy that we believe is essential to TiGrESS. The monographs will be distributed to the EU, targeted end-users, selected University libraries, selected research institutes and all members of the consortium to ensure the results of the project reach the identified user groups and beyond. Formal letters of interest in the results of the project have been received for many of the identified end-users detailed. Descriptions of the end-users and copies of the letters of interest can be found in Appendix IB and IC.

Project Component	Identified End-User Groups	Targeted End-Users
TIGRESS System (WP1, WP2)	Parties involved in exploring and / or managing complex socio-natural phenomena: *Research scientists* Environmental consultants *Data analysts* Regional governments *National governments* International agencies (GOs and NGOs)	TiGrESS consortium members. *Scientific community.* European Union. *Ministry of Transport, Public Works and Water Management, National Institute for Coastal and Marine Management, The Netherlands*
Urban demographics and water supply planning (WP3)	Urban and water resource planners. *Water companies.* Regional planning agencies. *National planning agencies.*	TiGrESS consortium members. *Scientific community.* David Lock Associates. *London Development Corporations.* Three Valleys Water. *Anglian Water.*
Dynamics of the European urban network (WP4)	City planning boards. *National planning agencies.* International planning agencies.	TiGrESS consortium members. *Scientific community.* European spatial planning observatory network (ESPON).
Land-use planning and sustainable agriculture (WP5)	Farmers and farming organisations. *Regional planning agencies.* Universities (for education and research). *Wildlife and conservation NGOs.*	TiGrESS consortium members. *Scientific community.* Madrid Autonomous Region.

Table 2: *TiGrESS Project End-Users*

The first volume in the set of monographs will be a synthetic volume to tie together the results of the whole project into a coherent body of knowledge regarding the utility of TG methods and the TIGRESS System for producing information and understanding relevant to integrated sustainable development policy. A CD-ROM version of the TIGRESS System complete with training manual and documentation will be distributed with this volume. The software interface to the TIGRESS System will be fully documented, permitting end-users to adapt and plug in their own models and/or databases following instructions provided. The remaining three volumes will detail the results of each case-study and evaluate the utility of TG and TiGrESS with respect to the specific policy problems concerned. Each of these volumes will contain a synthetic section based on the text of the first

monograph and be distributed with a CD-ROM version of the TIGRESS System along with pre-compiled versions of the case-study specific models and/or databases. Documentation and a training manual will also be included. End-users will be able to explore the TIGRESS System and the dynamics of the case-study specific models under different scenaria or patterns within TG databases. Where data is commercially sensitive, a revised version of the case-study model or database will be distributed minus the sensitive data. This will be done such that CD-ROM content quality or pedagogic utility is not jeopardised.

Imperial College (participant code 6) will set up and manage a TiGrESS project 'Extranet'. The extranet will provide a website for both general (public) and restricted (project) access, a bulletin board for project member use and an ftp site for dissemination of project results within the consortium generally and by work package. The website will describe the aims, methods and provide up-to-date progress reports on TiGrESS to the general public, end-users and consortium members.

In addition to this, each project member will assume responsibility for dissemination of results via standard routes including academic publications, conference presentations and non-academic publications. TiGrESS intends and expects each work package to produce at least 1 peer reviewed article per year in high quality journals, present at least 1 conference paper and also publish articles in relevant non-academic publications such as industry periodicals, popular press etc. All publications and presentations will acknowledge the financial support of the European Union.

7.4 Results Exploitation and Strategic Prospects :

The results of the TiGrESS project have potential for exploitation both within the TiGrESS consortium and the targeted end-users detailed in Table 2 over short-, medium- and long-terms. In the short-term, the production of the TIGRESS System will provide several members of the consortium with a much needed tool for analysing model results and data. We believe the resulting tool may have commercial applications but that these cannot be characterised until the working prototype is in place. With this in mind, we will form a working group to evaluate the commercial potential of the TIGRESS system which will report to the whole consortium at the last AGM and present its' findings to the EU as the Technology Implementation Plan (TIP) (see task 2.16 above). Certain opportunities within the consortium are already manifest.

RIKS bv. (participant code 2), a leading consultant in model-based decision-support technology for many years, has come across various problems in adequately analysing, visualising and interpreting individual-based model output over time and space. The current lack of adequate analysis tools combined with the lack of a clear ontological framework within which to interpret such model output is hindering the ability of RIKS bv. to discharge its consultancy duties. TiGrESS aims to provide both the tools and the ontology to address this problem.

Over the medium- to long-term, the methodology and technology provided by TG and TiGrESS will contribute to the establishment of the ERA (see below) and offer promise for exploitation by other groups. Across many domains individual-based modelling is increasingly being viewed as important and is consequently being explored and used by an increasing number of scientists and bodies providing policy-support. TiGrESS constitutes a very important and significant first step on the road to countering the analytical and visualisation problems that are currently faced regarding spatial *and* temporal information from the scale of the individual up. In doing so TiGrESS will facilitate the exploitation of individual-based data and models in the future within Europe.

Within each case-study, members of the consortium and identified end-users will be able to exploit the project results to help solve specific policy problems.

The study of the dynamics of urban sprawl and water resource management along the M11 corridor (WP3) involves an active end-user (David Lock Associates) in the project as an assistant contractor. David Lock Associates (participant code 8) are consultants to the London-Stanstead-Cambridge sub-regional study group involving regional planning bodies for Eastern England and various County Councils (Essex, Hertfordshire and Cambridgeshire). The research findings from WP3 will directly affect this study group and will, accordingly, be disseminated through and actively used by the planning bodies and councils involved.

Centre National de Recherche Scientifique (CNRS), Paris (participant code 4) is currently involved in ESPON (European Spatial Planning Observatory Network), a network being established by the MOLAND (Monitoring Land Use / Cover Dynamics) project. MOLAND addresses specific issues mentioned in the European Spatial Development Perspective (ESDP) both related to urban and regional development, and linked to sustainable land use management. The research to be carried out in WP4 directly relates to this Joint Research Centre programme in assessing the development of urban areas and identification of trends at the European scale. The results of

WP4 will be made available to and could benefit this and related projects, potentially providing a basis for the further evolution of research networks as envisaged under FP6.

Scientists within UEM (participant code 5) will use the results of the TiGrESS project as a practical aid to fulfilling their land-use planning consultancy duties. The spatio-temporal methodology developed as part of the WP5 research will form a valuable component to their on-going consultancy role within the Madrid Autonomous Area and the TIGRESS System will provide and ideal analytical and pedagogic tool for this activity. The TIGRESS System will also be used in land-use planning teaching and training activities at the UEM for students, external scientists and decision-makers. Last, the TIGRESS System and the project results will be used to help democratise the land-use planning process through enhancing communication and through the production of a booklet complete with CD in Spanish describing the results of WP5 to the stakeholders involved in the Madrid area.

Finally, the involvement of Cranfield University in existing EU projects may provide an opportunity to invite experts from FUTUREtec (Bergisch Gladbach, Germany) to be involved in the development of the Technology Implementation Plan (TIP).

7.5 TiGrESS and ERA :

Three key areas have been identified as priorities for establishment of the ERA – research integration, structuring the ERA and strengthening the foundations the ERA (COM(2001)94). TiGrESS will address all three priorities and create a range of opportunities for European scientific research in doing so.

European and national research within Europe is currently too fragmented and isolated along disciplinary boundaries (COM(2000)6). ERA will counter this problem by trying to integrate research in priority thematic areas around international Networks of Excellence and public-private partnerships (COM(2001)94). The TiGrESS consortium believes that Time-Geography provides an excellent framework within which to integrate research across multiple disciplines and around which a Network of Excellence can be formed. The results of TiGrESS project will permit a proper consideration of TG as a Network of Excellence candidate to be funded under Article 169 of FP6.

TG is a distinctly European approach to examining the world having been pioneered initially in Sweden in the 1950's. It contrasts significantly with the approaches to socio-economics found in North America today. The ontology and methods of TG offer a way to coherently integrate European social and natural science to address the identified thematic priorities of the ERA, particularly 'sustainable development and global change'.

Based upon the principles and ideas of TG, the TIGRESS System may potentially pave the way to the establishment of a European spatial and temporal analysis and visualisation tool. Europe is currently leading the way in individual-based complex systems modelling and often has the data available to parameterise such models from published sources or national / European sources. However in terms of spatial analysis the US leads the way with a wide range of globally used GIS products and related modelling activities. European 'good planning' practices are more often than not dictated by US-led technology. The integration of spatial *and* temporal analysis tools is an open field at present and one for which Europe has already recognised the potential (e.g. IST 2001 work programme cross-programme action V.1.3 CPA3). If Europe does not act soon the highly competitive US private sector will almost certainly produce such tools. To ensure that Europe does not lose out to the US as it has done with GIS technology and to ensure that the intellectual approach adopted within Europe to looking at and understanding complex social and natural phenomena over space and time remains distinctly European, research must be funded. We believe that TiGrESS provides an important part of the research to maintain European competitiveness and innovation in this field.

The Europeanisation of research is an aim reflected in work programmes including the July 2001 'Improving the Human Research Potential and the Socio-Economic Knowledge-Base' and one which could substantially improve the effectiveness and competitiveness of the ERA. Having a European intellectual approach (TG) and a European TG analysis tool (TiGrESS) provides the opportunity to place European complex systems and socio-natural research at the leading edge globally. TiGrESS will not of course produce the final and ultimate tool but will certainly take the necessary first-step and in doing so gain valuable experience from scientific, technological and policy-support perspectives. We envisage that the TG analysis system produced will form the basis to continued TG work within trans-national collaborations and within the network of researchers established by the project. When considered together, we believe that the various aspects of TiGrESS could substantially contribute to the creation of infrastructure for conducting multi-disciplinary policy relevant complex systems research within Europe and to strengthening the foundations of the ERA.

8. THE CONSORTIUM

SMC, the original co-ordinator of the TiGrESS bid was an international, inter-disciplinary research centre run by a consortium of universities in Northern Sweden. Among its other work, SMC contributed to the Archaeomedes and Modulus Projects and managed a Concerted Action under FP4, it was also a member of two FP5 consortia; Aquadapt and TiGrESS. However, SMC was recently placed under the exclusive control of Umeå University with secure funding from Swedish domestic sources and has decided to focus on domestically funded pure social science. TiGrESS and Aquadapt were inter-disciplinary in scope and European in focus, and SMC has withdrawn from both consortia. None of the key personnel on these projects now work for SMC.

Reviewers of the TiGrESS proposal suggested in their consensus report that the number of case studies be reduced but did not indicate which of the case studies should go. In the light of SMC's policy-shift and withdrawal, we naturally decided to drop the Scandinavian case study and to reassign responsibilities within the consortium wherever possible. This had the joint advantages that:

- It removed a case study without depriving us of the services of any Contractor who wished to remain part of the TiGrESS consortium.

- It responded to the reviewer's comments (under Block 5) by removing most sub-contractors from the project.

When all this was done, however, none of the other consortium members wished to take on the additional work of co-ordinating the TiGrESS project and a new consortium member was needed. After some discussion, the consortium chose the University of Newcastle upon Tyne which has agreed to provide a contract-funded base for the project's PI, (an ex-employee and regular visiting scientist on Tyneside).

Newcastle has an experienced Research Services Unit, well able to undertake the financial management of the project and has agreed to assume responsibility for the project's co-ordination. The remainder of the TiGrESS consortium has approved this change. We therefore propose that Newcastle assume all of SMC's residual duties. The PI will now work from Newcastle and assume personal responsibility for the administration of the project and will provide modelling services to Workpackages 4 and 5 in accordance with the original proposal. Thus, by bringing Newcastle (and the PI) into the consortium, we will be able to complete all the remaining TiGrESS workpackages.

TiGrESS originally had four key personnel at SMC. Two of these have relocated to other consortium institutions and so can discharge their responsibilities to TiGrESS as arranged. The third key member of staff is the project's PI who will now work on the project through Newcastle upon Tyne. The fourth key member of staff was originally recruited to SMC to help develop the Spanish workpackage and will now be employed through Newcastle upon Tyne. This member of staff must be based in Northern Europe to help forge the linkages between WPs 2 and 5 (See description of WP1 above and Block 1 of the evaluator's report).

The consortium and project will be co-ordinated by Newcastle University. Co-ordination will form part of the work to be completed within Workpackage 1, which will prepare, publish and distribute the set of scientific monographs to be produced by the project. The co-ordinator will be responsible for this task and also help evaluate the impact of Time-Geographical methods and the TIGRESS System on knowledge, understanding and reasoning processes of users (scientists and decision-makers) from each case-study workpackage (Workpackages 3-5). This evaluation will be performed in close collaboration with consultants from the UK. The assessment of the utility of TG will be carried out within Workpackage 1 based on the findings of the case-studies.

The consortium's experience of individual-based modelling of objects (typically people) that can move across a map means that it has special expertise in simulating "dynamic vectors" (points and polygons on a map). This expertise in vector models is complemented by that of RIKS bv. in the simulation of dynamic raster objects (maps presented pixel by pixel). RIKS is the developer of the Geonamica® system, an elegant tool for handling dynamic raster objects. RIKS will delegate an expert programmer whilst Imperial College (ICL) will provide a statistician and a highly experienced modeller / computer scientist to Workpackage 2, which will develop the TIGRESS System.

RIKS will have overall responsibility for Workpackage 2 but will work in very close co-operation with ICL and Newcastle. By common consent, RIKS has the most experience in software engineering and the construction of "client" software to act as an interface between the model and the modeller. The PI at Newcastle, on the other hand, has more experience in Time Geography and so will contribute substantially to the overall design of the

TIGRESS System, particularly in respect of the simulation, representation and analysis of dynamic vector objects. TiGrESS will combine excellent vector handling facilities with an excellent raster-based competence inherited from Geonamica®.

With its dynamic vector and raster technology, TiGrESS will provide a seamlessly integrated spatial and temporal data analysis and visualisation system. However, it will be more than this. TiGrESS is to be a complete tool for Time-Geographical analysis and data exploration with facilities for handling both empirical data and simulation output. Model and database interface and analysis protocols will be specified, implemented and documented by RIKS, Newcastle and ICL co-operatively.

The remaining three case-study workpackages each involve one principal partner institution supported and assisted by various other partners. The substantial research work into providing better understanding of policy-relevant problems undertaken within each of these workpackages will result in models and/or databases designed for use with the TIGRESS System. The model development, testing and experimentation work within each workpackage will be carried out by staff from the appropriate principal partners supported by assistant contractors and sub-contractors where required. Staff from Workpackage 2 will aid the technical task of integrating each case-study specific model or database into the TIGRESS System. The PI at Newcastle will provide technical support and act to link WP2 to the case studies under WP1.

A typical workpackage involves a small subset of the consortium. In each case, one partner, a project principal contractor, has prime responsibility for the management of that workpackage. Workpackage roles and responsibilities are detailed in table 3.

Workpackage	**Principal Partner**		**Secondary Partners**	
	Name	**Participant Code**	*Name*	**Participant Code**
WP1: Co-ordination & Synthesis	University of Newcastle-upon-Tyne (UNEW)	1	School of Water Sciences, Cranfield University (SWS)	3
			Dept. of Mechanical Engineering, University of Bath	10
WP2: TIGRESS System Development	Research Institute for Knowledge Systems (RIKS bv.)	2	Imperial College London (ICL)	6
			University of Newcastle-upon-Tyne	1
WP3: Dynamic Water Supply and Demand	School of Water Sciences, Cranfield University (SWS)	3	Centre for Water Systems, University of Exeter	7
			Research Institute for Knowledge Systems (RIKS bv.)	2
			David Lock Associates	8
WP4: European Urban Dynamics	Centre National de la Recherche Scientifique (CNRS)	4	University of Newcastle-upon-Tyne	1
			Research Institute for Knowledge Systems (RIKS bv.)	2
WP5: Land-Use & Sustainable Agriculture	Universidad Europea (UEM)	5	University of Newcastle-upon-Tyne	1
			Research Institute for Knowledge Systems (RIKS bv.)	2

Table 3: Workpackage Roles and Responsibilities

PARTNER	STAFF	EXPERTISE	PROJECT TASKS
1. Univ of Newcastle-upon-Tyne	Senior Scientist	Project Management, Modelling	*Project Coordination*, Modelling (WP4), Monograph Publication
	Scientist	Social Enquiry, Land-use Policy, Ecology	*WP5 Manager*, Development of TG database & landuse planning methodology
2. RIKS bv.	Senior Scientist	Dynamic simulation modelling, decision support systems	Strategic software development advice (all WP's)
	Programmer	Software engineering, C/C++, Component technologies	*WP2 Manager*, TIGRESS System implementation
	Technician	Software development and documentation	TIGRESS System implementation & documentation
3. Cranfield University	Senior Scientist*	Technology & water policy, EIA, Integrated water management	*WP3 Sponsor*, stakeholder engagement
	Scientist	Water treatment & reuse, integrated water mgt.	*WP3 Manager*, Water demand model development
	Scientist	Modelling, knowledge representation, qualitative reasoning	Evaluation & analysis of TG methodologies (WP1)
	Scientist	Inter-disciplinary & integrative methods, knowledge management	TG evaluation techniques and analysis (WP1)
4. CNRS, Paris	Senior Scientist*	Demography, settlement systems, spatial modelling	*WP4 Sponsor*, Demographic model design, scenario analysis
	Scientist	Statistical spatial modelling, network analysis	*WP4 Manager*, Data collection, model validation and empirical analyses
5. UEM, Madrid	Senior Scientist*	Soil health, agroecology, land planning	*WP5 Sponsor*, End-user engagement
	Scientist	Landscape analysis & planning	Eval. of habitat fragmentation, socioeconomic analysis (WP5)
	Technician	GIS, Remote sensing	Data collection & analysis (WP5)
6. Imperial College London	Scientist	Complex systems modelling, multi-dimensional visualisation	*WP2 Sponsor*, Devt & eval. of TG analysis & visualisation tools. TiGrESS Extranet support
	Scientist*	Bayesian statistical methods & decision analysis	Statistical advice & supervision (WP2)
	Scientist	Statistical methods	Statistical analysis & and validation of TG toolbox (WP2)
7. Exeter University	Senior Scientist*	Optimisation techniques, genetic algorithms, decision support system	Integration of optimisation and water demand models (WP3)
	Scientist	Water network optimisation techniques	Water supply network optimisation model (WP3)
8. David Lock Associates	Land-use planner	Strategic planning & planning policy	Stakeholder engagement (WP3)
9. Bath University	Scientist	Knowledge elicitation & experiential learning	Design TG evaluation techniques portfolio (WP1)

Table 4 : The expertise being provided by each member of the TiGrESS Consortium, and their individual roles within the project. (Core staff)*

In every workpackage, partners from two or more Member States are involved, which provides a strongly European dimension to the project's work. In Workpackage 1 consultants from the UK have been sub-contracted to assist Newcastle with the TIGRESS System evaluation process. In Workpackage 2 the complementary skills of a Dutch and a UK institute have been harnessed to build a complex analytical tool. Workpackage 4 brings domain-specific skills in water management and urban planning from several organisations the UK. In Workpackage 5 the demographic and urban dynamics expertise of a French group (CNRS) will be combined with the mathematical modelling skills of Newcastle to examine urban dynamics and trans-border issues in Europe. Finally, Workpackage 6 involves agronomists and planners from Madrid with a post-doctoral scientist recruited at Newcastle specifically to strengthen links between our institutions. UEM is a university department with a substantial interest in planning issues, soil science, nature conservation and the use of geographical information. TiGrESS will add value to this expertise by sharing its skills in the analysis of spatio-temporal data and providing UEM with a valuable tool for investigating planning scenaria in the Madrid region.

It should be noted that, although there are 10 TiGrESS partners, only 9 are actually involved in carrying out research work. Partner 4 (CNRS) is responsible for WP4. However, partner 4's contribution to TiGrESS will be through a joint research unit (JRU) to which it contributes - "Géographie-Cités – UMR 8504". This JRU is formed by a partnership between CNRS and the Université Panthéon Sorbonne (Université Paris 1). Consequently, CNRS and the Université Panthéon Sorbonne are acting jointly and severally on behalf of a JRU that has no legal status. TiGrESS partner 13 (Université Paris 1) is participating in the project only in the sense that it is a legal entity. It has mandated all decision-making and work to CNRS. (see Annex 5 for details)

Brief details of the consortium partners are provided below:

Partner #	1		
Contractual role	Principal Contractor - Co-ordinator		
Institution	Department of Archaeology		
Address	The Quadrangle, University of Newcastle-upon-Tyne Newcastle-upon-Tyne NE1 7RU, United Kingdom		
Telephone	+44 (0)191 222 5330	Fax	

Partner #	2		
Contractual role	Principal Contractor		
Institution	Research Instituut voor KennisSystemen bv.		
Address	P.O. Box 463 6200 AL Maastricht The Netherlands		
Telephone	+31-43-388.33.22	Fax	+31-43-325.31.55

Partner #	3		
Contractual role	Principal Contractor		
Institution	School of Water Sciences, Cranfield University		
Address	Cranfield Bedfordshire MK43 0AL, United Kingdom		
Telephone	+44 (0)1234 754814	Fax	+44 (0)1234 751671

Partner #	4		
Contractual role	Principal Contractor		
Institution	Centre National de Rechereche Scientifique (CNRS-DR01)		
Address	Geographie Cites – UMR 8504 13 Rue du Four 75006 Paris, France		
Telephone	+33-140464003	Fax	+33-1 40464009

Partner #	5		
Contractual role	Principal Contractor		
Institution	Departamento de Medio		
Address	Ambiente Universidad Europea UEM-CEES C/TAJO S/N E 28670 Villaviciosa de Odon Spain		
Telephone	+34-912115620	Fax	+ 34-916168265

Partner #	6		
Contractual role	Assistant Contractor		
Institution	Department of Environmental Science & Technology, Imperial College of Science, Technology & Medicine		
Address	Prince Consort Road London SW7 2BP, United Kingdom		
Telephone	+44 (0)207 594 9297	Fax	+44 (0)207 594 9266

Partner #	7		
Contractual role	Assistant Contractor		
Institution	Centre for Water Systems		
Address	School of Engineering & Computer Science University of Exeter Harrison Building, North Park Road Exeter EX4 4QF, United Kingdom		
Telephone	+44 (0)1392 263637	Fax	+44 (0) 1392 217965

Partner #	8		
Contractual role	Assistant Contractor		
Institution	David Lock Associates		
Address	50 North Thirtieth Street Milton Keynes, MK9 3BP, United Kingdom		
Telephone	+44 (0)1908 666276	Fax	+44 (0)1908 605747

Partner #	9		
Contractual role	Subcontractor		
Institution	Department of Mechanical Engineering		
Address	University of Bath Claverton Down Bath BA2 7AY, United Kingdom		
Telephone	+44 (0)125 826 826	Fax	

Description of the Participants

University of Newcastle-upon-Tyne

The University of Newcastle upon Tyne has a substantial track record in internationally funded inter-disciplinary research. At the time of writing it is undergoing a substantial re-organisation, amalgamating many of its smaller science and social science departments into research schools. The first phase of this amalgamation takes place on May 1st 2002. TiGrESS will be allocated to one of these schools at the discretion of the Provost who has supported the project with a time-limited "bridging contract" to enable the PI to complete the negotiation phase.

Research Instituut voor KennisSystemen bv.

RIKS bv. is a 100% daughter of Maastricht University Holding bv. Its main activity concerns the development of innovative computer-based information systems used for integrated public planning and socio-environmental policy-making. RIKS fulfils a bridging role: it applies new findings from fundamental research in Artificial Intelligence, Knowledge Engineering, Information and Computer Science, and Cognitive Psychology, to develop innovative tools and applications for end-users in the industry and in public and private organizations.

RIKS' experience relevant to this project comes from the design and implementation of explicitly spatial Decision Support Systems (DSS) for integrated public spatial planning and policy-making. Typically these systems represent the decision domain by means of integrated dynamic, and high-resolution spatial models. They allow the user to get a good understanding of the linked social, economic and environmental processes that evolve within the given physical and institutional constraints of the region studied. In the past 12 years RIKS has developed a number of such systems as part of research and commercial projects, including SimLucia, WadBOS, MODULUS, MURBANDY, RuimtEcol, EcoVisie & EnvironmentExplorer.

School of Water Sciences (SWS), Cranfield University

Cranfield University is an international centre of excellence in research and teaching in strategic areas of science, technology and management directed by the needs of industry. This applied emphasis is unique among UK universities. Established in 1946 as a College of Aeronautics, the University is now based on three campuses; Cranfield itself, Silsoe in Bedfordshire and the Royal Military College of Science at Shrivenham, near Swindon, Wiltshire. Across the three sites Cranfield specialises in technology, manufacturing, engineering, management, bioscience and medicine. It is also a world leader in defence and natural resource management, including the management of water quality.

Cranfield has an international reputation as a pioneering centre for education and research and the university's support from commerce and industry far exceeds that of any other UK university. The university has a postgraduate focus, with all students on the Cranfield campus on Masters, Doctoral or Continuing Professional Development (CPD) programmes. Cranfield staff are drawn not only from academia but also from senior positions in industry, and all remain close to the hub of commercial focus. This alliance with business ensures that industrial experts are interacting with researchers. Cranfield's main campus in Bedfordshire boasts its own airfield and sewage treatment works. The surrounding land has been developed as a technology park and chosen by Nissan as home for its European Technology Centre.

The School of Water Sciences is a centre of excellence that undertakes consultancy, research and training in science and technologies associated with the improvement of water quality to protect and enhance natural, human and industrial environments. This includes industrial and municipal wastewaters, potable water, and pure and ultra-pure water. Water Sciences approach to water and wastewater treatment is based on chemical engineering principles with an applied science perspective. The School is a corporate member of British Water, the Foundation for Water Research and the International Association of Water Quality.

Centre National de Recherche Scientifique (CNRS), Paris

Equipe P.A.R.I.S. belongs to the laboratory *Géographie-cités*, which is associated with CNRS, University Paris 1, University Paris 7, and Ecole Normale Supérieure of Lyon. The laboratory has about 80 members (30 researchers and lecturers from CNRS and the university, 4 engineers, 38 Ph.D. students, 2 administrators and a few associates). The fields of research that concern the laboratory are urban areas, territorial systems, cities and systems of cities. Most work has an epistemological dimension. The key concepts are differentiation, integration, interaction, system and network, within a spatio-temporal perspective. From a methodological point of view the laboratory has focused on the development of methods in the handling and the representation of geographical information, in spatial analysis, and in modelling. Spatial interaction models have been applied to study interregional and interurban migration flows in France, interurban airline traffic in Europe, transport of goods in western Europe. Dynamic models have been developed to simulate on the one hand the spatial redistribution of the residential population and of the activities inside a number of French cities, and on the other hand the evolution of the French system of cities in the long term.

All research developed in this laboratory combine theoretical reflection and empirical studies. The systematic comparison of variate study cases is used as a validation method. Most research concern France, European Union, and Eastern Europe. The members have an education in geography but most have also a long practice of interdisciplinary collaboration, on the one hand with sociologists, historians and archaeologists, and on the other with mathematicians, physicists, and specialists in computer sciences.

The laboratory has participated in different European projects. First the projects ARCHAEOMEDES (1991-1993) and ARCHAEOMEDES II (1996-1999) in the DG12 under the direction of Sander van der Leeuw (University of Cambridge and University of Paris 1). Then the project SPESP (Study Program on European Spatial Planning, 1998-2000) from DG16. In that project the laboratory collaborated with groups from the 15 countries of the EU. It was more specifically in charge of the coordination of the work on 1: providing and testing indicators of differentiation of the European territory in the field of accessibility and spatial integration; and 2: strategical studies for a new partnership between urban and rural areas. The laboratory will also be involved in the ESPON (European Spatial Planning Obervatory Network) in 2001-2006. Besides these European projects, the laboratory has many bi-lateral conventions with EU countries (Germany, Italy, Spain), Eastern European countries (Bulgaria, Hungaria, Rumania, Tchekien and Slovakien) and America (Canada and US), and Africa (Cameroun).

Departamento de Medio Ambiente, Universidad Europea UEM-CEES

The Department of Environment belongs to the Science Faculty inside Universidad Europea UEM-CEES. The Department was created in 1996. Its main objective at that time was to develop the Environmental Science Degree studies. The research team is multidisciplinary and is formed by fourteen researchers (Geologists, Biologists, Engineers of Agriculture, Forestry and Industry). The research topics are related with Land planning, Agroecology and Recovery of degraded areas, mainly soils and watersheds. During these last five years the Department has been involved in more than twenty projects at national and international scale (European Union, WWF, BID, National Geographic) and has been produced more than one hundred papers and books.

Dept. of Environmental Science & Technology, Imperial College London

Imperial College is a technological university having a strong international reputation in teaching and research across the main areas of science and technology. The College has extensive experience and an excellent track record in participating and in the co-ordination of National, International and European Union research projects. The Department of Environmental Science and Technology has research groups in the fields of environmental science, engineering, law and policy disciplines. The Department specialises in co-operation with industry and authorities to advance scientifically sound and practical methods for the sustainable use of renewable and natural resources at the regional, national and international levels in both the developed and developing world. The Department has developed an excellent international reputation for basic and strategic research, integrated assessment modelling and decision support.

9. PROJECT MANAGEMENT

We distinguish *projects* from other types of activity by noting that the former have *start dates*, *end dates* and one or more *deliverables*. At the heart of our project management protocols is the acknowledgement that every project needs persons to assume the following roles:

- **Peer Group:** the peer group of a project consists of a group of experienced people whose task is to monitor and co-ordinate the work. All tasks and deliverables specified in a project design must be 'signed off' on delivery by the Chairman of the Peer Group (or an authorised deputy) before remuneration can be authorised by the Peer Group. The Peer Group is collectively responsible for meeting all contractual obligations, the management of all funds and resources, and the delivery of services to clients.

In normal circumstances, the Peer Group merely keeps a "watching brief" on the Project as a whole and delegates mundane executive responsibilities and accountability to a *Project Manager*, and the task of representing its collective interests to a *Project Sponsor*.

- **Manager:** the Project Manager is responsible (and accountable to the Peer Group) for the timely, efficient and safe completion of the contract. The manager takes an *introvert* view of quality, looking inwards towards the project's staff to ensure that the work proceeds according to contract, statute and specification. The Manager may or may not be a member of the Peer Group but is always closely involved in the day to day business of the project.

- **Sponsor:** the Project Sponsor represents the interests of the ultimate consumer of the deliverables and of the Peer Group. The sponsor, therefore, takes an *extrovert* view of quality, looking outwards, towards the project's clients. The Sponsor's role within a project is that of an influential advisor and the sponsor's investment of time is usually somewhat smaller than that of the Manager. The Sponsor may or may not be closely involved in the day to day business of the project but is always a member of the Peer Group.

Suitably qualified personnel can serve both as Manager *and* Sponsor on a single project. When this occurs, the two roles must be distinguished. Day to day management and "introvert" quality issues are reported along the Managerial Line to the Manager of the project(s) above and thence to the Peer Group, but issues relating to "extrovert" quality can be handled informally by direct contact with the Peer Group.

Many projects have sub-projects within which the roles of Manager and Sponsor must also be assigned. Sub-projects also have start dates, end dates and deliverables. The Sponsor of a sub-project answers to the Peer Group of the whole Project, while the Manager of a sub-project reports along the Managerial Line to the Manager of the Project above. Sub-projects do not usually need a Peer Group of their own.

Effective Peer Groups meet their obligations by pushing responsibility and accountability down to Manager(s) and Sponsors while standing by to respond to ideas and information flowing back up from below. However, the Peer Group must respond to exceptional circumstances (for example where new opportunities are identified, resources are to be re-allocated or deliverables fail to materialise on time). Having outlined our favoured approach to Project Management, we now turn to the specific allocation of roles within TiGrESS.

The PI will manage the TiGrESS project from the University of Newcastle upon Tyne, and will recruit clerical, editorial and type-setting assistance to help co-ordinate the project and produce the monograph volumes that will form our final report and undertake the publication and distribution of these books. The PI will assume substantial responsibility for project co-ordination and synthesis and will therefore serve both as Manager and Sponsor of Workpackage 1 with administrative assistance from the Newcastle Research Services Unit and project-funded administrative staff.

The TiGrESS Peer Group will consist of the Managers and Sponsors of all constituent workpackages under the chairmanship of the PI. Other members of the Consortium may be recruited at the discretion of the group. The Peer Group will be collectively accountable to the EU in respect of the TiGrESS project. It will hold Annual General Meetings timed to predate annual reports. At these meetings, project staff will present results, discuss progress, monitor budgets and deliverables and assess the quality of our work in respect of the contract.

ANNEX 2

Human Activities, Drivers and Environmental Context

A2.1 Water Demand & Supply along the M11 corridor:

Any arbitrarily defined spatial zone (city, region, state etc.) can be seen as a complex system which evolves over time. Research into the dynamics which underlie such evolution has characterised city and regional economies as the compound result of different activities that to some extent fit together and need each other; a process of coevolution which is typical of many complex systems. Information relating to the coupled development through time of communities and the technological infrastructures which sustain their most basic needs (food, shelter, warmth, and of significance in this particular case, water), can be identified from a variety of disciplinary sources (e.g. History, Anthropology, Sociology, Engineering, Economics).

However, interdisciplinary analyses focused on policy relevant output are now required to convert what is a disparate knowledge base into a focussed, coherent understanding of socio-technical issues. Through such an agenda, the resultant understanding of the *coevolution* of society and technology, at the very least in terms of their spatial and temporal dependencies, will enhance our ability to plan (though not necessarily control) a sustainable future. The development of models of cities as complex self organising systems shows that the spatial dynamics of a sustainable city would be likely to give rise to substantial changes over time in the patterns and nature of water demand (consumption 'footprints'). Indeed, changes in technologies, social priorities, spatial and temporal demand and rainfall patterns may, in time, necessitate major modifications to the configuration and operation of the system. Sustainable communities will thereby require water supply systems which are capable of adapting to temporal and spatial variations in the demand profile. By viewing the co-evolutionary relationship between demand and supply in these terms, the criteria for desirable infrastructure characteristics are subtly altered. In particular, the system will be required to exhibit flexibility and adaptivity in the face of changing demand patterns. These characteristics can be enhanced by the use of novel water processing / recycling plants which provide opportunities for adaptive infrastructure configurations.

Government plans for the economic development of South East England make provision for large scale commercial, housing and industrial development along a corridor which runs from North East London, along the M11 motorway, to the city of Cambridge. Water resources are already under pressure in this region from the impacts of climate change and competing demands for water as a commodity and as a natural resource. Reliable projections of future water demand are essential for the design of water supply networks.

A2.2 European Urban Network:

The inequalities between regions have been and still are a problem of importance in the European construction. The place and the role of cities and towns in these inequalities are fundamental.

Traditionally the potential of growth of cities and towns depended on the agricultural wealth of the region (market logic), on the local resources (industrial logic), or on a situation advantage creating opportunities for trade (ports for example). The European urban configuration has emerged principally through a combination of those principles. This urban configuration is quite stable through time in terms of *pattern.* It represents in fact an inheritance, with both potentials and constraints, that strongly influence future development and that actors have to integrate in their planning. What evolve are on the one hand their spatial inscription (urban sprawl) and on the other the relative importance of the urban areas the ones compared to the others. The differences between growing centres and declining peripheries are increasing at different geographical scales (European, national and regional). "Centres" have here a broad meaning; it could be a city, but also a *multi-polar* area or an *axis* of urbanisation. Nowadays the potentials of growth are strongly related to the form of the interdependencies between cities at different levels.

The evolution of the number of inhabitants is a good measure of the wealth of a place. It reflects the dynamics of the age structure (dependent on preceding migrations) and of the migratory attractivity. The ability of a city or a town to be attractive depend on many factors. We propose to emphasize *context* effects of different levels:

- the *proximity to the core*, or to one of the cores of the considered area (at different geographical scales, regional, national, European); the role of this kind of proximity is complex: near the core, a place benefits of impulses of growth; at a certain threshold the training effect has disappeared, and a competition mechanism can emerge; far away enough, there is opportunity for a centre of secondary level. (Proximity has to be considered both from the point of view of physical and network proximity);

- the *relative position* in the considered area; from a *hierarchical* point of view (a same number of inhabitants has different consequences depending on if the city is the largest in its country, or the 10th); and from a *geographical* point of view : two cities similar in size and economical profile, near each other, will have different potentials of evolution if they are located in the north or the south of their own country; the same is the case for two cities, one located in the middle, the other near the border of a country ;

- the *urban forms* in the considered area; monocentric/polycentric, dense/remote,... ; the new communication technologies have favoured new kinds of interactions between places, in particular relations between peripheral places of same importance have emerged parallel to traditional hierarchical relations. The hypothesis is that different forms of settlements create different opportunities for such interactions, which in turn create different potentials of growth.

The question of sustainability needs to be analysed at different levels:

1. At the local level of the city or the town: Below a certain number of inhabitants, the available information may be insufficient for adopting some innovations, and some services could be over-dimensioned etc. So a reduction below a certain threshold may reduce the image and the attractivity of the place and cause further decline. This kind of retroaction is clearly a factor of unsustainability at the level of the city or town being considered;

2. At the regional, national and European level: Different relative growth and decline induce a *recomposition* of the urban settlement. To a certain extent the decline of some cities will have no impact on the functioning of the whole system, but too important and systematic inequalities inside the system of cities could result in unsustainability of the whole system (increasing costs of territorial management for example);

It is important therefore to explore future trajectories at the level of cities, types of cities, regions and at the macro-level of the European urban system, in order to identify sustainable future socio-economic and demographic development pathways.

A2.3 Land Planning & Sustainable Agriculture in Madrid:

Over the last three decades the Madrid Autonomous Community has gone from having no land-planning controls to a well-defined and firm planning system. Most of the planning regulations were drafted by architects whose conception of planning issues was neither representative of nor sensitive to the needs of the wider community and of the natural resources. The system has been particularly damaging in respect of environmental and socio-economic issues. A great deal of valuable agricultural land has been lost to buildings and dams, resulting in damage to the economic bases of rural communities and growing pressure on the natural environment. This pressure has resulted in the tightening of regulations, which has further constrained economic development in rural communities. The result has been a form of cultural exclusion arising as an unforeseen consequence of earlier water-management and land-planning decisions.

The regulations are reviewed on a ten-year basis and the next phase of review seems likely to result in substantial changes. The changes made must reflect the contemporary situation, including the location of dams and new settlements, while actively searching for viable pathways to economic and environmental sustainability.

Two opposing pressures must be reconciled. Growing popular and commercial pressure is being exerted to relax planning restrictions, particularly in respect of new developments while the statutory requirement to maintain Regional Parks and the demands of Agenda 21 require the maintenance and, in some cases, some tightening of existing controls. The reconciliation of these conflicts calls for a deep understanding of the social and legal contexts in which they arise.

The different types of current regulations need to be reviewed, both those related to land planning itself and those related to conservation of the natural environment. At the municipal level an understanding is required of land planning changes through time and present day socio-economic dynamics. Interest groups and their needs in the use of the territory must also be addressed.

Three main issues must be reconciled in order to integrate sustainable agriculture into land-planning regulations and thus identify potentially sustainable development pathways:

Soil health: The soil is a complex dynamic system *in its own right* with a substantial living and organic component. There are measurable parameters of soil health and crop productivity which are inter-related with each other and with agricultural practices. At a superficial level, therefore, one might imagine that the key to maintaining soil health and good levels of productivity is purely a matter for the farmer. In practice, however, this is not the case.

Socio-economic dynamics: The farmer, who works a specific set of soils in a particular geographical location, is subject to commercial and political pressures in the form of subsidies and advice from marketing organisations. These pressures are seldom sensitive either to the precise location of the land or to soil health. The farmer has personal goals and wishes and is a member of a community with norms and expectations to which he/she must be responsive. Since the Common Agriculture Policy reform in 1992, environmental conservation issues have been emphasised in the agri-environmental policy design and implementation and as such influence the farmer.

Habitat fragmentation: It is now widely acknowledged that environmentally sensitive farms provide suitable habitat patches for many animal and plant species, as well as being "corridors" that provide safe migration routes between patches within the landscape. Indicators of habitat fragmentation and biodiversity can be used as measures of land suitability for sustainable agriculture.

Reconciling these issues is essential if sustainable pathways are to be identified which accommodate both the natural environmental dynamics and the human socio-economic drivers.

Annex 3

Description of End-Users of the TIGRESS System

The following organisations have expressed interest in the project. Some will provide the necessary data for the project objectives to be accomplished, some will participate in periodic meetings and propose issues which are directly applicable to the proposed research, and others will act as potential end-users of the TIGRESS System and routes for the exploitation of the research results in the case study regions.

➢ Governmental and Non-Governmental Organisations

The Ministry of Transport, Public Works and Water Management, The Hague, The Netherlands has approximately 14.000 employees and may therefore be regarded as one of the larger ministries. The ultimate responsibility for the entire ministry lies with Minister T. Netelenbos. She is assisted by the State Secretary Ms M. de Vries, the chief civil servants and has advisory bodies at her disposal. The ministry has responsibilities for ensuring that the country is habitable for the point of view of protection against flooding and the availability of versatile water systems, and ensuring the safe mobility and good communication facilities needed for Dutch society to function healthy, both nationally and internationally.

➢ Private Organisations

David Lock Associates is a leading town planning and urban design consultancy in the UK. *They are an active end-user partner (assistant contractor)* in the TiGrESS project with a client base which includes local and regional planning agencies, urban development corporations and a variety of other governmental and private clients. They will provide an immediate route for the dissemination, exploitation and application of the TiGrESS project.

The **Three Valleys Water Company PLC** supplies most of the populations along the M11 corridor between North London and Cambridge with potable water. In October 2000, Three Valleys Water and its sister company, North Surrey Water Limited, merged. Three Valleys Water was the result of a merger between Colne Valley, Lee Valley and Rickmansworth water companies in 1994 (these companies created by 29 other mergers over 130 years), and North Surrey Water Limited was the result of a merger of South West Suburban Water Company and the Woking & District Water Company in 1973, companies also created by mergers, the earliest dating back to 1869. Three Valleys have over 130 years experience in the water industry.

APPENDIX 2

MILESTONES

MILESTONES OF SUSTAINABLE DEVELOPMENT (SD)

INTERNATIONAL SPHERE ⇩	EUROPEAN SPHERE ⇩	SPANISH SPHERE ⇩
1987. Brundtland Report, International Commission on environment and development → definition of Sustainable Development	**1972.** First programmes on environmental protection	After a transition period, CIFCAMA was created as the first national commission on environment
1992. UN Conference on Environment and Development, Rio Summit → Agenda 21 →Convention on Biological Biodiversity →Convention on Climate Change **1994.** Convention on fight against Desertification	**1993.** The European Union Treaty → Prevention principle	**1997-2000.** Launch of the implementation of agreements reached in the Rio Summit and Rio+5
1997. Rio+5, Kyoto Protocol → National Strategies on SD (NSSD) **2001.** UNEP and OCDE →Directives on SDS **2002.** World Summit on SD, Johannesburg, Rio+10. United Nations → Implement NSSD by 2005 → Local Action Plan Agenda 21	**1997.** Treaty of Amsterdam → Confirmation of SD as political objective of the EU **2001.** Gothenburg Council Adoption of the European Strategy for Sustainable Development (ESSD)	**2002.** World Summit on SD, Johannesburg Rio+10. United Nations → Spanish Government presents a draft of the NSSD → Alternative document to the NSSD presented by ecologist groups and PSOE, then the main party in the opposition
2004. International ratification of Kyoto Protocol	**2004.** After Rio+10 → Revision of SDS and Agenda 21 → Directive on Environmental Responsibility	**2004 – to date.** Participation ion the Mediterranean Strategy for SD **2005.** SSD remains unpublished today

MILLENIUM DEVELOPMENT GOALS

MILESTONES IN THE POLITICAL-ENVIRONMENTAL FRAMEWORK

	DECADE OF THE 70'S	DECADE OF THE 80'S	DECADE OF THE 90'S	2000-TO DATE (2005)
WORLDWIDE	**1971.** Ramsar Agreement, wetland conservation; CITES, Agreement on the trafficking with wild fauna and flora endangered species **1972.** Stockholm Conference on Human Environment	UNESCO establishes the concept of protection of "Reserves of Biosphere"	**1992.** UN Conference on Environment and Development, Rio Summit →Convention on Biological Biodiversity →Convention on Climate Change →Agenda 21 **1994.** Convention on fight against Desertification	**2002.** World Summit on Sustainable Development Johannesburg, Rio+10 **2004.** International ratification of Kyoto Protocol
EUROPEAN SPHERE	**1971.** Berna Agreement, conservation of natural heritage **1972.** First environmental action programmes **1976.** Barcelona Agreement, protection of the Mediterranean environment **1979.** Bonn Agreement, actions for the conservation of migratory birds		**1992.** Directive on Habitat 92/43/CEE to guarantee the conservation of biodiversity through the maintenance of natural habitats and the conservation of wild fauna and flora → Creation of Natura 2000 network formed by special conservation areas (SCA) **1997.** Treaty of Amsterdam → Confirmation of SD as political objective of the EU	**2001.** Gothenburg Council Adoption of the European Strategy for Sustainable Development (SSD) **2002.** Declaration of Teide to activate Natura 2000 network **2004.** After Rio+10 → Revision of SDS and Agenda 21 → Directive on Environmental Responsibility
	Declaration of protected	**1989.** Law /89 on	**1995.** Adoption of the	**2004.** RD 95/97 and Law

NATIONAL SPHERE	figures during the dictatorial period: National Parks and National Places. Natural Places and Monuments of national interest were also established. **1979.** Adoption of the European Directive on birds and establishment of special conservation areas for birds (SPA)	conservation of natural resources and related fauna and flora	Directive on Habitat – RD 95/97 – and designation of Places of Communitarian Importance (SCI) **1996.** Strategic Plan of the Ramsar Agreement on wetlands **1997.** Laws 40 and 41/97 modify Law 4/89 with regards to the administration of National Parks **1998.** Agreement on Biological Diversity; National Programme to fight against Desertification.	43/2003 (which modifies Law 4/89) incorporates Natura 2000 network
REGIONAL SPHERE (MADRID)		**1988.** First designation of SPA	**1990.** Law 7/90 on wetland protection **1993.** 23% of the territory is declared SPA **1995.** Law 16/95 on forest protection **1999.** 40% of the territory is declared SCI	**2002-2004.** Natura 2000 network. → After SCI and SPA initiatives, SCA is established and actions to preserve natural habitats and species are taken.

MILESTONES IN THE POLITICAL-URBAN PLANNING FRAMEWORK

	DECADE OF THE 70's AND THE 80'S	DECADE OF THE 90'S	2000-TO DATE (2005)
EUROPEAN SPHERE	**1982.** The European Position in Land Planning → background in Land Planning	**1994.** Dresde Meeting →new approaches in The European Land Planning Policies **1997.** Directive (CE/97/11) →First steps in the EIA.	**2001.** Directive (CE/2001/92) in Environmental Assessment in specific plans and programmes **2002.** Conference People, Planet and Prosperity "Obstacles of Agenda 21" of the EU Commission **In current process.** The Directive on Environment Impact Assessment (EIA) and the Directive on Strategic Environmental Assessment (SEA) for Plans, Programmes and Projects.
NATIONAL SPHERE	**1978.** The Spanish Constitution (Article 148.3) →Responsibilities in land planning to the regional governments. **1986.** RD EIA	**1992.** Law 1/1992 on Land Planning (*Ley sobre el regimen del suelo y valoraciones*). **1998.** Law 6/1998 replaced the earlier one.	**2001.** Law 6/2001, transposición de la Directiva Europea (CE/97/11). Y modifica el RD 1202/1986
REGIONAL SPHERE (MADRID)	**1984.** Land planning legislation focused on the PGOUM *(Plan General de Ordenación Urbanística de Madrid)*		**2001.** Land Law 9/2001 (*Ley del suelo*). → "Municipal land planning Schemes" are in process. **2005-In process.** Proposal of Reform of current Land Law

MILESTONES IN THE POLITICAL-AGRARIAN FRAMEWORK

	FROM DECADE OF THE 50'S UNTIL 80'S	DECADE OF THE 90'S	2000-TO DATE (2005)
EUROPEAN SPHERE	**1957.** Treaty of Rome. → Treaty establishing the European Community	**1992.** Treaty of Maastricht, Reform of the CAP → Accompanying measures were introduced: early retirement, agro-environmental measures and forestry →Regional Policy, financed by the Structural Funds constituted by the European Agricultural Guidance and Guarantee Fund (EAGGF) and the European Social Fund (ESF) **1994-1999.** Period known as *"The first pillar of CAP"* →market policy, with price support measures **1996.** The European Union Conference on Rural Development (Cork, Ireland) **1999.** The Agenda 2000 Reform. → *"The second pillar of CAP"* Rural development regulation (Council Regulation [EC 1257/1999])	**2000.** Implementation of the Agenda 2000. **2003-2004.** CAP and Rural Development Reform. This reform will also establish the EU's position in the negotiation ongoing with WTO →Strengthened rural development policy, new measures to promote the environment, and a reduction in direct payments for bigger farms in order to finance the new rural development policy. → All subsidies or payments for production support will be replaced or scrapped from 2006. →Rural Development Policy (2007-2013): the novel European Agriculture Rural Development Fund (EARDF) and special support to NATURA 2000 areas

		completely discharged from market policy: 1. Agro-environmental measures (eco-condicionality), 2. Rural development Initiatives → Improvement of the Structural Funds and the Cohesion Fund → Decentralising the management of the EAGGF	
NATIONAL SPHERE	**Decade of the 70's.** Rural migration to metropolis **1988.** Spain entered in the EC → Implementation of the Common Agrarian Policy (CAP)[1] → Regional Policy **1989-1993.** Structural adjustment of Spain with the rest of the member countries	**1992.** Reform of 1992 → The EU Regional Policy established Objective areas through Multi-annual Operational Programmes under the Structural Funds, specifically funded by the (EAGGF)[2] → 1994 – 1999, First Rural Development Programme **1999.** Agenda 2000 →New Objectives areas in the Regional Policy. → High significance of Rural Development Programmes reach in the EU policies.	**2000.** Implementation of the Agenda 2000. →2000 – 2006, Second Rural Development Programme **2003.** Organic Farming Plan **2003-2004.** Reform of the CAP → Critical position from Farmers Trade Unions and other Associations **2004.** Presentation of the last national survey from Ministry of Agriculture *"Libro Blanco de Agricultura y Desarrollo rural"*
	1989 – 1993. First period of the Regional Policy	**1994 – 1999.** Second period of the Regional Policy	**2000 – 2006.** Third period of the Regional Policy

[1] CAP is widely known as PAC (*Politica Agraria Comun*) in Spain.
[2] EAGGF known as FEOGA (*Fondo Europeo de Orientacion y Garantia Agricola*) in Spanish.

REGIONAL SPHERE (MADRID)	→ Objective areas under the Structural Funds: Objective 2 and 5b, before the reform of CAP in 1992. →First Period of Communitarian Initiatives (LEADER I)	→ Objective areas under the Structural Funds: Objective 2 and 5b, before the implementation of Agenda 2000 → Second Period of Communitarian Initiatives (LEADER II and PRODER I) **1997 - 1999.** First Period of market policy *"The first pillar of CAP"* → Specific regionalised instruments "direct support scheme" **1994 - 1999.** First Period of Rural Development Programme within *"The second pillar of CAP"* →Main measures: "improving environmental", "structural and marketing improvements", "training" and "supporting income" → Strongly linked the Communitarian Initiatives	→ After implementing of Agenda 2000: Objective 2 to support economically and socially less-disfavoured areas as industrial, urban and rural; Objective 3 to support modernisation of policies and training systems. → Third Period of Communitarian Initiatives (LEADER + and PRODER 2) **2000 - 2002.** Second Period of market policy *"The first pillar of CAP"* **2000 - 2006.** Second Period of Rural Development Programme within *"The second pillar of CAP"* →Multifunctionality. → Initiatives to programmes of the Regional Policy and Rural Development Programme, Communitarian Initiatives under co-financing with the member countries

APPENDIX 3

BOOKLET - SPANISH & ENGLISH

HACIA UNA PLANIFICACIÓN TERRITORIAL SOSTENIBLE EN LA COMUNIDAD DE MADRID:DIRECTRICES Y RECOMENDACIONES

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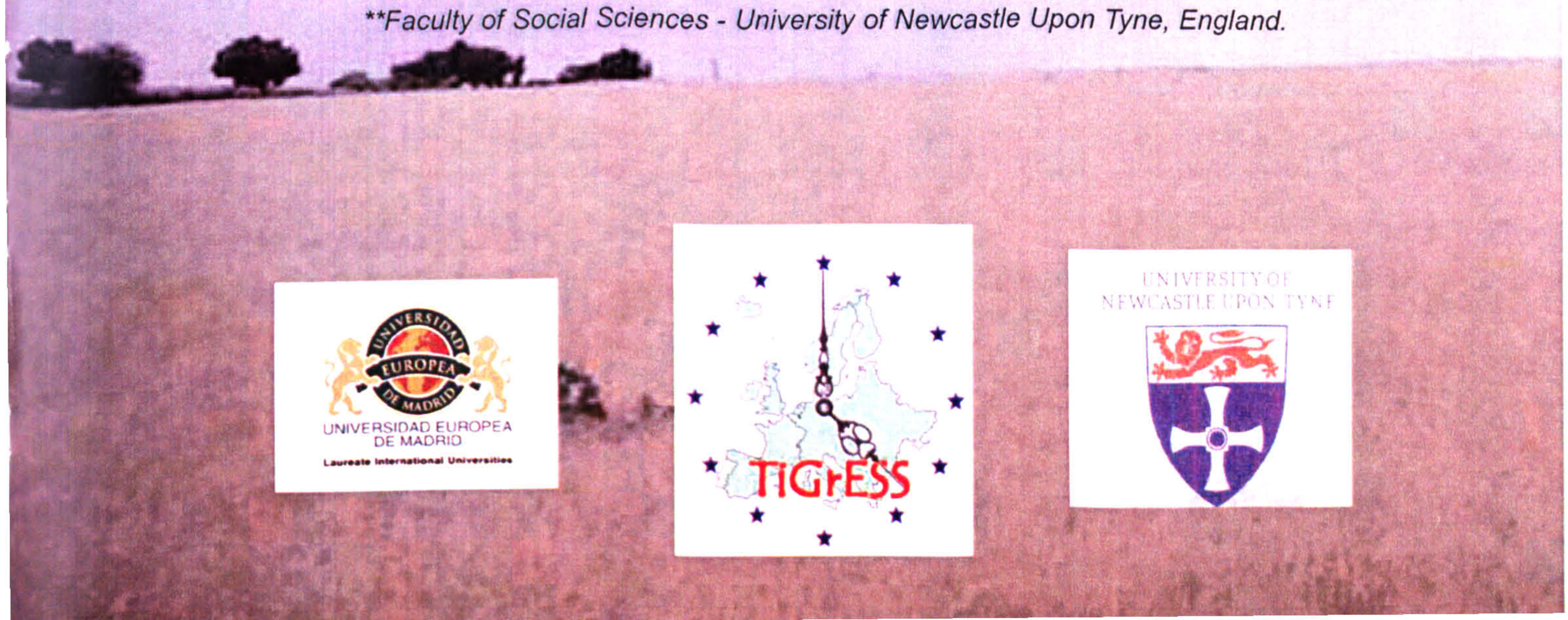
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El desarrollo de esta "guía de recomendaciones" ha sido posible gracias a la inestimable colaboración de los diversos grupos de interés involucrados en la Planificación Territorial.

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-Al Gobierno Regional de la Comunidad Autónoma de Madrid por la colaboración de la Consejería de Medio Ambiente y Ordenación Territorial, y de la Consejería de Economía e Innovación Tecnológica. Más concretamente a la Dirección General de Medio Natural, a la Subdirección General de Planificación Territorial y a la Dirección General de Agricultura y Desarrollo Rural.

-A los alcaldes y agentes de desarrollo local (ADL) de los Ayuntamientos de Belmonte de Tajo y Cercedilla.

-A los grupos de desarrollo rural o acción local, en especial a ADESGAM, al Comité de agricultura ecológica de la Comunidad de Madrid, a las asociaciones de agricultores y ganaderos, a las cooperativas de consumidores y productores, a los sindicatos agrarios y a los grupos ecologistas.

-Y muy en especial a los agricultores ecológicos: Julio Arroyo, ganadero de la Asociación Biodinámica de San Yago en Cercedilla; Andrés Morate, vitivinicultor y propietario de la bodega de vinos ecológicos "Andrés Morate" en Belmonte de Tajo; y Hugo Vela, propietario del vivero "Monjarama" en San Sebastián de los Reyes, por su colaboración desinteresada y generosa.

Porque sin sus valiosas aportaciones esta publicación no hubiera sido posible.

El Equipo de Trabajo se responsabiliza de las opiniones difundidas en esta "guía de recomendaciones", las cuales no reflejan necesariamente los puntos de vista de los grupos de interés que han aportado ideas a este documento, ni las políticas de la Comisión Europea.

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INTRODUCCIÓN

Los paisajes rurales de la Comunidad de Madrid, con un carácter eminentemente mediterráneo, han sufrido durante las últimas décadas importantes cambios en sus características, transformándose en paisajes más fragmentados. La fragmentación -entendida como el proceso por el cual extensos y continuos hábitat son divididos en pequeñas manchas (Andrén, 1997)- y la pérdida de los hábitat naturales se consideran en la actualidad como algunos de los problemas más importantes en el ámbito de la conservación de las especies y la pérdida de diversidad. El aumento de la fragmentación de los hábitat está relacionado tanto con el desarrollo de infraestructuras viarias como con la destrucción directa del hábitat debido a los conflictos relacionados con los cambio de uso de suelo o a la intensificación de determinadas prácticas agrícolas y forestales. Se estima que alrededor de un 30% de las áreas propuestas dentro de la futura Red Natura 2000 (Directiva 92/43 CEE) se verán afectadas por una intensificación de las prácticas agrícolas (Heath and Rayment, 2001).

En la región de Madrid la producción agraria se encuentra en declive debido a la baja productividad de las cosechas, a las inadecuadas infraestructuras y a la alta presión en las áreas peri-urbanas donde en un pasado la agricultura se desarrollaba. Desde 1989 a 1999, según datos del censo agrario, el área dedicada a la agricultura se había reducido en un 13%. Concretamente en 1989, la región de Madrid tenía un 68% de su área dedicada a la agricultura, pasando en 2002 a representar tan solo un 29 % de toda la superficie de la Comunidad Autónoma de Madrid (MAPYA, 1989), este área supone aproximadamente unas 229.428 ha.

El desarrollo de la agricultura ecológica en la Comunidad de Madrid, como en el resto de España, ha presentado un notable incremento en los últimos años. Sin embargo, la presión urbanística para la construcción de áreas urbanas, industriales y el tejido de transportes, ha contribuido a perder muchas tierras agrícolas, entre ellas las de mejor calidad (Martínez Falero, 2002).

Como se refleja en el Libro Blanco de Agricultura y Desarrollo Rural: "La agricultura sigue siendo una actividad esencial para mantener el tejido social y el equilibrio territorial" (MAPYA, 2004), hecho que viene a confirmar el papel esencial e ineludible que tiene la agricultura en la planificación territorial sostenible.

La ineficaz e insuficiente transposición de las regulaciones europeas, tanto en el ámbito agrícola, como en el de la ordenación del territorio y el medio ambiente, se ha debido, principalmente, a la descoordinación existente entre las acciones regionales, nacionales y europeas. La ausencia de regulaciones específicas de los agro-ecosistemas es un reflejo del abandono de la agricultura en la planificación territorial, anteponiéndose la presión urbanística a la demanda del sector agrario.



La Encomienda, en Belmonte de Tajo (Madrid)

En concreto, la Ley del Suelo de la Comunidad Autónoma de Madrid (Ley 9/2001) obliga a establecer planes generales de ordenación urbana e implementarlos en los municipios. Hasta ahora, la mayoría de los municipios continuan con las Normas Subsidiarias (anteriores a la ley citada), fundamentadas exclusivamente en el desarrollo de las áreas urbanas. Suele suceder que, en la mayoría de los casos, los suelos de elevada potencialidad agrícola o de alto valor ecologico, son los primeros en ser elegidos para su urbanización o para su ocupación por obras públicas. Esta situación, nos lleva a predecir a corto plazo, que la agricultura madrileña podría quedar restringida a las zonas de menor potencialidad, encontrándose de esta manera, condenada a desaparecer, o a ser una actividad absolutamente marginal dentro de los sectores productivos.

INTRODUCCIÓN

Esta "guía de recomendaciones" es uno de los resultados de un proyecto más amplio denominado TiGrESS (Time-Geographical approaches to Emergence and Sustainable Societies). Se trata de un proyecto perteneciente al V Programa Marco de la Unión Europea donde el objetivo común de los equipos de investigación que lo componen es el desarrollo de herramientas para la toma de decisiones en la planificación del territorio. En particular, el objetivo del equipo de investigación de Madrid es el diseño de una herramienta de planificación territorial sostenible, que tenga en cuenta el significativo papel de la agricultura en la conservación y recuperación de los valores ecológicos del territorio. La finalidad de dicha herramienta es la de informar a los planificadores y a quienes toman las decisiones en el ámbito político, tanto a escala municipal y regional, como nacional, del posible impacto de los futuros escenarios políticos en los cambios de uso del territorio.

A través del estudio y análisis de los usos sobre el territorio en la Comunidad Autónoma de Madrid, y de los cambios acontecidos en los mismos, desde 1982 hasta la actualidad, se detectaron numerosas carencias en los procesos de planificación territorial. Mediante reuniones de expertos se propusieron una serie de acciones políticas directa o indirectamente relacionadas con este ámbito, que tienen como eje principal la planificación sostenible del territorio. Dichas acciones políticas se discutieron, evaluaron y consensuaron con un amplio rango de grupos de interés, involucrados en materia de planificación del territorio. Algunos de estos grupos, partícipes desde el principio en este proceso, permitieron el contacto con otros grupos de interés locales, asegurando de esta forma, la riqueza y pluralidad del texto. Se contrastaron opiniones, potencialidades e intereses desde ámbitos tan diversos como los agricultores y las asociaciones agrarias, o los organismos competentes en materias de urbanismo en el Gobierno Regional.

Esta guía se estructura en dos grandes bloques: en un primer bloque se presentan las acciones políticas y todos los grupos involucrados en cada acción y en un segundo bloque los grupos de interés y las recomendaciones para cada una de las acciones políticas.

Esta estructuración del documento permite una doble entrada para su mejor comprensión. La primera parte ofrece una visión integral de cada acción política y la segunda, una síntesis de las recomendaciones para cada uno de los grupos de interés, en relación con cada una de las acciones.



Mosaico de cultivos en Belmonte de Tajo (Madrid), Primavera, 2005

ACCIONES POLÍTICAS PROPUESTAS PARA UNA PLANIFICACIÓN TERRITORIAL MÁS SOSTENIBLE

A continuación se presentan las siete acciones políticas que se proponen:

ACCIÓN POLÍTICA 1. PROTECCIÓN DE ÁREAS AGRÍCOLAS TRADICIONALES

ACCIÓN POLÍTICA 2. APOYO AL DESARROLLO DE LA AGRICULTURA ECOLÓGICA

ACCIÓN POLÍTICA 3. PROMOCIÓN DE MERCADOS LOCALES

ACCIÓN POLÍTICA 4. RECUPERACIÓN DE RIBERAS

ACCIÓN POLÍTICA 5. MEJORAR EL ACCESO, LA DISPONIBILIDAD Y LA CALIDAD DE LA INFORMACIÓN AGROAMBIENTAL

ACCIÓN POLÍTICA 6. COORDINACIÓN ENTRE MEDIO AMBIENTE, AGRICULTURA Y PLANIFICACIÓN

ACCIÓN POLÍTICA 7. PROMOCIÓN DE LOS PROCESOS DE PARTICIPACIÓN

Estas acciones políticas son fruto de la diagnosis realizada en el territorio, de las carencias detectadas en los procesos de Planificación Territorial y de la discusión con los grupos implicados. Dentro de cada acción se sigue el siguiente esquema:

- **Situación actual de cada acción política**
- **Iniciativas**
- **Grupos de interés involucrados y Recomendaciones**

Situación actual

La red de comunicaciones en la Comunidad Autónoma de Madrid actúa como un eje de expansión de la actividad urbanística desde el centro urbano hacia el área peri-urbana alcanzando un radio de 25 a 50 kilómetros. En este territorio, las áreas naturales protegidas, tanto espacios naturales protegidos bajo la legislación española, como espacios derivados de la transposición de las directivas europeas (LIC, Lugares de Importancia Comunitaria, y ZEPA, Zonas de Especial Protección para Aves) ocupan el 40% del territorio (Red Natura, 2004). Este crecimiento urbano y el porcentaje de áreas naturales protegidas hacen que muchos terrenos rústicos óptimos para la agricultura sean recalificados como urbanos, desplazando la actividad agro-ganadera a un plano marginal y a terrenos de peor calidad. Esta situación puede suponer el abandono de la actividad agro-ganadera a medio o largo plazo, y la consiguiente perdida de los agro-ecosistemas típicos Mediterráneos.



Agricultura peri urbana-tradicional en Belmonte de Tajo (Madrid), Primavera, 2005

Iniciativas

La iniciativa que se plantea es la **protección de áreas agrícolas tradicionales**, que se pondría en marcha a través de un plan regional para salvaguardar el valor agrícola del suelo incluyendo la actividad ganadera y silvícola.

Este plan favorecería el mantenimiento de la agricultura tradicional (olivares y viñedos, secanos tradicionales y huertas en regadío) aumentando la diversidad paisajística, creando zonas de amortiguación y conexiones biológicos entre los espacios protegidos, asi como la puesta en marcha de actividades educativas y turísticas, y la producción de alimentos locales de calidad.

En el caso de las áreas peri-urbanas se crearía un cinturón de agricultura sostenible que controlaría el impacto del area úrbana en el resto del territorio. Este cinturón actuaría como una zona de amortiguación y podría facilitar, además, la conexión entre los distintos Espacios Naturales Protegidos y entre manchas de vegetación n natural (aún sin estar protegidas) a través de corredores ecológicos. Esta estructuración del paisaje permitiría un mayor control de la fragmentación paisajística ocasionada por la expansión urbanística y la creación de nuevas infraestructuras.



Agricultura peri urbana-tradicional en Belmonte de Tajo (Madrid) junto a un desarrollo urbanístico incipiente, Primavera, 2005

Por otra parte, la protección del territorio agrícola permitiría mantener agro-ecosistemas tradicionales, y en especial los suelos de riberas, también conocidos como vegas, por su importante valor ecológico, mediante prácticas sostenibles.

Por último, la calidad paisajística de estas zonas agrícolas tradicionales y la producción de alimentos de calidad, impulsaría la puesta en marcha de actividades educativas y turísticas en la región, favoreciendo la multifuncionalidad del territorio.

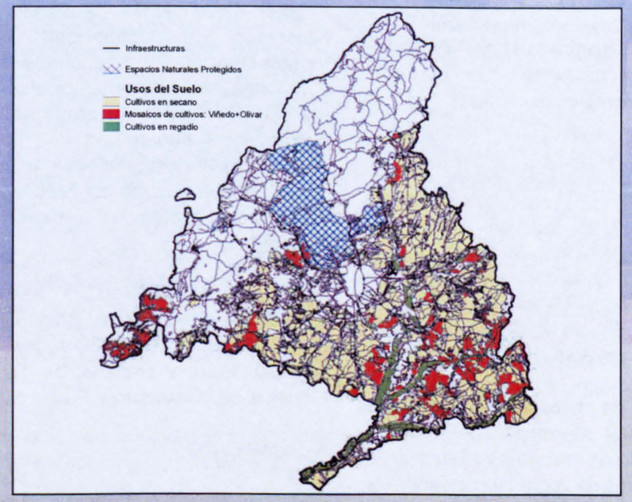


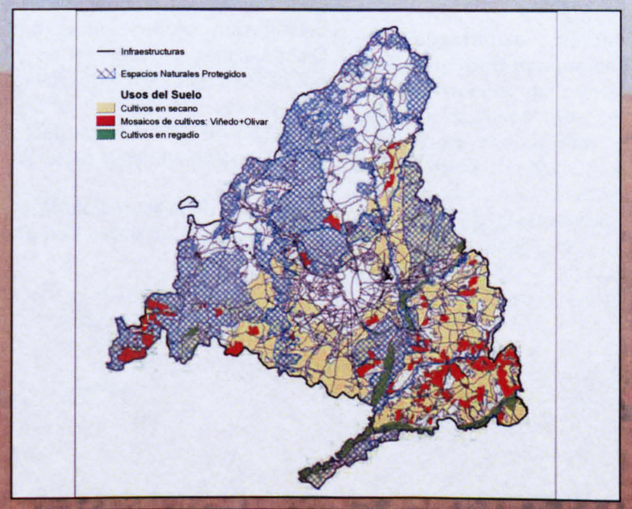
Huertas tradicionales en áreas periurbanas en Villaviciosa de odón (Madrid). Primavera, 2005

ACCIÓN POLÍTICA 1: PROTECCIÓN DE AREAS AGRÍCOLAS TRADICIONALES



Agricultura peri urbana-tradicional en Belmonte de Tajo (Madrid)





Evolución de los usos del suelo, áreas naturales protegidas y la red de infraestructuras en dos décadas (2002 – 1982)
Fuente: Elaboración propia

Grupos de interés implicados y Recomendaciones

A continuación se presentan los grupos de interés involucrados y las recomendaciones:

En el ámbito Nacional

MINISTERIO DE MEDIO AMBIENTE [DIRECCIÓN GENERAL PARA LA BIODIVERSIDAD]

MINISTERIO DE AGRICULTURA, PESCA Y ALIMENTACIÓN [DIRECCIÓN GENERAL DE DESARROLLO RURAL Y DIRECCIÓN GENERAL DE INDUSTRIAS AGROALIMENTARIAS Y ALIMENTACIÓN]

- Apoyar la puesta en marcha de iniciativas regionales y coordinar el seguimiento respecto a las recomendaciones del nuevo reglamento del Fondo Europeo Agrícola para el Desarrollo Rural (FEADER) sobre la protección de producciones agrícolas dentro de la Red Natura 2000 (Delpeuch, R., 2004; MMA, 2005)

En el ámbito Regional

CONSEJERÍA DE ECONOMÍA E INNOVACIÓN TECNOLÓGICA [DIRECCIÓN GENERAL DE AGRICULTURA Y DESARROLLO RURAL] EN COORDINACIÓN CON LA CONSEJERÍA DE MEDIOAMBIENTE Y ORDENACIÓN TERRITORIAL [DIRECCIÓN GENERAL DE URBANISMO Y PLANIFICACIÓN REGIONAL, Y LA DIRECCIÓN GENERAL DE MEDIO NATURAL]

- Desarrollar un **plan de protección de áreas agrícolas estratégicas** por su función de transición entre áreas urbanas y áreas naturales. Estas áreas serían compatibles con usos de recreo y conservación.

- **Inventario (identificación, zonificación y catalogación) de agro-ecosistemas tradicionales** y áreas agrícolas de alto valor, tanto ecológico como productivo, incluyéndose en esta zonificación áreas tradicionalmente cerealistas, suelos de ribera o vega y pastizales, debido a su significativo papel en la conservación de la biodiversidad. Esta línea se pondría en marcha en coordinación con el Plan Natura 2000 de la Consejería de Medioambiente y Ordenación Territorial, cuya función es conservar y gestionar los espacios agrícolas dentro de la Red Natura 2000.

- Establecer **zonas agrícolas de exclusión urbanística** que actúen como filtros territoriales, dentro de los cuales también se incluiría la red de Vías Pecuarias. De este modo, se permitiría el desarrollo de planes municipales de acción agrícola en áreas peri-urbanas. Esta iniciativa vendría a sumarse a la propuesta de promover espacios agrícolas en áreas urbanas, del Libro Blanco de Agricultura de la Comunidad Autónoma de Madrid (Dirección General de Agricultura y Desarrollo Rural, 2005).

- Promover las **denominaciones de calidad** para mejorar la comercialización de los productos, tales como las denominaciones de origen, los productos de cultivo ecológico, y otras etiquetas como "Alimentos de Madrid".

En el ámbito Regional y Local

CONSEJERÍA DE MEDIOAMBIENTE Y ORDENACIÓN TERRITORIAL [DIRECCIÓN GENERAL DE URBANISMO Y PLANIFICACIÓN REGIONAL]

AYUNTAMIENTOS

- Crear herramientas de planificación territorial que potencien la solidaridad entre municipios, estableciendo mecanismos conjuntos de compensación supra-municipales, como por ejemplo los **fondos de financiación común**. Estas herramientas supondrían una solución óptima para equilibrar las desigualdades económicas y sociales que se generan como consecuencia de la declaración de espacios protegidos o futuros espacios agrícolas protegidos.

CONSEJERÍA DE ECONOMÍA E INNOVACIÓN TECNOLÓGICA [DIRECCIÓN GENERAL DE AGRICULTURA Y DESARROLLO RURAL] EN COORDINACIÓN CON LA CONSEJERÍA DE MEDIOAMBIENTE Y ORDENACIÓN TERRITORIAL [DIRECCIÓN GENERAL DE URBANISMO Y PLANIFICACIÓN REGIONAL]

AYUNTAMIENTOS

- Participar activamente en el establecimiento y la delimitación de las zonas agrícolas tradicionales. Dichas zonas se protegerían y se limitatarían para actividades agrícolas, educativas y de protección de la naturaleza, siendo así excluidas de los planes generales de ordenación urbanística de los municipios (PGOU) como zonas deexpansión urbanística.

- Promover la elaboración de planes municipales de acción agrícola en áreas peri-urbanas o de transición urbano-rural.

ACCIÓN POLÍTICA 1: PROTECCIÓN DE AREAS AGRÍCOLAS TRADICIONALES

CONSEJERÍA DE ECONOMÍA E INNOVACIÓN TECNOLÓGICA [DIRECCIÓN GENERAL DE AGRICULTURA Y DESARROLLO RURAL]

GRUPOS DE ACCIÓN LOCAL Y/O DESARROLLO RURAL

SINDICATOS AGRARIOS

GRUPOS ECOLOGISTAS

- Incentivar prácticas agrícolas y ganaderas que respeten el entorno, favoreciendo una mejor conservación de los valores ecológicos. Facilitar y promover el arrendamiento rústico para el mantenimiento, reemplazo o nuevo establecimiento de agricultores y ganaderos que apliquen prácticas sostenibles.

- Promover el papel de la agricultura tradicional y en concreto el de los cinturones agrícolas como filtros territoriales en áreas de transición urbano-rural. De igual modo, reclamar la importante función de esta actividad en la promoción de un turismo sostenible de calidad, por ejemplo la propuesta de rutas agroturísticas que promocionen el senderismo en agro-ecosistemas.

- Apoyar el proceso de revalorización de agro-ecosistemas tradicionales a través de una iniciativa de protección de zonas agrícolas estratégicas, fomentando el intercambio de experiencias entre regiones con proyectos similares en este campo (Cataluña e Islas Canarias).

- Promover la participación de las asociaciones locales y los expertos en la identificación y catalogación de agro-ecosistemas tradicionales de cara a su conservación.

CONSEJERÍA DE ECONOMÍA E INNOVACIÓN TECNOLÓGICA [DIRECCIÓN GENERAL DE TURISMO]

GRUPOS ECOLOGISTAS

ASOCIACIONES DE TURISMO

AYUNTAMIENTOS

- Elaboración de rutas agro-turísticas promoviendo la importante función de la actividad agro-ganadera en la promoción de un turismo sostenible de calidad.

En el ámbito Local

AYUNTAMIENTOS

SECTOR DE LA CONSTRUCCIÓN

- Respetar en la elaboración de los planes generales de ordenación urbanística (PGOU), las áreas propuestas como zonas de protección agrícola, por el papel que representarían en el territorio como cinturones agrícolas de exclusión urbana en las zonas de transición urbano-rural y peri-urbanas. Estas áreas tendrían una asignación específica por la cual se designan espacios libres preservados para la conservación, mantenimiento y aprovechamiento.

ASOCIACIONES DE PRODUCTORES Y TRANSFORMADORES ECOLÓGICOS

ASOCIACIONES Y COOPERATIVAS DE AGRICULTORES Y GANADEROS

PEQUEÑAS Y MEDIANAS EMPRESAS (PYMES)

ASOCIACIONES DE TURISMO

AGRICULTORES Y GANADEROS

- Participar en la gestión de las áreas agrícolas tradicionales como grupos de interés especialmente involucrados en la actividad agraria. Esta participación activa ayudaría a frenar el declive en el que se encuentra actualmente la agricultura tradicional. De igual modo esta participación fomentaría el desarrollo de cultivos de calidad, huertas tradicionales y modelos alternativos autosuficientes de producción agrícola-ganadera que repercutirían a su vez, positivamente, en la comercialización de productos en los mercados locales y en el fomento de las rutas agro-turísticas en el entorno de estas áreas.

ASOCIACIONES DE PRODUCTORES Y TRANSFORMADORES ECOLÓGICOS

ASOCIACIONES Y COOPERATIVAS DE AGRICULTORES Y GANADEROS

AGRICULTORES Y GANADEROS

- Conservación de setos y linderos, así como manejo de los cultivos mediante rotaciones y establecimiento de alternativas de cultivos.

Cultivos de olivar en Belmonte de Tajo. Junio, 2005

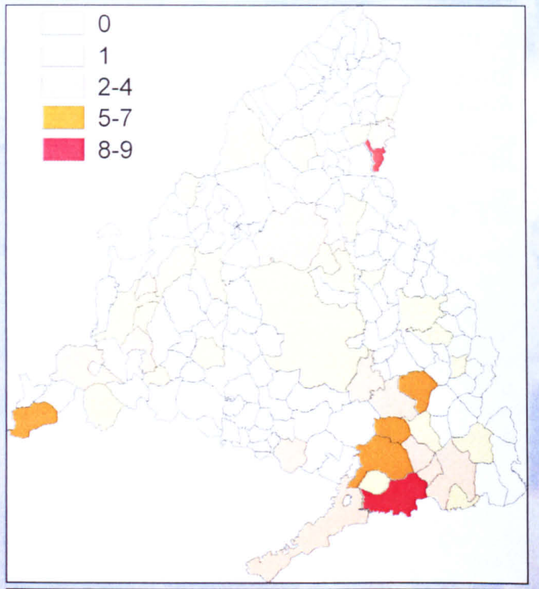


Situación actual

La agricultura ecológica en la Comunidad Autónoma de Madrid ha experimentado un intenso crecimiento en los últimos cinco años. En la actualidad se alcanza una superficie de 5215,83 hectáreas y 111 operadores implicados en la producción y en la transformación (Comité de agricultura ecológica de la Comunidad de Madrid, 2004). Dicha superficie supone el 2,3 % de la superficie agraria útil (SAU) de la región. Este crecimiento puede explicarse debido a la función que la agricultura está adquiriendo en la región.

La agricultura en la región de Madrid esta caracterizada por su baja relevancia productiva y económica. Sin embargo, en la actualidad, está alcanzando un papel de abastecedora de una demanda diversa y de mayor calidad entre la población (Libro Blanco de Agricultura y Desarrollo Rural, MAPYA 2004). Este cambio de tendencia se debe, principalmente, al creciente consumo de productos ecológicos por parte de los madrileños. De este modo, la región de Madrid ofrece un escenario muy diferente al de otras regiones, donde este tipo de agricultura se destina, básicamente, a la exportación.

La agricultura ecológica supone una alternativa muy positiva debido a múltiples factores, entre los que destacan la contribución a la conservación de la biodiversidad y la mejora de la calidad de vida, tanto en el medio rural como urbano. El mantenimiento de los setos en las fincas, el no uso de productos químicos de síntesis, el tipo de labores y el sistema de rotaciones de cultivos contribuyen a evitar la erosión del terreno, la pérdida de especies singulares y la contaminación de las aguas, entre otras. En definitiva, se favorece una estrecha relación entre la agricultura y el medio natural. De igual modo, la agricultura ecológica fomenta la conservación del paisaje tradicional, permite el mantenimiento de una actividad en el medio rural y fomenta un turismo sostenible y de calidad a través de la promoción de ferias, muestras o de la venta de los productos artesanos.



Número de agricultores, ganaderos y productores ecológicos en Madrid (2003) *Fuente: Elaboración propia*



Finca de ganadería ecológica, dedicada a la producción y transformación de productos ecológicos Cercedilla (Madrid), Primavera 2005.



Instalaciones de la finca Río Pradillo dedicada a la producción y transformación de productos de ganadería ecológica. Cercedilla (Madrid), Primavera 2005.

Iniciativas

La elaboración de un ***plan de apoyo al desarrollo de la agricultura ecológica*** promovería la conversión de fincas a agricultura ecológica y el establecimiento de industrias familiares y artesanales. Esto permitiría afrontar el incremento de la oferta de productos ecológicos en la región, así como controlar el abandono de tierras agrícolas y potenciar el comercio local. Este plan se establecería en el mismo marco de desarrollo que el Plan de Agricultura Ecológica del Ministerio de Agricultura Pesca y Alimentación (MAPYA, 2004).

Grupos de interés implicados y Recomendaciones

A continuación se presentan las acciones específicas recomendadas y los actores que intervendrían en su puesta en marcha para acometer esta iniciativa.

<u>En el ámbito Nacional</u>

MINISTERIO DE AGRICULTURA, PESCA Y ALIMENTACIÓN [DIRECCIÓN GENERAL DE ALIMENTACIÓN E INDUSTRIAS AGROALIMENTARIAS]

- Seguimiento de la articulación de los planes autonómicos de agricultura ecológica con el plan nacional.

<u>En el ámbito Regional</u>

CONSEJERÍA DE ECONOMIA E INNOVACION TECNOLÓGICA [DIRECCIÓN GENERAL DE AGRICULTURA Y DESARROLLO RURAL Y DIRECCIÓN GENERAL DE TURISMO] EN COORDINACIÓN CON LA CONSEJERÍA DE MEDIOAMBIENTE Y ORDENACION TERRITORIAL [DIRECCIÓN GENERAL DE PROMOCIÓN Y DISCIPLINA AMBIENTAL]

- Poner en marcha el **plan autonómico de desarrollo de la agricultura ecológica** articulándolo con el plan nacional existente. Este plan debe asegurar la participación de todo el sector agrario en su puesta en marcha y seguimiento, además de impulsar la agricultura ecológica en los Espacios Protegidos. Del mismo modo, debería: fomentar la inversión para la conversión de fincas y la instalación de industrias artesanales de transformación; potenciar el intercambio de semillas ecológicas y variedades autóctonas y el desarrollo de buenas prácticas agrarias; investigar nuevas vías de comercialización para promover el consumo de productos ecológicos; y elaborar planes de capacitación, asesoramiento e intercambio entre las cooperativas, asociaciones y agriculturas familiares.

- Desarrollar un **plan de concienciación y educación ambiental** que aborde la importancia de la conservación de reductos de vegetación natural o semi-natural y la creación, restauración y/o mantenimiento de corredores ecológicos, no sólo en el ámbito de la agricultura ecológica sino en todo el ámbito agrícola. Este plan potenciaría y fomentaría estas actuaciones a través de premios o reconocimientos de una gestión agrícola cercana a la naturaleza, que tenga un reflejo en etiquetas de calidad, primas compensatorias, etc.

- Desarrollar un turismo sostenible a través de los proyectos de educación y campañas de sensibilización ambiental, apoyando en su diseño y promoción a las asociaciones locales.

<u>En el ámbito Regional y Local</u>

GRUPOS DE ACCIÓN LOCAL Y/O DESARROLLO RURAL

GRUPOS ECOLOGISTAS

SINDICATOS AGRARIOS

- Gestionar, junto con la Dirección General de Agricultura y Desarrollo Rural, acciones especificas para el desarrollo de la agricultura ecológica, como por ejemplo los planes de capacitación para empresas familiares y jóvenes agricultores, las subvenciones para la conversión a agricultura ecológica y para la instalación de industrias artesanales, y ayudas para las campañas de promoción y comercialización.

- Vincular la promoción de la agricultura ecológica con otras iniciativas, entre ellas el apoyo a los mercados locales a través del asesoramiento en buenas prácticas agrícolas o la conservación de usos y prácticas tradicionales como un medio para aumentar la diversificación de los productos y mejorar la producción.

- Apoyar las campañas de asesoramiento y difusión de buenas prácticas agrícolas y de la agricultura ecológica, de las asociaciones de agricultores y ganaderos.

<u>En el ámbito Local</u>

AYUNTAMIENTOS

- Promocionar la producción y la transformación ecológica local a través de visitas a las fincas ecológicas, así como ceder espacios para la la localización de ferias y promocionar y difundir estos productos.

ASOCIACIONES DE PRODUCTORES Y TRANSFORMADORES ECOLÓGICOS

ASOCIACIONES Y COOPERATIVAS DE AGRICULTORES Y GANADEROS

ASOCIACIONES DE TURISMO

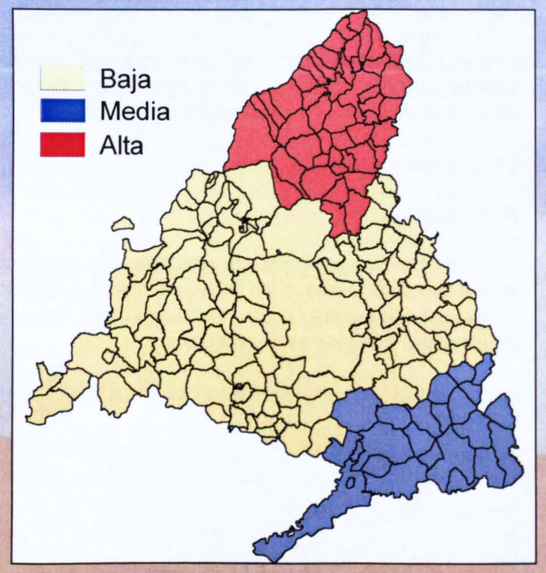
PEQUENAS Y MEDIANAS EMPRESAS (PYMES)

- Difusión y aplicación de prácticas sostenibles, tales como el mantenimiento de setos vivos, la conservación de reductos de vegetación natural, la rotación de cultivos, utilización de abonos naturales, etc. Estas medidas fomentarían la conservación de la biodiversidad y las características del suelo, así como, desde el punto de vista productivo, una diversificación de la producción.

- Fomentar el intercambio de experiencias entre las diferentes asociaciones, a través de la organización de programas de formación que favorezcan el desarrollo de la actividad. Las PYMES de turismo impulsarían la agricultura ecológica con la promoción de rutas verdes, gastronómicas y educativas, en el entorno de las fincas ecológicas y/o industrias artesanales.

Situación actual

La Comunidad de Madrid se encuentra entre las más prósperas y con mayor densidad de población en España (Libro Blanco de Agricultura y Desarrollo Rural, MAPYA 2004). Las áreas agro-ganaderas están localizadas en las zonas más alejadas del centro urbano, al sur y al norte de la región. El papel marginal de la actividad agro-ganadera se refleja en el 1% del PIB regional. En el sureste encontramos la comarca de la Campiña, con cultivos de cereales. En el sur y suroeste se localizan la comarca de las Vegas[1] y la comarca Sur-Occidental, que mantienen mosaicos de cultivos tradicionales (olivares y viñedos), cultivos de huerta y ganadería extensiva. En el norte, en la región montañosa, por último, se encuentran la comarca del Lozoya-Somosierra[2] y la comarca de la Sierra del Guadarrama, que son fundamentalmente ganaderas. En esta región encontramos, junto a municipios con riesgo de despoblamiento, algunos municipios con un gran interés turístico para la población madrileña debido a su cercanía a parajes naturales.



Indice de Ruralidad (población en los municipios < 10.000 habitantes)
Fuente: Elaboración propia

Iniciativas

La propuesta de promoción de mercados locales crearía nuevas oportunidades para los pequeños y medianos agricultores/ganaderos así como para la población joven en los municipios rurales. El mantenimiento de la actividad productiva agrícola-ganadera, la recuperación de artesanía o prácticas tradicionales y la comercialización de productos locales, son algunas de las líneas que apoyarían esta propuesta. Esta iniciativa complementaría el Programa de Desarrollo Rural de la Unión Europea, que fomenta la "pluri-actividad" en la agricultura. El plan de apoyo al sector hortícola del Gobierno Regional, que se encuentra en fase de elaboración, se vería también favorecido por esta propuesta.

A través de esta propuesta se crearían redes de productores y consumidores, que permitirían acortar los canales de comercialización entre el área rural y el área urbana, acercando así la población urbana al medio rural. Este sistema de comercialización, se suma a los principios que se vienen fomentando en agroecología. La agricultura y la ganadería ecológica juegan un papel importante en la relación existente entre el área rural y urbana, satisfaciendo la demanda de productos de calidad de la población metropolitana. Del mismo modo esta iniciativa permitiría un impulso en el desarrollo de las actividades agro-turísticas.



Mercado local en el área peri urbana de Madrid, Primavera 2005



Ruta agro-turística en Belmonte de Tajo (Madrid), Primavera 2005

1.Ya existen iniciativas de mercados de productos ecológicos, como es el caso de los municipios de Hoyo de Manzanares y Colmenar de Oreja.
2.Son las únicas comarcas rurales de la región (>25% municipios son rurales)

ACCIÓN POLÍTICA 3. PROMOCIÓN DE MERCADOS LOCALES

Grupos de interés implicados y Recomendaciones

Para la consecución de esta iniciativa, a continuación se presentan las acciones específicas recomendadas y los actores que intervendrían en su puesta en marcha.

<u>En el ámbito Regional</u>

CONSEJERÍA DE ECONOMIA E INNOVACION TECNOLÓGICA [DIRECCIÓN GENERAL DE AGRICULTURA Y DESARROLLO RURAL Y DIRECCIÓN GENERAL DE TURISMO] EN COORDINACIÓN CON LA CONSEJERÍA DE MEDIOAMBIENTE Y ORDENACION TERRITORIAL [DIRECCIÓN GENERAL DE PROMOCIÓN Y DISCIPLINA AMBIENTAL]

- Promocionar a través de campañas, y apoyar institucionalmente, con asesoramiento y financiación, el asociacionismo local, las pequeñas y medianas empresas y las cooperativas de productores y consumidores, tanto a nivel local como regional.

- Vincular esta iniciativa con la promoción de un turismo sostenible y diversificado (gastronómico, cultural y natural) a través de medidas específicas, entre ellas la promoción de la red de Vías Pecuarias como posibles elementos de conexión entre mercados locales, adecuación y mantenimiento de dichas vías como rutas agro-turísticas.

<u>En el ámbito Regional y Local</u>

CONSEJERÍA DE MEDIOAMBIENTE Y ORDENACION TERRITORIAL [DIRECCIÓN GENERAL DE URBANISMO Y PLANIFICACIÓN REGIONAL]

SECTOR DE LA CONSTRUCCIÓN

AYUNTAMIENTOS

- Recuperar el concepto de "ágora" en la planificación urbanística, de manera que en la elaboración de los planes generales de ordenación urbanística (PGOU) se cediesen terrenos para el establecimiento de mercados locales y otras actividades colectivas en los espacios públicos.

GRUPOS ECOLOGISTAS

GRUPOS DE ACCIÓN LOCAL Y/O DESARROLLO RURAL

SINDICATOS AGRARIOS

AYUNTAMIENTOS

- Apoyar el establecimiento de mercados locales, tanto a nivel municipal como comarcal, que acorten los canales entre productores y consumidores con el fin de adaptar la oferta a la creciente demanda del mercado.

Igualmente, mediante campañas de promoción y participación en los mismos, fomentar el asociacionismo local y las redes de productores y consumidores.

- Vincular esta iniciativa con campañas de sensibilización agro-ambiental y con la promoción de los recursos turísticos de los municipios, tales como la gastronomía, la cultura y la naturaleza, a través del mantenimiento y la mejora de rutas eco-turísticas.

- Promocionar la participación en los mercados locales de las asociaciones de agricultores y ganaderos, las asociaciones de turismo, las asociaciones agro-ecológicas, las pequeñas y medianas empresas (PYMES) y las redes o cooperativas de productores y consumidores.

<u>En el ámbito Local</u>

AYUNTAMIENTOS

- Fomentar la inversión local, en especial con el establecimiento de las pequeñas y medianas empresas (PYMES) y las cooperativas u otras asociaciones locales de productores y consumidores. Igualmente, promover la formación de redes intermunicipales que permitan la mayor implicación de los grupos interesados.

AGRICULTORES Y GANADEROS

ASOCIACIONES DE PRODUCTORES Y TRANSFORMADORES ECOLÓGICOS

ASOCIACIONES Y/O COOPERATIVAS DE AGRICULTORES Y GANADEROS

ASOCIACIONES DE TURISMO

PEQUENAS Y MEDIANAS EMPRESAS (PYMES)

- Utilización de los mercados locales como medio de promoción para los productos locales, y como espacios de intercambio entre los productores y transformadores asociados y/o pequeños empresarios.

- Mantenimiento y diseño de rutas turísticas con una componente agrícola, cultural y natural que promocionen la gastronomía y artesanía tradicional, junto con la riqueza paisajística.

- Puesta en marcha de alternativas de comercialización local que favorezcan el acercamiento entre productores y consumidores (Ferias gastronómicas, degustación, etc.)

Situación actual

En unos paisajes tan ampliamente modificados por el hombre como son los europeos, y en los que la fragmentación de los hábitat es una característica generalizada, los ríos y su banda de vegetación juegan un papel muy importante en la conservación de la diversidad biológica, siendo en ocasiones los únicos restos de vegetación natural existente en el paisaje. Los corredores fluviales constituyen en esas ocasiones, nexos de unión entre los retazos de vegetación autóctona remanente y son, por tanto, un "puente" entre poblaciones más o menos alejadas, con las consiguientes implicaciones desde el punto de vista de la conservación del banco genético de especies amenazadas (Burel y Baudry, 2002, Bennet, 1999).

Los cursos fluviales han sido uno de los hábitat más maltratados en la Comunidad de Madrid en las últimas décadas a consecuencia del desarrollo industrial, la intensificación de los cultivos agrícolas, la expansión urbanística, la creación de embalses y los acondicionamientos de los cauces con diferentes fines. Sin embargo, pese a esta elevada degradación, todavía existen tramos fluviales cuya fauna supone una reserva de especies de gran valor ambiental (Cubillo, F. et al. 1990)

Garantizar un óptimo estado de conservación de la vegetación de ribera y de los cursos fluviales en la Comunidad de Madrid se convierte en un tema prioritario en el ámbito de la conservación, dadas las exigencias sobre la calidad del agua y la conservación de los hábitat y las especies acuáticas, vigentes actualmente a nivel europeo o internacional (Directiva Marco de Aguas, Convenio Ramsar, Convenio de Bonn, Convenio de Berna, Directiva Hábitat, Directiva Aves).

Se puede decir que los ríos más importantes de la región madrileña se encuentran afectados, en mayor o menor medida, por graves problemas de contaminación y por cambios radicales en su entorno, especialmente en sus cursos medio y bajo (Cubillo, F. et al, 1990). Estos ríos y sus riberas (Ver Mapa) representan un significativo papel como lugares de especial protección para la conservación del hábitat, conocidos como Lugares de Interés Comunitario o LIC y futuros espacios de la Red Natura 2000. La contaminación de las aguas es el impacto más evidente debido a los residuos industriales y los vertidos de casi seis millones de habitantes. La ocupación del dominio público hidráulico, con la consiguiente alteración de los bosques de ribera, se ha acelerado en los últimos años, inicialmente debido a la expansión de terrenos agrícolas y posteriormente por el fenómeno de la urbanización.

La gestión hídrica aplicada por las distintas administraciones con competencias, Ministerio de Medio Ambiente y las diferentes unidades dentro del organismo de cuenca correspondiente, está perdiendo las oportunidades económicas y sociales que los cauces recuperados podrían presentar (Amigos de la Tierra, 1998). Actualmente existen algunos proyectos impulsados por el Ministerio de Medio Ambiente, la Confederación Hidrográfica del Tajo y el Gobierno Regional, el Proyecto CAUCE -rehabilitación de cauces-, el Proyecto LINDE -delimitación de dominio público hidráulico- y el Proyecto A.G.U.A. -actuaciones para la gestión y la utilización del agua-. Sin embargo, algunas actuaciones no están siendo suficientemente transparentes desde el punto de vista de los movimientos ecologistas (Grupo ecologista El Soto, 1998).

La mayor coordinación e integración de las políticas de gestión hídrica y la implicación de los sectores involucrados no gubernamentales, resume las principales recomendaciones del análisis de la política hídrica de la Unión Europea realizado por ADENA (WWF, 2003). Estas medidas de urgencia coinciden con las identificadas en el plan de acción de los Espacios Naturales Protegidos: una gestión integral del territorio y una articulación de los agentes implicados en él (EUROPARC, 2002).



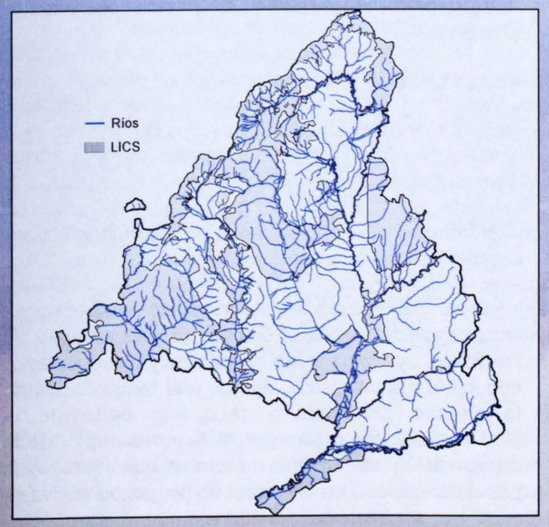
Ribera degradada en el río Jarama a su paso por San Sebastián de los Reyes (Madrid), Primavera 2005.

Iniciativas

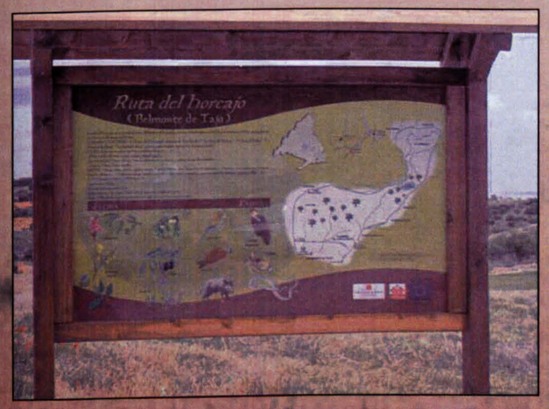
La propuesta de un **programa especifico de restauración de cursos fluviales** a escala regional permitiría, por un lado, integrar los planes de ordenación de los recursos naturales (PORN) en un contexto más amplio de planificación del territorio, al servir como marco de referencia a la escala regional. Por otro lado, permitiría cumplir acuerdos internacionales tales como el Convenio internacional Ramsar y las Directivas europeas Hábitat 92/43/CEE, Aves 79/409/CEE y Marco del Agua 2000/60/CEE.

ACCIÓN POLÍTICA 4. RESTAURACIÓN DE RIBERAS

El cumplimiento de estas Directivas mejoraría la calidad del agua para su uso en agricultura y permitiría el mantenimiento de la actividad agrícola mediante la promoción de buenas prácticas agrarias. Además, y en consonancia con el espíritu de la Estrategia Nacional de Conservación de la Biodiversidad, podría suponer, en muchos casos, la recuperación de los cauces fluviales como corredores ecológicos. Todos estos objetivos, junto con la creación de zonas recreativas con una red de sendas para un turismo alternativo -cultural, gastronómico y natural- en el entorno fluvial, mejorarían la calidad ambiental y la calidad de vida de los ciudadanos. Esta mejora de la calidad de vida repercutiría positivamente en un incremento de la población y, en consecuencia, aumentarían las inversiones en la región.



LICs y principales ríos de la región
Fuente: Equipo Técnico Red Natura 2000, Comunidad Autónoma de Madrid, 1999.



Ruta agro-turísticadel Horcajo en Belmonte de Tajo (Madrid)

Recomendaciones y grupos de interés implicados

A continuación se enumeran las acciones recomendadas y las entidades involucradas, partiendo de iniciativas con competencia nacional hasta las más locales.

<u>En el ámbito Nacional y Regional</u>

MINISTERIO DE MEDIO AMBIENTE

- Favorecer la coordinación entre las instituciones de una u otra forma involucradas (Ministerio de Medio Ambiente, organismos de cuenca, Gobierno Regional y Gobierno Local) en la recuperación y conservación de riberas.

- Favorecer y promover la aplicación de la Directiva Marco de Aguas a través de divulgación, formación y asignación de medios para el desarrollo de los trabajos de referencia necesarios para su adecuada implementación. En la actualidad ya se han llevado a cabo foros de debate promovidos por asociaciones ecologistas (ADENA) y el Ministerio de Medio Ambiente (Dirección General del Agua).

MINISTERIO DE MEDIO AMBIENTE EN COORDINACIÓN CON LA CONSEJERÍA DE MEDIOAMBIENTE Y ORDENACIÓN TERRITORIAL [DIRECCIÓN GENERAL DEL MEDIO NATURAL, DIRECCIÓN GENERAL DE PROMOCIÓN Y DISCIPLINA AMBIENTAL]

- Puesta en marcha de un **programa para la recuperación de los cursos fluviales** que se enmarcaría dentro de otras estrategias innovadoras que se encuentran actualmente en proceso, como el proyecto CAUCE de rehabilitación de cauces y el proyecto LINDE de limitación del dominio público hidráulico, impulsados respectivamente por la Consejería de Medioambiente y Ordenación Territorial y la Confederación Hidrográfica del Tajo, dentro del Ministerio de Medio Ambiente.

- Garantizar la asignación de medios económicos, técnicos y humanos para la realización de un diagnóstico actualizado sobre el estado de conservación de las riberas y los ríos de la Comunidad de Madrid, siguiendo los requerimientos de la Directiva Marco de Aguas y las directrices dimanantes de los trabajos realizados a escala nacional (Ministerio de Fomento, Centro de Estudios y Experimentación de Obras Públicas-CEDEX-, Centro de Estudios Hidrográficos).

- Poner a disposición pública, mediante vías telemáticas o similares, la información resultante de los estudios sobre estado de conservación de las riberas y ríos de Madrid, de tal forma que puedan servir de apoyo

ACCIÓN POLÍTICA 4. RESTAURACIÓN DE RIBERAS

en los estudios que se lleven a cabo a diferentes escalas de trabajo.

En el ámbito Regional y Local

Consejería de Medioambiente y Ordenación Territorial [Dirección General del Medio Natural, Dirección General de Promoción y Disciplina Ambiental] y la Consejería de Economia e Innovación Tecnológica [Dirección General de Turismo]

Grupos de acción local y/o desarrollo rural

Grupos ecologistas

Ayuntamientos

- Recuperar ecológicamente las riberas que se encuentren en diferentes estados de degradación y vincular estrechamente esta recuperación con otros aprovechamientos ambientalmente sostenibles en el entorno, a través de la coordinación entre las consejerías, los grupos de desarrollo rural, los ayuntamientos y las asociaciones de turismo. Como ejemplo representativo de este tipo de acción se puede citar el establecimiento de redes de sendas que promocionen el turismo local -con una componente gastronómica y cultural y que promocionen la pernocta en el área- que podrían suponer un valor añadido para los servicios de la zona. Mediante esta actuación se potenciaría el conocimiento del entorno a través de campañas turísticas locales y regionales, con programas de educación y sensibilización ambiental en la población. A este respecto se puede citar como ejemplo el programa "Explora Madrid" y la red de Vias Verdes.

- Promover y facilitar la coordinación entre las Instituciones con competencias dentro del programa especifico de recuperación de cursos fluviales.

- Mejorar el actual sistema de señalización de las sendas que afectan al entorno de las riberas y ríos madrileños.

- Potenciar los programas de educación ambiental en la población madrileña, a través de campañas locales y regionales.

En el ámbito Local

Ayuntamientos

- Apoyo al programa específico para la restauración de los cursos fluviales promoviendo la conservación de estos ecosistemas y participando según sus posibilidades y competencias en los procesos de restauración que se determinen.

- Poner los medios a su alcance para conservar y mejorar el actual sistema de señalización de las sendas en el entorno de las riberas, en las que tenga competencias, con el objeto de promocionar el eco-turismo en los municipios.

- Promoción y apoyo a la creación de sendas en el entorno de las riberas en colaboración con los agentes locales y PYMES, con el objeto de potenciar el conocimiento del medio y valorar el patrimonio local, a través de campañas turísticas locales que incluyan programas de educación ambiental en los ayuntamientos, etc.

Asociaciones de productores y transformadores ecológicos

Asociaciones y cooperativas de agricultores y ganaderos

Asociaciones de turismo

Pequenas y medianas empresas (pymes)

Agricultores y ganaderos

- Promoción y asesoramiento en buenas prácticas agrarias y ganaderas en el entorno de los ríos.

- Apoyar y promover la conservación-restauración de linderos, setos y zonas húmedas ubicados dentro de las fincas agrícolas, para garantizar y/o recuperar la conectividad paisajística, ayudar a la recuperación de la calidad del agua y recuperar parte de la biodiversidad como una garantía, por ejemplo, de la conservación de agentes naturales que ejercen un papel beneficioso en el control de plagas de cultivos.

ACCIÓN POLÍTICA 5. MEJORAR EL ACCESO, LA DISPONIBILIDAD Y LA CALIDAD DE LA INFORMACIÓN AGROAMBIENTAL

Situación actual

Pese a que actualmente existe disponible en medios telemáticos información sobre el territorio a escala de planificación, esta información es deficitaria en algunos campos (distribución de especies amenazadas y localización de hábito sensibles, delimitación de áreas de interés agrícola y áreas agrícolas de elevado valor ecológico, localización de áreas con suelo de elevado valor agrícola, etc.) y para algunos proyectos se hace necesaria información espacial a una escala de mayor detalle.

La disponibilidad de toda esta información, de una manera integrada, en bases de datos públicas y de fácil acceso, facilitaría la redacción de los proyectos relacionados con la planificación y la gestión del territorio a diferentes escalas espaciales. Del mismo modo, esta disponibilidad de información ambiental implicaría un ahorro presupuestario y humano al evitar el esfuerzo económico y material que en muchas ocasiones se produce al hacer el mismo inventario del medio físico y biótico varias veces para proyectos diferentes. Así se potenciaría la colaboración a largo plazo y estable entre grupos de investigación, gestores e instituciones. Esta información, además, permitiría mejorar la calidad de los proyectos presentados ya que, en muchas ocasiones, al no haber información detallada disponible y no haber presupuesto para realizar un inventario del medio adecuado, el resultado se traduce en estudios de escasa calidad, en los que, muy frecuentemente, se pasan por alto elementos del medio de elevado valor (presencia de especies amenazadas o hábitat sensibles, suelos de elevado valor, etc.).

Por otro lado, la integración de la información agro-ambiental, permitiría la búsqueda y aplicación de indicadores de sostenibilidad ambiental en relación con los cambios de uso en el territorio, posibilitando un seguimiento adecuado y una detección precoz de los cambios ambientales en el medio. El Observatorio de la Sostenibilidad en España (OSE) desempeña un papel muy importante en la integración de información ambiental y búsqueda de indicadores de sostenibilidad a nivel Nacional (Jiménez Herrero et al. 2005)

Iniciativas

La necesidad de elaborar diagnosis más rigurosas nos lleva a promover una mejora de la información agro-ambiental, tanto en disponibilidad como en calidad, para la planificación y gestión del territorio. El principal objetivo de esta acción es llevar a cabo una **integración y mejora de la calidad de la información agroambiental** que las diferentes administraciones con competencias en la materia poseen, con el fin de mejorar, a su vez, la disponibilidad pública de dicha información. Esto permitiría, por una parte, optimizar la planificación física del territorio y mejorar la coordinación entre administraciones. Por otra parte, esta iniciativa facilitaría la implementación y el cumplimiento de acuerdos internacionales como la Agenda 21, el Convenio de Estrategia de Biodiversidad y la Directiva Europea de Evaluación Ambiental Estratégica. Por último, la disponibilidad de esta información haría posible la búsqueda y aplicación de indicadores de sostenibilidad en la planificación territorial en la Comunidad de Madrid, en la línea seguida por el Observatorio de la Sostenibilidad en España.

Grupos de interés implicados y Recomendaciones

A continuación se enumeran las acciones recomendadas y las entidades involucradas, partiendo de iniciativas con competencia nacional hasta las más locales.

En el ámbito Regional

Consejería de Medioambiente y Ordenación Territorial [Dirección General de Urbanismo y Planificación Regional, Dirección General del Medio Natural, Dirección General de Promoción y Disciplina Ambiental] en coordinación con la Consejería de Economía e Innovación Tecnológica [Dirección General de Agricultura y Desarrollo Rural]

- Crear bases de datos accesibles al público que integren la información agrícola y ambiental existente a diferentes escalas de trabajo, a partir de una catalogación y zonificación rigurosa del territorio y su entorno. De esta forma se obtendrá una visión global del valor ecológico y agrícola del territorio. Estas bases de datos podrían ser utilizadas en los diferentes ámbitos de estudio del territorio: planificación municipal y regional, estudios de impacto ambiental y trabajos a escala de proyecto sobre el territorio.

- Asignar un mayor presupuesto a la creación de información temática básica sobre el territorio y a la creación de bases de datos sobre organismos vivos.

En el ámbito Regional y Local

Consejería de Medioambiente y Ordenacion Territorial
Consejería de Economía e Innovación Tecnológicai

Grupos ecologistas

Grupos de acción local y desarrollo rural

Expertos [profesionales e investigadores]

- Establecer cauces adecuados para mejorar la accesibilidad de la información a los diferentes organismos que trabajan en el territorio, desde asociaciones locales, institutos de investigación, organismos gubernamentales, personas físicas, etc.

- Mejora de la información sobre la distribución de especies y hábitat amenazados a una escala operativa para los estudios que se realizan sobre el territorio, especialmente en las zonas de interés agrícola y ecológico.

Situación actual

En áreas donde confluye el uso agrícola, el uso urbano y la conservación, se pueden producir en algunas ocasiones tensiones sobre el territorio que repercuten finalmente en la pérdida de valores naturales y agrícolas. Estas tensiones son, con cierta frecuencia, fruto de una falta de coordinación entre las instituciones con competencias sobre el territorio, y podrían ser evitadas con una mejora en la coordinación entre dichas instituciones[3].

Esta mejora en la coordinación intra-institucional podría conseguirse mediante la creación de grupos de trabajo efectivos, tanto a nivel intra-departamental como inter-departamental. La Consejería de Medioambiente y Ordenación del Territorio y la Consejería de Economía e Innovación Tecnológica (Dirección General de Agricultura y Desarrollo Rural y Dirección General de Turismo, respectivamente) y los municipios estarían involucrados en este proceso de mejora.

La ausencia de una coordinación adecuada entre las diferentes administraciones ha generado una situación de incoherencia en la clasificación del suelo, el reparto de ayudas agroambientales, la planificación de Espacios Protegidos y la planificación de nuevas redes de infraestructuras. Además, las administraciones regionales están desvinculadas de las competencias municipales, dando lugar a descoordinaciones igualmente importantes.

Iniciativas

Una de las iniciativas que se propone consiste en **coordinar acciones transversales y permanentes a escala territorial, en los ámbitos agrícola, medioambiental y urbanístico**, a través de reuniones regulares de coordinación en las que se elaborarían los planes integrales del territorio. En estas mesas de coordinación se realizarían, además, los planes de seguimiento y evaluación de dichos planes.

La implementación de estas medidas permitiría una mayor coordinación de las actuaciones, una implementación más eficiente de las políticas y una disminución de los recursos necesarios. La puesta en marcha de estas mesas de coordinación "comisiones mixtas" y "grupos de trabajo" supondría, también, una fuente de asesoramiento para todos los componentes y deberían siempre acompañarse de un seguimiento por parte de las autoridades que se designen como responsables, debido a la complejidad que presenta la existencia de un amplio número de grupos de trabajo.

3.Estas afirmaciones se recogieron durante las entrevistas llevadas a cabo con los diferentes grupos de interés durante el trabajo de campo realizado en el periodo 2003/2005 en el marco del proyecto TiGrESS.



Encuentro agricultores con técnicos de los grupos de desarrollo rural (Agente de Desarrollo Rural de ARACOVE en la Bodega de Andrés Morate en Belmonte de Tajo (Madrid), Primavera 2005

Grupos de interés implicados y recomendaciones

Para la consecución de esta propuesta se presentan las siguientes recomendaciones y los actores que estarían implicados en su puesta en marcha.

En el ámbito Nacional

Ministerio de Medio Ambiente [Dirección General para la Biodiversidad]

Ministerio de Agricultura, Alimentación y Pesca [Dirección General de Desarrollo Rural y Dirección General de Industrias Agroalimentarias y Alimentación]

- Fomentar la creación de grupos de trabajo intra-territoriales e inter-consejeriales, participando en la coordinación de los mismos, para posteriormente realizar el seguimiento de sus funciones y objetivos.

En el ámbito Regional

Consejería de Medioambiente y Ordenación Territorial [Dirección General de Urbanismo y Planificación Regional, Dirección General del Medio Natural, Dirección General de Promoción y Disciplina Ambiental]

Consejería de Economía e Innovación Tecnológica [Dirección General de Agricultura y Desarrollo Rural, Dirección General de Turismo]

- Crear comisiones de coordinación intra-territorial, que involucren a las direcciones generales de representantes del Gobierno Regional, a los Gobiernos Locales y los grupos intermediarios de

interés.

- **Reactivar el borrador del Plan Regional Estratégico Territorial (PRET)** involucrando a todas las consejerías con competencias, sin olvidar a los servicios competentes en la Dirección General de Agricultura y Desarrollo Rural, que actualmente están en un segundo plano en el ámbito de la planificación, como es el caso del Servicio de Ordenación Rural.

- También en el ámbito de la planificación urbanística, promover, facilitar el trabajo en común e impedir la derogación de las mesas intra-departamentales sobre calificación del suelo no urbanizable, urbanizable protegido y urbanizable.

- En el ámbito de los Espacios Protegidos fomentar la creación de grupos de trabajo activos que integren a gestores, investigadores y grupos locales, favoreciendo una efectividad real de las reuniones del patronato de espacios protegidos.

- Crear redes de asesoramiento que favorezcan la relación entre el sector ambiental y agrícola, apoyando a las delegaciones comarcales como órganos de asesoramiento (también conocidas como cámaras agrarias), y trabajando conjuntamente con los sindicatos agrarios, patronatos de espacios protegidos y grupos de desarrollo rural o acción local.

- Vincular los planes de dinamización turística de la región ideados por la Dirección General de Turismo a los aspectos agrícolas y ambientales del territorio, involucrando a las direcciones generales competentes. Un ejemplo ya existente es el Programa EXPLORA MADRID en el que colaboran la Consejería de Medio Ambiente y Ordenación Territorial, la Consejería de Educación y la Dirección General de Turismo.

En el ámbito Regional y Local

Grupos ecologistas

Sindicatos agrarios

Expertos [profesionales e investigadores]

Grupos de acción local y/o desarrollo rural

Sector de la construcción

- Participación de agentes locales (y de representantes del amplio número de grupos de interés involucrados en la planificación territorial, tanto en el sector agrícola, como en el ambiental y urbanístico) en las "comisiones mixtas" y "grupos de trabajo", de manera que faciliten los diagnósticos del territorio y realicen evaluaciones de las medidas puestas en marcha.

- Organizar comisiones mixtas a nivel regional y local, fortalecer la participación de los grupos de interés locales, coordinar los actores o grupos de interés tanto a nivel regional como local, e intermediar para alcanzar el consenso en las decisiones.

En el ámbito Local

Ayuntamiento

Asociaciones de productores y transformadores ecológicos

Asociaciones y/o cooperativas de agricultores y ganaderos

Asociaciones de turismo

Pequenas y medianas empresas (pymes)

- Participar activamente en la puesta en marcha y el funcionamiento de las comisiones locales y los grupos de trabajo, sectoriales y territoriales, junto con el resto de grupos de interés en el ámbito municipal y supra-municipal.

ACCIÓN POLÍTICA 7. PROMOCIÓN DE LOS PROCESOS DE PARTICIPACÓN PÚBLICA EN LA ORDENACIÓN TERRITORIAL

Situación actual

Los procesos de participación pública relacionados con la planificación del territorio reflejan una carencia de espacios conjuntos de debate, lo cual se traduce en una disminución de la eficacia de estos procesos. La inadecuada identificación de los grupos de interés involucrados y la falta de implicación de los actores en la elaboración de las diagnosis necesarias, tanto a nivel regional como local, son dos factores importantes que repercuten negativamente en los resultados del proceso de participación pública. Los espacios de participación quedan reducidos, en muchas ocasiones, a la fase de alegaciones una vez que se han elaborado los planes y antes de su aprobación final. La Ley 2/2005 de modificación de la Ley del Suelo de la Comunidad Autónoma de Madrid [BOCM 87, 12/04] y los planes generales de ordenación urbanística (PGOU) de los municipios de la región resultantes de la Ley del Suelo 9/2001 [BOCM 177, 17/07], en los cuales no se establece ninguna metodología de participación pública, representan un claro ejemplo de la situación actual en esta materia.

Iniciativas

La iniciativa que se plantea propondría la participación de los diferentes grupos implicados en la ordenación territorial, y en la elaboración y puesta en marcha de un **plan estratégico de ordenación del territorio**. Junto con esta medida se propone el establecimiento de periodos superiores a dos meses para la fase de alegaciones. Esta serie de iniciativas están estrechamente ligadas a la puesta en marcha de comisiones mixtas y grupos de trabajo entre los diferentes niveles institucionales y sectoriales, y permitiría establecer nuevos espacios de participación pública en planificación del territorio para consensuar los intereses de los diferentes grupos involucrados.

Esta iniciativa se complementaría con la creación de una **red de planificación participativa**. Esta red facilitaría la puesta en marcha de las Agendas 21 en los municipios, posibilitando un intercambio de información y experiencias entre los distintos agentes implicados, así como la puesta en marcha de otros convenios internacionales que España ha ratificado, por ejemplo el Convenio de Aarhus sobre participación en temáticas ambientales.

Grupos de interés implicados y recomendaciones

Para la consecución de esta propuesta se presentan las siguientes recomendaciones y los grupos de interés que deberían estar implicados en su puesta en marcha.

<u>En el ámbito Nacional</u>

Ministerio de Medio Ambiente [Dirección General para la Biodiversidad]

Ministerio de Agricultura, Alimentación y Pesca [Dirección General de Desarrollo Rural, Dirección General de Industrias Agroalimentarias y Alimentación]

- Reactivar la **revisión del documento de la Estrategia Nacional de Desarrollo Sostenible como herramienta integradora en la planificación del territorio**, permitiendo la participación de los grupos de interés, así como incorporar la obligatoriedad de incorporar metodologías participativas en la planificación regional.

- Seguimiento del cumplimiento de acuerdos internacionales, tales como la puesta en marcha de la Agenda 21 Local y el Convenio de Aarhus.

<u>En el ámbito Regional</u>

Consejería de Medioambiente y Ordenacion Territorial [Dirección General de Urbanismo y Planificación Regional, Dirección General del Medio Natural, Dirección General de Promoción y Disciplina Ambiental]

Consejería de Economia e Innovación Tecnológica [Dirección General de Agricultura y Desarrollo Rural, Dirección General de Turismo]

- Incorporar metodologías participativas en la legislación de planificación, y posteriormente en la elaboración, puesta en marcha y seguimiento de los planes y programas de desarrollo de la región. Esta medida se acompañaría por una adecuada orientación para los grupos implicados y por un seguimiento obligatorio de los procesos de participación.

- Abrir un nuevo proceso de discusión del borrador del Plan Regional Estratégico Territorial (PRET), teniendo en cuenta los diversos programas de desarrollo regional, e involucrando a los diferentes grupos de interés de la región.

- Coordinar la creación de una red de planificación participativa regional que permita integrar las diversas herramientas de planificación del territorio y facilite la puesta en marcha de las Agendas Locales 21.

- Establecer un acuerdo sobre el tiempo disponible para las alegaciones en los planes generales de ordenación urbanística (PGOU), sin que ello signifique un aumento de la carga administrativa.

ACCIÓN POLÍTICA 7. PROMOCIÓN DE LOS PROCESOS DE PARTICIPACÓN PÚBLICA EN LA ORDENACIÓN TERRITORIAL

<u>En el ámbito Regional y Local</u>

Grupos ecologistas

Sector de la construcción

- Participar en la puesta en marcha de planes sectoriales y territoriales de desarrollo de la región, así como promover de igual modo la reactivación del borrador del Plan Regional Estratégico Territorial (PRET) a nivel regional, impulsando metodologías participativas en su puesta en marcha.

Sindicatos agrarios

Grupos de acción local y desarrollo rural

- Promover procesos participativos en la elaboración y discusión de los programas de planificación territorial, tanto de desarrollo rural como de ordenación de los recursos naturales.

Expertos [profesionales e investigadores]

- Investigar la aplicación de diferentes metodologías participativas en los programas de desarrollo regionales.

- Demandar la participación de grupos de expertos en la elaboración de planes estratégicos sectoriales y territoriales.

<u>En el ámbito Local</u>

Ayuntamientos

Asociaciones de productores y transformadores ecológicos

Asociaciones y cooperativas de agricultores y ganaderos

Asociaciones de turismo

Pequenas y medianas empresas (pymes)

- Impulsar y proponer metodologías participativas en los distintos programas actualmente en marcha en la planificación del territorio, y en especial en la elaboración de los planes generales de ordenación urbanística (PGOU) favoreciendo, de esta forma, el consenso entre los diferentes puntos de vista de los grupos de interés del municipio. De igual modo demandar la reactivación del Plan Regional Estratégico Territorial (PRET) de la Comunidad deMadrid.

GRUPOS DE INTERÉS, COMPETENCIAS Y ACCIONES RELACIONADAS

GOBIERNO NACIONAL

MINISTERIO de MEDIO AMBIENTE

Dirección General para la Biodiversidad

Su función principal es velar por la conservación de la biodiversidad y promover el desarrollo sostenible, a través de algunas líneas específicas como: el seguimiento del cumplimiento de la legislación nacional e internacional en materia de conservación de la naturaleza, la elaboración de atlas y libros rojos, la propuesta de indicadores ambientales, etc. En el caso de acciones derivadas de normas europeas, como la Red Natura 2000, el papel de ésta Dirección General es fundamental en la coordinación de actuaciones con las consejerías de las comunidades autónomas con competencias en la materia.

Dirección General del Agua

Son competencia de esta institución todas aquellas funciones relacionadas con los organismos de cuenca y son las responsables de la administración hidráulica de las cuencas intercomunitarias. Entre las labores estarían la elaboración del Plan Hidrológico de la Cuenca, así como la realización de su seguimiento y revisión. El proyecto, la construcción y explotación de las obras realizadas con cargo a los fondos propios del organismo y las que sean encomendadas por el Estado así como las que se deriven de los convenios con las comunidades autónomas, corporaciones locales y otras entidades públicas o privadas, son también su competencia.

MINISTERIO de AGRICULTURA, PESCA Y ALIMENTACIÓN

Dirección General de Desarrollo Rural

Sus principales funciones consisten en ejercer las competencias en materia de formación y fomento de la incorporación de las nuevas tecnologías al ámbito rural, además de todas aquellas relacionadas con la promoción del asociacionismo y el desarrollo de competencias sobre actividades medioambientales vinculadas a la actividad agraria (medidas agroambientales, forestación de tierras agrarias o compensación de rentas agrarias en zonas desfavorecidas y con limitaciones ambientales).

Dirección General de Industrias Agroalimentarias y Alimentación

Entre las competencias encomendadas, se destaca la elaboración de la normativa básica estatal, el desarrollo y la coordinación de las actividades relacionadas con las industrias y mercados alimentarios. Todo ello en cooperación con las comunidades autónomas. Es también competencia, la elaboración, en colaboración con la Secretaría General de Agricultura, de las propuestas que permitan establecer la posición española ante la Unión Europea.

Acciones políticas	***Recomendaciones***
1. Protección de áreas agrícolas tradicionales	Seguimiento del nuevo Reglamento de Desarrollo Rural Europeo (FEADER), respecto a la protección de espacios agrícolas en espacios de la Red Natura 2000. ***MINISTERIO de MEDIO AMBIENTE*** ***Mº de AGRICULTURA, PESCA y ALIMENTACIÓN***
2. Apoyo al desarrollo de la agricultura ecológica	Seguimiento de la transposición a nivel regional del Plan Nacional de Agricultura Ecológica. ***Mº de AGRICULTURA, PESCA y ALIMENTACIÓN***
3. Promoción de mercados locales	–
4. Recuperación de riberas	Apoyo financiero y mediante campañas de promoción para la recuperación de los cursos fluviales. Favorecer la coordinación entre las instituciones con posible participación en su gestión (Ministerio de Medio Ambiente, Confederaciones Hidrográficas, y Gob. Regional y Local). ***MINISTERIO de MEDIO AMBIENTE***
5. Mejorar el acceso, la disponibilidad y la calidad de la información agro-ambiental	–
6. Coordinación Medio Ambiente - - Agricultura - Planificación	Fomentar, promover y favorecer el seguimiento de los grupos de trabajo y comisiones mixtas. ***MINISTERIO de MEDIO AMBIENTE*** ***Mºde AGRICULTURA, PESCA y ALIMENTACIÓN***
7. Promoción de los procesos de participación	Reactivar la revisión de la Estrategia Nacional de Desarrollo Sostenible como herramienta integradora en planificación del territorio. ***MINISTERIO de MEDIO AMBIENTE*** ***Mº de AGRICULTURA, PESCA y ALIMENTACIÓN***

Mº: Ministerio

GRUPOS DE INTERÉS, COMPETENCIAS Y ACCIONES RELACIONADAS

GOBIERNO REGIONAL EN COORDINACIÓN CON LAS DIFERENTES CONSEJERÍAS

CONSEJERíA DE MEDIO AMBIENTE Y ORDENACIóN TERRITORIAL

Dirección General de Urbanismo y Planificación Regional

Sus competencias están centradas en el desarrollo y seguimiento de instrumentos de planificación y ordenación del territorio. Otra de las funciones principales es el desarrollo de un sistema de información urbanístico para la inspección de la actividad urbanística regional.

Dirección General del Medio Natural

Las funciones van directamente enfocadas la planificación, protección, conservación y restauración del medio natural de la región. Debe desempeñar funciones de cooperación y coordinación con otros organismos en la gestión de espacios comunes en materia de recursos naturales y montes. Además, debe tomar decisiones relacionadas con el planeamiento, gestión y seguimiento de Espacios Naturales Protegidos.

Dirección General de Promoción y Disciplina ambiental

Las funciones van directamente enfocadas a la planificación, ejecución y seguimiento de actividades de educación, formación, información y sensibilización ambiental, que se promuevan con el objeto de alcanzar modelos de desarrollo sostenible, poniendo particular atención sobre aquellas actuaciones dirigidas a promover el desarrollo socioeconómico de las poblaciones locales en áreas rurales y naturales.

CONSEJERíA DE ECONOMíA E INNOVACIóN TECNOLÓGICA

Dirección General de Agricultura y Desarrollo Rural

Competencias generales en la elaboración y ejecución de líneas de actuación en materia de agricultura, ganadería, desarrollo rural e industrias agro-alimentarias. Igualmente se gestionan y coordinan los programas de desarrollo de la región, que fomentan la diversificación y valoración de productos locales y desarrollo de las zonas rurales. Otras funciones específicas son la capacitación y asesoramiento en buenas prácticas, el apoyo a la actividad asociativa a través de las delegaciones comarcales y el fomento de las denominaciones de calidad local.

Dirección General de Turismo

Las competencias se relacionan con la planificación, gestión y promoción de la actividad turística. Esta actividad se coordina con ayuntamientos, pequeñas y medianas empresas (PYMWA) o asociaciones locales, debiendo informar de cada actividad a las administraciones e instituciones relacionadas con el sector.

Acciones políticas	***Recomendaciones***
1. Protección de áreas agrícolas tradicionales	Desarrollar un **plan de protección de áreas agrícolas estratégicas** .
2. Apoyo al desarrollo de la agricultura ecológica	Elaborar un **plan de apoyo al desarrollo de la agricult ura ecológica**; Potenciar la diferenciación de calidad en los productos para facilitar la mejora en la comercialización.
3. Promoción de mercados locales	Campañas de promoción de mercados locales; Vincular los mercados locales con un turismo sostenible en la región.
4. Recuperación de riberas	Desarrollo y financiación de un **programa para la recuperación de los cursos fluviales.**
5. Mejorar el acceso, la disponibilidad y la calidad de la información agro-ambiental	Ampliar y mejorar la calidad de la informac ión base del territorio y facilitar la accesibilidad a la misma para favorecer una planificación integral del mismo y adecuada a las escalas de trabajo.
6. Coordinación Medio Ambiente- -Agricultura- Planificación	Creación y promoción de comisiones mixta s y grupos de trabajo, y posteriormente seguimiento de estos espacios de participación; Creación de redes de asesoramiento en las delegaciones comarcales.
7. Promoción de los procesos de participación	Incorporar metodologías participativas en la legislac ión de planificación, elaboración, puesta en marcha y seguimiento de los planes y programas de desarrollo de la región; Reactivar el borrador del **Plan Regional Estratégico Territorial (PRET)** ; Coordinar la creación de una red de planificación participativa que integre las diversas herramientas existentes.

GRUPOS DE INTERÉS, COMPETENCIAS Y ACCIONES RELACIONADAS

CONSEJERÍA DE ECONOMÍA E INNOVACIÓN TECNOLÓGICA

Dirección General de Agricultura y desarrollo rural

Competencias generales en la elaboración y ejecución de líneas de actuación en materia de agricultura, ganadería, desarrollo rural e industrias agro-alimentarias. Igualmente se gestionan y coordinan los programas de desarrollo de la región, que fomentan la diversificación y valoración de productos locales y desarrollo de las zonas rurales. Otras funciones específicas son la capacitación y asesoramiento en buenas prácticas, el apoyo a la actividad asociativa a través de las delegaciones comarcales y el fomento de las denominaciones de calidad local.

Direccion General de Turismo

Las competencias se relacionan con la planificación, gestión y promoción de la actividad turística. Esta actividad se coordina con ayuntamientos, pequeñas y medianas empresas (PYMES) o asociaciones locales, debiendo informar de cada actividad a las administraciones e instituciones relacionadas con el sector.

Acciones políticas	***Recomendaciones***
1. Protección de áreas agrícolas tradicionales	Participación en la realización de un inventario de agro -ecosistemas tradicionales y zonas agrícolas de exclusión urbanística; Promover los cinturones agrícolas, como filt ros territoriales. ***D.G. DE AGRICULTURA Y DESARROLLO RURAL*** Promover la agricultura tradicional como un recurso más de promoción turística. ***D.G. DE TURISMO***
2. Apoyo al desarrollo de la agricultura ecológica	Apoyar con asesoramiento y financieramente la capa citación en buenas prácticas, la instalación de industrias artesanales, la diversificación y la comercialización de productos. ***D.G. DE AGRICULTURA Y DESARROLLO RURAL***
3. Promoción de mercados locales	Promoción del asociacionismo local. ***D.G. DE AGRICULTURA Y DESARROLLO RURAL*** Creación de rutas eco-turísticas que revaloricen los recursos locales. ***D.G. DE TURISMO***
4. Recuperación de riberas	Creación y promoción de sendas turísticas, siguiendo criterios de sostenibilidad ambiental, en el entorno de las riberas. ***D.G. DE TURISMO***
5. Mejorar el acceso, la disponibilidad y la calidad de la información agro-ambiental	Apoyar financieramente la creación de bases de datos accesibles al público y a las Instituciones competentes, que integren información agrícola y ambien tal.
6. Coordinación Medio Ambiente -Agricultura- Planificación	Crear redes de asesoramiento que favorezcan la relación con los organismos competentes en el sector ambiental. ***D.G. DE AGRICULTURA Y DESARROLLO RURAL*** Vincular los planes de dinamización tur ística con los recursos naturales y agrícolas de la región. ***D.G. DE TURISMO*** Creación, participación y seguimiento de las comisiones mixtas regionales y sectoriales.
7. Promoción de los procesos de participación	Incorporación de métodos de participación pú blica que promuevan la planificación del territorio en su conjunto.

DG: Dirección General

GRUPOS DE INTERÉS, COMPETENCIAS Y ACCIONES RELACIONADAS

CONSEJERÍA DE MEDIO AMBIENTE Y ORDENACIÓN TERRITORIAL

Dirección General de Urbanismo y Planificación Regional

Sus competencias están centradas en el desarrollo y seguimiento de instrumentos de planificación y ordenación del territorio. Otra de las funciones principales es el desarrollo de un sistema de información urbanístico para la inspección de la actividad urbanística regional.

Dirección General del Medio Natural

Las funciones van directamente enfocadas la planificación, protección, conservación y restauración del medio natural de la región. Debe desempeñar funciones de cooperación y coordinación con otros organismos en la gestión de espacios comunes en materia de recursos naturales y montes. Además, debe tomar decisiones relacionadas con el planeamiento, gestión y seguimiento de Espacios Naturales Protegidos.

Dirección General de Promoción y Disciplina ambiental

Las funciones van directamente enfocadas a la planificación, ejecución y seguimiento de actividades de educación, formación, información y sensibilización ambiental, que se promuevan con el objeto de alcanzar modelos de desarrollo sostenible, poniendo particular atención sobre aquellas actuaciones dirigidas a promover el desarrollo socioeconómico de las poblaciones locales en áreas rurales y naturales.

Acciones políticas	***Recomendaciones***
1. Protección de áreas agrícolas tradicionales	Elaboración de un inventariado de agro -ecosistemas tradicionales y zonas agrícolas de exclusión urbanística; Desarrollar herramientas de compensación o solidaridad supra -municipales. ***D.G. URBANISMO Y PLANIFICACIÓN REGIONAL*** ***D.G. MEDIO NATURAL***
2. Apoyo al desarrollo de la agricultura ecológica	Campañas de difusión de productos ecológicos. ***D.G. PROMOCIÓN Y DISCIPLINA AMBIENTAL***
3. Promoción de mercados locales	Elaboración y promoción de rutas turísticas con una componente agrícola, cultural y natural, Promoción del asociacionismo local. ***D.G. MEDIO NATURAL*** ***D.G. PROMOCIÓN Y DISCIPLINA AMBIENTAL*** Recuperación del concepto de "ágora" en la planificación urbanística, cediendo te rrenos públicos para el desarrollo de estos mercados. ***D.G. URBANISMO Y PLANIFICACIÓN REGIONAL***
4. Recuperación de riberas	Elaborar un programa para la recuperación de los cursos fluviales ; Zonificación y caracterización de cauces fluviales en función de su grado de conservación. ***D.G. MEDIO NATURAL*** Creación y promoción de rutas eco-turísticas siguiendo criterios de sostenibilidad ambiental; Divulgación de la Directiva Marco de Aguas para promover su cumplimiento. ***D.G. PROMOCIÓN Y DISCIPLINA AMBIENTAL***
5. Mejorar el acceso, la disponibilidad y la calidad de la información agro-ambiental	Apoyar financieramente la creación de bases de datos accesibles al público y a las instituciones competentes, que integren información agrícola y ambiental.
6. Coordinación Medio Ambiente -Agricultura- Planificación	Creación, participación y seguimiento de las comisiones mixtas regionales y sectoriales; Impedir la desaparición de grupos de Trabajo en materia de planificación urbanística.
7. Promoción de los procesos de participación	Activación Plan Regional Estratégico Territorial (PRET) a nivel regional en el que se involucran todos las planes de acción conjunta

DG: Dirección General

GRUPOS DE INTERÉS, COMPETENCIAS Y ACCIONES RELACIONADAS

GRUPOS ECOLOGISTAS

Grupos locales, regionales y nacionales en los que se engloban todas aquellas asociaciones no gubernamentales sin ánimo de lucro, con fines acordes a los principios expresados en la Ley 4/89 sobre Conservación de la Naturaleza. Entre algunos de los grupos consultados se encuentran "Amigos de la Tierra", "Ecologistas en Acción" y "ADENA-WWF España"

Acciones políticas	***Recomendaciones***
1. Protección de áreas agrícolas tradicionales	Participar en el inventariado de áreas agrícolas estratégicas y promover la participación de a*sociaciones locales* y de *expertos*; Creación de rutas agro-turísticas promocionando un turismo sostenible.
2. Apoyo al desarrollo de la agricultura ecológica	Participar en las campañas de divulgación de agricultura ecológica como medio de conservación de los valores ecológicos.
3. Promoción de mercados locales	--
4. Recuperación de riberas	Campañas de sensibilización y educación ambiental en la región, que apoyen la creación de sendas con criterios ambientalmente sostenibles en el entorno de las riberas.
5. Mejorar el acceso, la disponibilidad y la calidad de la información agro-ambiental	Apoyar la mejora de la accesibilidad y de la calidad de la información de tal forma que permita la realización de unos diagnósticos del territorio mas apropiados.
6. Coordinación Medio Ambiente -Agricultura- Planificación	Participar en las comisiones mixtas sectoriales.
7. Promoción de los procesos de participación	Impulsar metodologías participativas especialmente en la elaboración de los planes generales de ordenación urbanísticos (PGOU).

GRUPOS DE INTERÉS, COMPETENCIAS Y ACCIONES RELACIONADAS

GRUPOS DE DESARROLLO RURAL O ACCIÓN LOCAL

Los Grupos de acción local y/o de desarrollo rural gestionan, coordinan y promueven programas de desarrollo en las regiones y comarcas, apoyando las iniciativas locales, además de promover y activar la coordinación entre asociaciones, ayuntamientos e instituciones competentes en el Gobierno Regional. Igualmente comparten tareas con los agentes de desarrollo local (ADL) en los municipios. Estos grupos se establecieron con la puesta en marcha de las Iniciativas de la Comisión Europea, como es el caso de los Programas LEADER y PRODER.

Acciones políticas	***Recomendaciones***
1. Protección de áreas agrícolas tradicionales	Incentivar prácticas agrícolas y ganaderas que permitan una mejor conservación de los valores ecológicos; Promover la participación de *los grupos de interés locales* en el inventariado de agro-ecosistemas locales; Incentivar la protección de zonas agrícolas estratégicas.
2. Apoyo al desarrollo de la agricultura ecológica	Campañas de capacitación en prácticas ecológicas, en la gestión de industrias artesanales y en la comercialización de productos de calidad.
3. Promoción de mercados locales	Apoyar los mercados locales como medio de promoción de los recursos locales e intercambio de experiencias; Fomentar la creación de redes de mercados intermunicipales.
4. Recuperación de riberas	Vincular la creación de sendas eco-turísticas en las riberas con otros aprovechamientos sustentables del entorno mediante campañas entre las asociaciones y PYMES locales.
5. Mejorar el acceso, la disponibilidad y la calidad de la información agro-ambiental	Apoyar la mejora de la accesibilidad y de la calidad de la información, de tal forma que esta mejora permita realizar unos diagnósticos del territorio mas apropiados.
6. Coordinación Medio Ambiente -Agricultura- Planificación	Organización y participación en las comisiones mixtas y grupos de trabajo tanto a nivel local como regional; Fortalecer la participación de los grupos de interés local, tales como asociaciones locales, grupos ecologistas, etc.
7. Promoción de los procesos de participación	Promover procesos participativos en la elaboración y discusión de programas de planificación territorial, incluyendo las Agendas 21 Locales, los programas de desarrollo rural y los planes de ordenación de los recursos naturales (PORN) y las herramientas de gestión de espacios protegidos.

GRUPOS DE INTERÉS, COMPETENCIAS Y ACCIONES RELACIONADAS

SINDICATOS AGRARIOS

Los Sindicatos agrarios, son también conocidos por Organizaciones Profesionales Agrarias (OPA)y tienen entre sus principales funciones las de representar al sector agrícola y ganadero en las decisiones de mercado a nivel Nacional y Europeo, promover el cooperativismo y reivindicar su papel en las decisiones políticas. Algunos de los Sindicatos entrevistados son "COAG" y "Plataforma Rural".

Acciones políticas	***Recomendaciones***
1. Protección de áreas agrícolas tradicionales	Apoyar la iniciativa de protección de zonas agrícolas tradicionales.
2. Apoyo al desarrollo de la agricultura ecológica	Fomentar el asociacionismo e intercambio de experien cias entre agricultores, ganaderos y productores; Formación de agricultores y ganaderos en gestión de fincas, buenas prácticas e instalación de industrias familiares.
3. Promoción de mercados locales	Incentivar la participación de las asociaciones y coop erativas de agricultores, los productores y los consumidores; Fomentar la creación de redes de mercados inter-municipales.
4. Recuperación de riberas	--
5. Mejorar el acceso, la disponibilidad y la calidad de la información agro-ambiental	--
6. Coordinación Medio Ambiente -Agricultura- Planificación	Organización y participación en las comisiones mixtas y/o grupos de trabajo sectoriales.
7. Promoción de los procesos de participación	Fortalecer la participación publica de los grupos de interés local.

GRUPOS DE INTERÉS, COMPETENCIAS Y ACCIONES RELACIONADAS

EXPERTOS (Profesionales e Investigadores)

Se engloban dentro de este grupo de interés a todos aquellos profesionales e investigadores cuyo ámbito profesional se desarrolla dentro de la ordenación y gestión del territorio, la conservación de la naturaleza, el desarrollo rural y las ciencias agronómicas y forestales. Estos expertos pertenecen tanto a centros de investigación como a otras instituciones públicas o privadas, universidades o consultorías.

Acciones políticas	***Recomendaciones***
1. Protección de áreas agrícolas tradicionales	--
2. Apoyo al desarrollo de la agricultura ecológica	--
3. Promoción de mercados locales	--
4. Recuperación de riberas	--
5. Mejorar el acceso, la disponibilidad y la calidad de la información agro-ambiental	Participar en el inventariado de áreas agrícolas estratégicas y hábitat y especies amenazados; Mejorar la accesibilidad de la información a través de vías telemáticas permitiendo el acceso a los diferentes organismo s que trabajan en el territorio.
6. Coordinación Medio Ambiente -Agricultura- Planificación	Organización y participación en las comisiones mixtas tanto a un nivel regional como local; Fortalecer la participación de los asociaciones locales, grupos de desarrollo rural y grupos ecologistas.
7. Promoción de los procesos de participación	Demandar la participación de grupos de expertos en la elaboración de planes estratégicos sectoriales y territoriales.

GRUPOS DE INTERÉS, COMPETENCIAS Y ACCIONES RELACIONADAS

SECTOR DE LA CONSTRUCCIÓN

Se engloban dentro de este grupo de interés a las empresas constructoras, las cuáles son los principales propietarios del suelo de la Comunidad Autónoma de Madrid. También se inlcuyen los despachos de arquitectos vinculados estrechamente con la realización de los planes generales de ordenación urbanística (PGOU).

Acciones políticas	***Recomendaciones***
1. Protección de áreas agrícolas tradicionales	Respetar las áreas propuestas como zonas de protección agrícola en los planes generales de ordenación urbanística (PGOU).
2. Apoyo al desarrollo de la agricultura ecológica	Planificación de espacios públicos, conocidos como "ágora" en la ordenación urbanística de los municipios.
3. Promoción de Mercados locales	--
4. Recuperación de riberas	--
5. Mejorar el acceso, la disponibilidad y la calidad de la información agro-ambiental	--
6. Coordinación Medio Ambiente -Agricultura- Planificación	Participación en las comisiones sectoriales tanto en el ámbito local como regional.
7. Promoción de los procesos de participación	Promover la elaboración del Plan Regional Estratégico Territorial (PRET) a nivel regional.

GRUPOS DE INTERÉS, COMPETENCIAS Y ACCIONES RELACIONADAS

AYUNTAMIENTOS

Las Corporaciones locales o Gobiernos locales son comúnmente conocidos por Ayuntamientos. Estos desempeñan como principal función la gestión de los recursos municipales. Su papel en la planificación urbanística del municipio es fundamental en la actualidad, ya que la mayor parte de los municipios se encuentran en un proceso de elaboración o revisión de los planes generales de ordenacion urbanística (PGOU) de acuerdo a la legislación vigente, debiendo coordinarse con las instituciones regionales en materias como espacios naturales o montes públicos, y con la Dirección General de Turismo en aquellas actividades relacionadas con el sector.

Acciones políticas	***Recomendaciones***
1. Protección de áreas agrícolas tradicionales	Establecer áreas agrícolas de protección especial en el marco de los planes generales de ordenación urbanística (PGOU).
2. Apoyo al desarrollo de la agricultura ecológica	Organización y/o promoción de eventos para la promoción de productos ecológicos.
3. Promoción de mercados locales	Cesión de espacios públicos para la localización de mercados; Señalización y mantenimiento de rutas agro -turísticas; Fomentar la inversión local en los recursos de la zona.
4. Recuperación de riberas	Vincular la recuperación ecológica de las riberas con otros aprovechamientos sustentables del entorno, como la creación y promoción de rutas eco-turísticas y las campañas de sensibilización ambiental; Mejorar el sistema de señalización de sendas en el entorno de las riberas; Participar en la puesta en marcha de medidas de recuperación en coordinación con las instituciones competentes.
5. Mejorar el acceso, la disponibilidad y la calidad de la información agro-ambiental	--
6. Coordinación Medio Ambiente -Agricultura- Planificación	Creación y/o participación en las comisiones mixtas locales y grupos de trabajo en el ámbito municipal y/o local.
7. Promoción de los procesos de participación	Incorporación de métodos de participación pública que promuevan la planificación del territorio en su conjunto; Activación de la elaboración del Plan Regional Estratégico Territorial (PRET) a nivel regional en el que se involucran los diferentes planes de acción conjunta.

GRUPOS DE INTERÉS, COMPETENCIAS Y ACCIONES RELACIONADAS

ASOCIACIONES DE TURISMO Y PYMES (Pequeñas y Medianas Empresas)

Se engloban dentro de este grupo de interés las pequeñas empresas, mayormente de inversión local, y otras iniciativas locales de turismo, por ejemplo negocios de multi-aventura, casas rurales, etc.

Acciones políticas	***Recomendaciones***
1. Protección de áreas agrícolas tradicionales	Elaborar rutas agro-turísticas con el fin de promocionar un turismo sostenible en la región.
2. Apoyo al desarrollo de la agricultura ecológica	Organizar visitas a las fincas ecológicas como otro recurso turístico más de la región.
3. Promoción de mercados locales	Diseño y mantenimiento de rutas turísticas con una componente agrícola, cultural y natural que promocionen la gastronomía y artesanía tradicional, junto a la riqueza paisajística.
4. Recuperación de riberas	Promover la conservación y/o recuperación de sendas en las riberas; Combinar la creación de rutas eco-turísticas con planes de educación ambiental y del entorno.
5. Mejorar el acceso, la disponibilidad y la calidad de la información agro-ambiental	--
6. Coordinación Medio Ambiente -Agricultura- Planificación	Participación en las comisiones mixtas.
7. Promoción de los procesos de participación	Demandar procesos de participación pública en la planificación del territorio.

GRUPOS DE INTERÉS, COMPETENCIAS Y ACCIONES RELACIONADAS

ASOCIACIONES DE PRODUCTORES Y TRANSFORMADORES ECOLÓGICOS Y PYMES (Pequeñas y Medianas Empresas)

En este grupo se incorpora un amplio y diverso tipo de asociaciones, en las cuales se defiende, desde la denominación de los productos ecológicos, hasta modelos alternativos de agro-ecología y autosuficiencia. Se ha tenido en cuenta al Comité de Agricultura Ecológica de la Comunidad de Madrid (CAECM), a la Asociación de Productores Ecológicos (APRECO), la Asociación de Agricultura Biodinámica de San Yago y a la Cooperativas de Productores y Consumidores "Bajo el Asfalto está la Huerta" (BAH).

Acciones políticas	***Recomendaciones***
1. Protección de áreas agrícolas tradicionales	Organizar rutas agro-turísticas con el fin de promocionar los agro-ecosistemas típicos Mediterráneos.
2. Apoyo al desarrollo de la agricultura ecológica	Fomentar asociacionismo entre productores y distribuidores ecológicos; Promover la formación en buenas prácticas, gestión de fincas, instalación de industrias artesanales, comercialización de productos.
3. Promoción de Mercados locales	Iniciativas que acorten los canales de comercialización entre productores y consumidores; Promoción de productos ecológicos y otras denominaciones de calidad.
4. Recuperación de riberas	Promoción de buenas prácticas agrarias en las fincas agrícolas situadas próximas a los ríos; Creación de rutas eco-turísticas en el entorno de las riberas.
5. Mejorar el acceso, la disponibilidad y la calidad de la información agro-ambiental	--
6. Coordinación Medio Ambiente -Agricultura- Planificación	Participación en las comisiones mixtas.
7. Promoción de los procesos de participación	Participar y demandar procesos de participación abiertos en la planificación del territorio.

GRUPOS DE INTERÉS, COMPETENCIAS Y ACCIONES RELACIONADAS

ASOCIACIONES Y COOPERATIVAS DE AGRICULTORES Y GANADEROS

En este grupo de interés se incluyen a las asociaciones locales, comarcales, mancomunales y regionales dedicadas tanto a la gestión de terrenos públicos, como a la producción y la comercialización de productos agrícolas o transformados. Se encuentran dentro de este grupo, las asociaciones de ganaderos encargadas de la gestión de las Dehesas Municipales, o tambien a las cooperativas de vino, agrupando a los productores de uva que se encargan de su transformación y comercialización.

Acciones políticas	***Recomendaciones***
1. Protección de áreas agrícolas tradicionales	Desarrollo de modelos alternativos autosuficientes de producción agrícola-ganadera y comercialización.
2. Apoyo al desarrollo de la agricultura ecológica	Fomento del asociacionismo entre agricultores, ganaderos y productores de la región; Asesoramiento en gestión de fincas ecológicas e industrias familiares.
3. Promoción de mercados locales	Promover espacios públicos de comercialización local que favorezcan el acercamiento entre productores y consumidores.
4. Recuperación de riberas	Fomentar buenas prácticas agrarias en las fincas entorno a los ríos y riberas.
5. Mejorar el acceso, la disponibilidad y la calidad de la información agro-ambiental	--
6. Coordinación Medio Ambiente -Agricultura- Planificación	Participación en las comisiones mixtas sectoriales, tanto locales como regionales.
7. Promoción de los procesos de participación	Participar y demandar procesos de participación abiertos en la planificación del territorio.

GRUPOS DE INTERÉS, COMPETENCIAS Y ACCIONES RELACIONADAS

AGRICULTORES Y GANADEROS

Esta agrupación representa a aquellos agricultores y ganaderos independientes que no pertenecen a ninguna asociación, pero como propietarios, arrendatarios y usuarios del suelo, representan un grupo de interés imprescindible en la planificación y gestión del territorio. Se incluyen tanto agricultores y ganaderos convencionales como ecológicos.

Acciones políticas	***Recomendaciones***
1. Protección de áreas agrícolas tradicionales	Conservación de huertas tradicionales y variedades autóctonas; Manejo de cultivos mediante rotaciones; Mantenimiento de setos y linderos.
2. Apoyo al desarrollo de la agricultura ecológica	Prácticas agrícolas respetuosas con el entorno; Instalación de pequeñas industrias familiares; Organización de visitas a las fincas para promocionar los productos y la producción ecológica; Intercambio de experiencias entre productores ecológicos.
3. Promoción de mercados locales	Utilización de los mercados como medio de promoción de los productos locales y espacios de intercambio entre productores y consumidores.
4. Recuperación de riberas	Conservación de setos, linderos y zonas húmedas en las fincas agrícolas.
5. Mejorar el acceso, la disponibilidad y la calidad de la información agro-ambiental	--
6. Coordinación Medio Ambiente -Agricultura- Planificación	Participación en los grupos de trabajo locales.
7. Promoción de los procesos de participación	Demandar el relevante papel de las asociaciones y cooperativas en los procesos de planificación.

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TOWARDS SUSTAINABLE LAND PLANNING IN THE AUTONOMOUS COMMUNITY OF MADRID: GUIDELINES AND RECOMMENDATIONS

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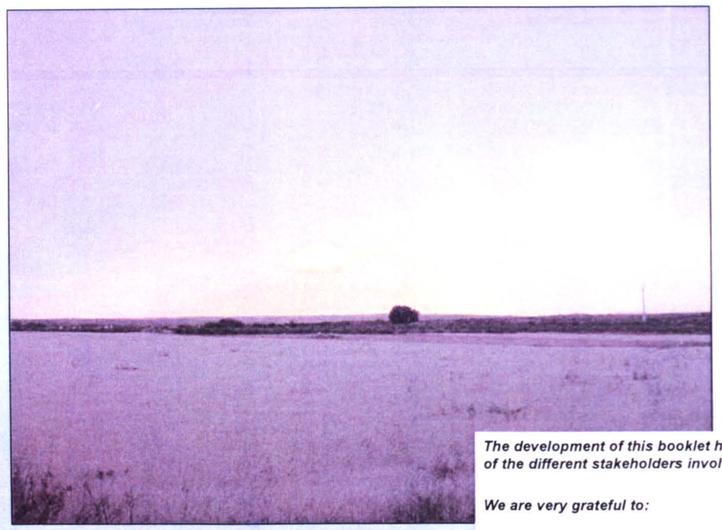
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INTRODUCTION

The landscapes of the Community of Madrid, with an eminently Mediterranean and rural character, have suffered important changes in the last few decades on being fragmented. This fragmentation, is the process by which extensive stretches of land are divided into mosaic areas (Andrén, 1997). Together with the loss of natural habitats it is considered at present as the main problem in the conservation of the different species, as well as the loss of diversity. The increase in the fragmentation of the habitat is related to the development of road and rail networks, to the direct destruction of the habitats due to land use conflicts and to specific farming and forestry practices. An estimated 30% of the proposed areas within the future Natura 2000 network (92/43 EEC Directive) will be affected by an intensification of farming practices (Heath and Rayment, 2001).

In the Madrid region the agrarian production is on the decline due to the low productivity of the crops, inadequate infrastructures and pressure put on the peri-urban areas where farming took place in the past. According to the agrarian census, the land used for agriculture had been reduced by 13% from 1989 to 1999. For example, in 1989 68% of land in the Madrid region was used for agriculture, whereas in 2002 only 29% of the land in the whole of the Community of Madrid was used for this purpose (MAPYA, 1989). This area covers approximately 228,428 hectares.

The development of agro-ecology in the Community of Madrid, as in the rest of Spain, has increased considerably in recent years. However, the pressure from developers to build more urban areas, industrial estates and transport networks has contributed to a great loss of farmland, including some of the best quality (Martínez Falero, 2002).

As is reflected in the White Book of agriculture and rural development, "Agriculture still continues to be essential to maintain a social and territorial balance" (MAPYA, 2004). This fact confirms the necessary role that agriculture plays in sustainable development planning.

The inefficient and insufficient adoption of the European regulations in agricultural. territorial planning and environmental issues is mainly due to the lack of coordination between the regional, national and European institutional interventions. The absence of specific regulations on the agro-systems is a reflection of what little importance is given to agriculture in territorial planning. The urbanistic pressure is given preference over the demands of the agrarian sector.



Nature Reserve "La Encomienda" in the municipality Belmonte de Tajo (Madrid)

In particular, the landuse Law of the Community of Madrid (Law 9/2001) makes establishing urban planning guidelines obligatory. Up to now the majority of municipalities continue applying subsidiary regulations (prior to the above-mentioned Law), based exclusively on the development of the urban areas. What usually happens is that the land with a high agricultural potential or high ecological value is the first to be chosen for urbanization or occupation by public works. This situation could mean that farming in Madrid would become restricted to the areas with less potential in the short term and destined to disappear or become an absolutely marginal activity within the productive sectors.

INTRODUCTION

This booklet is one of the results of a broader project called TiGRESS (Time Geographical Approaches to Emergence and Sustainable Societies). This project belongs to the 5th Framework Programme of the European Union, where the common aim of the research teams is the development of decision-making tools in territorial planning. In particular the aim of the Madrid research team is to design a sustainable territorial planning tool which would bear in mind the important role of agriculture in the conservation and recuperation of ecological value of the land. The objective of the referred tool is to inform town planners and decision makers at the national, regional and municipal levels of the possible impact of the future political scenarios on land use change.

Through study and analysis of landuse and landuse changes in the Community of Madrid from 1982 up to the present day, numerous deficiencies have been detected in the land planning processes. A series of policy interventions, either directly or indirectly related to these matters, have been proposed in meetings with experts whose main interest is sustainable land planning. Some of these groups who participated from the beginning of the process put us in contact with other groups who contributed to the richness and diversity of the text. Opinions, potentiality and interests were compared in areas as different as farming associations and organisms responsible for urbanism in Regional Government.

This booklet is divided into two main parts: In the first part the policy interventions and the stakeholders involved are introduced. In the second part the stakeholders and the proposed recommendations for each of the policy interventions are introduced.

The structure of this document has a double input to allow for a better understanding. The first part offers a total vision of each policy and the second a synthesis of the recommendations for each one of the stakeholders in relation to each intervention.



Crop mosaic: vineyards and olive trees in Belmonte de Tajo (Madrid), Spring 2005

PROPOSED INTERVENTIONS FOR MORE SUSTAINABLE LAND PLANNING

The seven policies proposed are presented as follows:

POLICY INTERVENTION 1. Protection of traditional farmland

POLICY INTERVENTION 2. Support for the development of agro-ecology

POLICY INTERVENTION 3. Promotion of local markets

POLICY INTERVENTION 4. Recuperation of riverbanks

POLICY INTERVENTION 5. Improvement of availability and quality of environmental information

POLICY INTERVENTION 6. Coordination between environment, agriculture and planning

POLICY INTERVENTION 7. Promotion of participation processes

These policy interventions are the fruit of the diagnosis carried out in the territory, of the deficiencies detected in territorial planning and of the conversations held with the stakeholders. The following outline is used for each action:

- Present situation of each one
- Initiatives
- Recommendations and stakeholders

Current Situation

The rail and road network of the Autonomous Community of Madrid acts as the axis of urbanistic expansion from the city centre to the peri-urban areas covering a radius of 25-50 kilometres. Within this territory, the natural species protected under Spanish legislation, the SCI (Sites of Communitary Importance) and SPA (Sites of Special Protected Areas for Birds) under European Directives occupy 40% of the whole territory (Natura 2000 Network, 2004). Urbanistic growth and the high percentage of natural protected areas have led to a great deal of good rural farmland being converted into urban land, forcing farmers to move to inferior quality land. This situation could mean the abandonment of the cultivation of crops and livestock farming in the medium or long term and the consequent loss of the typical Mediterranean agro-systems.



Traditional Olivar tree as peri-urban agriculture in the municipality Belmonte de Tajo (Madrid), Spring 2005

Initiatives

The proposed initiative for the protection of strategic farming areas would become a reality if a regional plan to safeguard the agricultural value of the land, including livestock farming and forestry, were introduced.

This plan would favour the continuation of traditional agriculture such as olive groves, vineyards, dry crops and irrigated crops. This would increase the diversity of the landscape which would mitigate the impact of urban areas and act as an ecological corridor between protected areas. It would also improve tourist and educational activities and provide good quality organic food to be sold in local markets.

In the case of peri-urban areas a belt of sustainable agriculture could be created and would mitigate the impact of the urban area on the rest of the territory. This belt would act as a protection between the different protected natural spaces and "patches" of natural vegetation (even if they are not protected areas) through the ecological corridors. This structure of the landscape would permit a greater control of the landscape fragmentation caused by urban expansion and the creation of new infrastructures.



Traditional peri-urban agriculture in the surroundings of Madrid, Spring 2005

On the other hand, the production of the farmland would permit the agro-ecosystems to be kept as they are and, above all, the river valleys and banks for their important ecological value, through sustainable practices.

Finally, the quality of the landscape of these traditional farmlands and the production of good quality organic food would encourage educational and tourist activities in the region, favouring a multifunctional use of the territory.

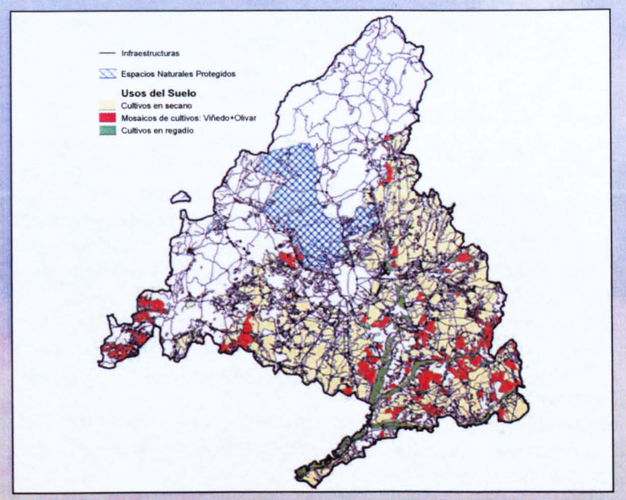


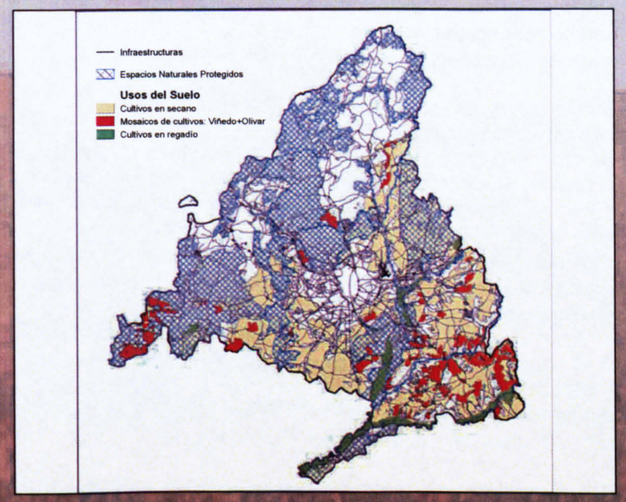
Vegetable Plots in traditional riverbanks in Villaviciosa de Odon, Spring 2005

POLICY INTERVENTION 1: PROTECTION OF STRATEGIC FARMING AREAS



Traditional peri-urban farming in the municipality Belmonte de Tajo (Madrid) beside an upcoming urban development.





Evolution of network of infrastructures, Natural Protected Sites and land use (dry crops, vineyard and olive tree mosaic, irrigated crops in two decades (2002 – 1982)
Source: Own elaboration drawn up by the team

Stakeholders and Recommendations

The stakeholders involved and the recommendations at each level will be introduced as follows:

At National Level

Ministry of Environment (Directorate of Biodiversity)

Ministry of Agriculture, Food and Fisheries (Directorate of Rural Development and Directorate of Food)

- To support, coordinate and follow-up the regional initiatives according to the regulations of the European Agricultural Fund for Rural Development (EAFRD) on the protection of farming land within the Natura 2000 network (Delpeuch, R., 2004; MMA, 2005).

At Regional Level

Regional Directorate of Economy and Technology (Department of Agriculture and Rural Development) in coordination with the Regional Directorate of Environment and Land Planning (Department of Land Planning and Urbanism)

- To develop a **plan of protection of strategic farming areas** in its transition from natural areas to urban areas. These areas would be compatible with recreational and conservation uses.

- **Inventory of strategic ecosystems (identifying, zoning and cataloguing) of high-value agricultural areas**, both ecological and productive. Cereals, riverbanks, valleys and pastures are included in this zoning because of their relevant role in biodiversity conservation. This proposal would be coordinated with the Natura 2000 Network of the above-mentioned.

- To establish **farming areas excluded from urban development** which could act as territorial filters within which the livestock tracks would be included. This would allow the guidelines from municipal agricultural plans in peri-urban areas to be developed. This initiative would complement the White Paper on Agriculture of the Autonomous Community of Madrid's proposal to promote agrarian spaces in urban areas (Department of Agriculture and Rural Development, 2005).

- To promote quality control to improve marketing of products, such as certificates and seals of quality and labelling such as "organically grown products" and "food of Madrid".

At Regional and Local Level

Directorate of Environment and Territorial Planning (Department of Land Planning and Urbanism)

Municipalities

- To create **territorial planning tools to encourage solidarity between municipalities** by establishing joint supra-municipal mechanisms, for example, common funding mechanisms. These tools would help to balance the economic and social differences that arise as a consequence of the declaration of protected areas or future protected agrarian spaces.

Regional Directorate of Economy and Technology (Department of Agriculture and Rural Development) in coordination with the Regional Directorate of Environment and Land Planning (Department of Land Planning and Urbanism)

Municipalities

- To participate actively in establishing and defining boundaries of strategic farming areas. The said areas would be protected and would only be yielded for use in agricultural and educational activities or as protected natural spaces. Thus being excluded from the urban planning guidelines of the municipalities as areas of urban expansion.

- To promote **municipal plans of agricultural action** in peri-urban and in transitional rural to urban areas.

Directorate of Economy and Technology (Department of Agriculture and Rural Development)

Local Action groups

Farmers´trade unions

Ecologists groups

- To encourage agricultural and livestock practices that would respect the surrounding areas, leading to a better conservation of the their ecological value. To provide and promote the letting of rustic land for its maintenance, replacing or introducing new farmers who would use sustainable practices.

- To promote **traditional agriculture and particularly sustainable agriculture belts** which could act as a territorial filter, as well as encouraging sustainable tourism by creating paths for walking tours in traditional agro-ecosystems.

- Promotion of environmental awareness of traditional agro-ecosystems through an initiative for protection of strategic farming areas, encouraging the regions with

POLICY INTERVENTION 1: PROTECTION OF STRATEGIC FARMING AREAS

similar projects in this field, for instance, Catalonia and the Canary Islands, to share their experiences.

- To promote the participation of the local associations and experts in identifying and cataloguing the traditional agro-ecosystems with a view to their conservation.

Regional Directorate of Economy and Technology (Department of Tourism)

Ecologists groups

Tourism associations

Municipalities

- These groups would create agro-tourist routes to promote the important agricultural and livestock activities, to encourage sustainable quality tourism.

At Local Level

Municipalities

Building Sector

- To respect the proposed protected farming areas when drawing up the urban planning guidelines, because of the important role these areas play in the territory as agricultural belts. These areas would be excluded from urban development in the transition from rural to urban and peri-urban areas and be similar to the system by which open spaces are protected for their conservation, maintenance and use.

Agricultural and livestock farmers

Associations of producers of organic food

Farmers´associations or cooperatives

Small and Medium Sized Enterprises

Tourism Associations

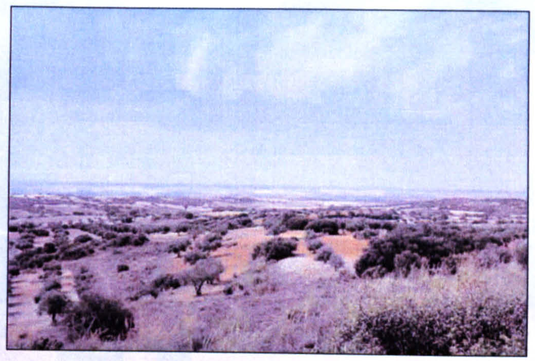
- To participate in the management of the traditional agricultural areas as stakeholders particularly involved in agrarian activities. This direct participation would help to slow down the current decline in traditional agriculture. It would also further the development of quality products, traditional fruit and vegetable gardens and alternative, self-sufficient models of agricultural and livestock production, which would in turn have positive repercussions on the commercialisation of products in local markets and agro-tourism in the surrounding areas.

Agricultural and livestock farmers

Associations of producers of organic food

Farmers´associations or cooperatives

- Conservation of hedges and borders, as well as management of crops by rotating and introducing alternative crops.



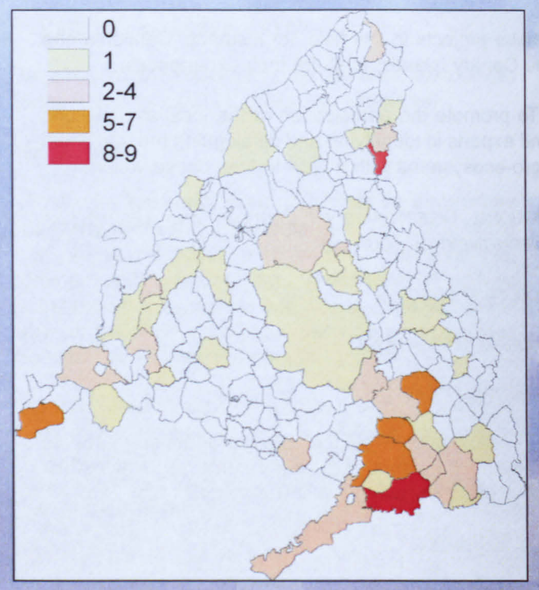
Olivar trees mosaic in the municipality Belmonte de Tajo
Summer, 2005

Current Situation

Organic Farming in the Autonomous Community of Madrid has increased immensely over the last five years. At present it covers an area of 5,215.83 hectares and has 111 workers in production and marketing (Committee of Organic Agriculture in the Community of Madrid, 2004). This area covers 2.3% of all usable agriculture land in the region. This growth is due to the role that organic agriculture has acquired in the region.

Agriculture in the Community of Madrid has been known for its low productivity and poor economy. However, now there is more demand from the people to supply varied and better quality products (White Paper of Agriculture and Rural Development, Ministry of Agriculture, Food and Fisheries, 2004). This change in tendency is mainly due to the growing consumption of organic products by the people of Madrid. For this reason, the region of Madrid is quite different from other regions that basically cultivate for export.

Organic Agriculture is a very positive alternative for several reasons, the most important of which are the contribution to the conservation of biodiversity and the improvement in the quality of life, both in rural and urban environment. The upkeep of the hedges around estates and fields, not using chemical products, the way the land is worked and the crop rotating system, all contribute avoiding erosion of the land, the loss of unique species and water contamination, among other things. All these factors help to establish a closer relationship between the farmers and their natural environment. Likewise organic agriculture encourages the conservation of the traditional landscape, it allows for the continuity of activities in the rural environment and it attracts sustainable quality tourism through fairs, markets and the sale of organically grown foods.



Number of organic agricultural and livestock farmers and organic producers in the region of Madrid (2003). *Source: Own elaboration*



Organic livestock farm which produces dairy products in the municipality Cercedilla (Madrid), Spring 2005



"Río Pradillo" organic livestock farm in the municipality Cercedilla (Madrid), Spring 2005

Initiatives

The elaboration of a plan to support organic farming development would promote the conversion of land to organic agriculture and the establishment of home grown products and traditional craft industries. This would lead to an increase in the supply of organic products, avoid abandoning agricultural land and further local trade. This plan would be established in the same framework of development as the plan of organic agriculture of the Ministry of Agriculture, Food and Fisheries (MAPYA, 2004)

POLICY INTERVENTION 2: SUPPORT TO ORGANIC FARMING DEVELOPMENT

Stakeholders and Recommendations

The specific policies recommended and the stakeholders who will take part in carrying out this initiative are as follows:

<u>At National Level</u>

Ministry of Agriculture, Food and Fisheries (Directorate of Food)

- Monitoring of the regional plans for organic farming with the National Plan.

<u>At Regional Level</u>

Regional Directorate of Economy and Technology (Department of Agriculture and Rural Development and Department of Tourism) in coordination with the Regional Directorate of Environment and Land Planning (Department of Promotion and Environmental Control)

- To put the **regional plan for the development of organic agriculture into practice**, coordinating with the existing national plan. This plan should ensure the participation of the whole agrarian sector in its implementation and follow-up, besides promoting organic agriculture in protected areas. In the same way they should foment investment for the conversion of land and the installation of craft industries. They should also encourage the exchange of the ecological seeds and autochthonous varieties as well as the development of good agricultural practices. Research should also be done to find new channels to commercialise organic products; to design plans for training, assessing and sharing experiences among the cooperatives, associations and small farmers.

- To develop a **plan of awareness and environmental education** to tackle the importance of the conservation of natural and semi-natural vegetation areas. To create, restore and/or maintain sustainable agricultural belts, not only in organic agriculture but also in the whole agricultural environment. This plan would encourage and foment these interventions by recognising and awarding those who carry out responsible farming practices with nature, in the form of quality labels, compensation benefits and so on.

- To develop sustainable tourism through educational programmes and environmental awareness campaigns, which would give support to and promote local associations.

<u>At Regional and Local Level</u>

Local Action groups

Ecologists groups

Farmers´ trade unions

- To manage, along with the Department of Agriculture and Rural Development, specific interventions for the development of organic agriculture such as training programmes for family businesses and young farmers, subsidies for the conversion to organic agriculture and for the installation of craft industries and subsidies for the promotion and marketing campaigns.

- To link the promotion of the organic agriculture with other initiatives, such as support for local markets by assessment of good agricultural practices or the conservation of traditional uses and methods as a measure to increase the variety of products and to improve their production.

- To support the assessment campaigns, the dissemination of good agricultural practices, organic agriculture and farming associations.

<u>At Local Level</u>

Municipalities

- To promote local ecological production and land transformation through visits to organic farms and to provide locations for fairs and markets to commercialise these products.

Associations of producers of organic food

Farmers´associations and cooperatives

Tourism Associations

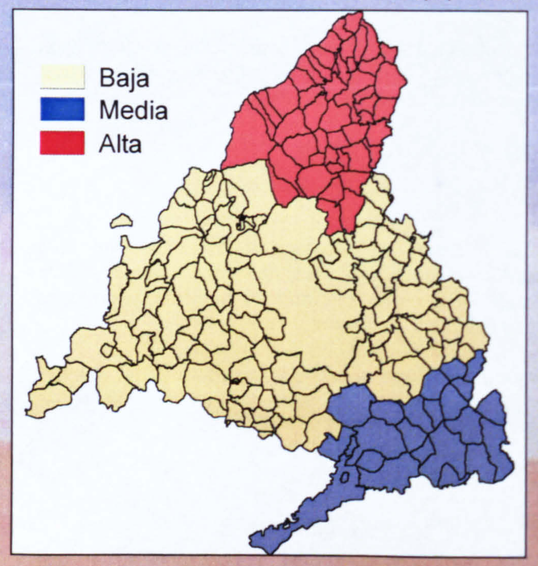
Small and Medium sized Enterprises (SMEs)

- To spread and apply sustainable practices such as hedge maintenance, conservation of areas of natural vegetation, crop rotation, use of natural fertilizers and so on. These measures would foster the conservation of the biodiversity including the landscape, the characteristics of the soil and a wider variety of products.

- To encourage the different associations and SMEs to share their experiences through the organization of training programmes which would favour the development of the different activities. The associations and SMEs of the tourist sector would encourage ecological agriculture by promoting country walks, gastronomic and educational routes within the areas surrounding the organic farms and craft industries.

Current Situation

The Autonomous Community of Madrid is amongst the richest and most densely populated of Spain (White Paper on Agriculture and Rural Development, MAPYA 2004). The agrarian zones are located to the North and South of the region, in those areas which are farthest from the city centre. The marginal role of agriculture and livestock farming represents 1% of the regional GDP. In the Southeast we find "La Campiña" comarca, where cereals are grown. The South and Southwest are "Las Vegas"[1] and "South Western" comarcas, with mosaics of traditional crops, olive groves and vineyards and extensive vegetable and livestock farming. In the northern part of the region, the mountainous area, are the comarcas of "Lozoya-Somosierra"[2] and "Guadarrama", which are mainly dedicated to cattle raising. In this region we find some towns of great interest for tourism, being close to beautiful natural locations, as well as some municipalities which are threatened with depopulation.



Low, medium and high Rural Index (Municipalities< 10.000 inhabitants) *Source: Own elaboration*

Initiatives

The promotion of local markets would create new opportunities for small and medium-sized farmers and the young population in rural areas. Some of the guidelines that support this proposal would include maintaining agrarian production, encouraging craft and traditional farming practices and trading of local products. This initiative would complement the European Union's Rural Development Programme, which promotes multi-activity in agriculture. The Regional Government's plan in support of the horticulture sector, currently in elaboration, would also benefit from this proposal.

This proposal could favour the creation of producer and consumer networks, allowing a simplification of distribution channels between rural and urban areas, narrowing the gap between the population of the city and the country. This commercialisation system runs parallel to the principles of organic agriculture. Organic farming and livestock breeding play an important role in the relationship between urban and rural areas, as it satisfies the city's demand for high-quality products. This policy intervention would also allow for agro-touristic activities to be developed.



Local market in the peri-urban area of the Autonomous Community of Madrid, Spring 2005



Agro-Touristic route in the municipality Belmonte de Tajo (Madrid), Spring 2005

1. Some organic products market initiatives already exist, for instance in the municipalities Hoyo de Manzanares and Colmenar de Oreja.
2. These are the only rural comarcas in the region (>25% of municipalities are rural).

POLICY INTERVENTION 3: PROMOTING LOCAL MARKETS

Stakeholders and Recommendations

The specific policies recommended and the stakeholders who will take part in carrying out this initiative are as follows:

<u>At Regional Level</u>

Regional Directorate of Economy and Technology (Department of Agriculture and Rural Development and Department of Tourism) in coordination with the Regional Directorate of Environment and Land Planning (Department of Promotion and Environmental Control)

- Promoting local associations, SMEs and cooperatives of producers and consumers at local and regional levels. This shall include organising awareness campaigns, institutional and financial support and advice.

- Linking this initiative with the promotion of sustainable tourism (gastronomic, cultural and natural) through specific measures including creating the cattle tracks network as connections between local markets. These cattle tracks should be converted into agro-touristic routes and properly maintained.

<u>At Regional and Local Level</u>

Regional Directorate of Environment and Land Planning (Department of Planning and Urbanism)

Building Sector

Municipalities

- **Recuperate the "ágora" concept (meaning public common space)** in urban planning, in such a way that the urbanistic plan includes the yielding of land for the establishment of local markets and other collective activities in public spaces.

Ecologists groups

Local Action groups

Farmers´trade unions

Municipalities

- To support the **creation of local markets**, both at the municipal and supra-municipal level, bringing producers and consumers closer and adapting the offer to the growing demand. Participating in these market activities and undertaking awareness campaigns will encourage local associations, as well as the creation of producer and consumer networks.

- To link this initiative with agro-environmental campaigning and the promotion of the touristic resources of the municipalities such as gastronomy, culture and nature. Concerning the latter, manufacturing and improving eco-touristic routes.

- To promote the participation of farmer associations, tourism associations, agro-environmental organisations, SMEs and producer and consumer networks and cooperatives in the local markets.

<u>At Local Level</u>

Municipalities

agricultural and livestock farmers

Associations of producers of organic food

Farmers´associations and cooperatives

Tourism Associations

Small and Medium sized Enterprises (SMEs)

- Encourage local investment, notably through the establishment of SMEs and cooperatives or other associations of producers and consumers.

- To design and maintain tourist routes with agricultural, natural and cultural elements, as well as landscape value.

- Launching alternative channels of local distribution which bring together producers and consumers (gastronomic fairs, tasting,...)

Current Situation

Rivers and their natural banks play a very important role in biological biodiversity. They are sometimes the only remains of natural vegetation, especially in landscapes drastically modified by man, such as in Europe.

In these cases, fluvial corridors constitute the union between remnants of autochthonous vegetation and they are therefore a bridge between remote localities. This has serious consequences on the conservation of endangered species (Burel & Baudry, 2002. Bennet, 1999).

River basins have been within the most damaged habitats in the Autonomous Community of Madrid over the last decades. This is due to the intensification of agriculture, urban growth, the creation of water reservoirs and the modification of river courses for different reasons. Nevertheless, despite this high level of degradation, there are still rivers whose fauna represents a valuable reserve of species of environmental importance (Cubillo, F. et al, 1990).

It is a priority in the Autonomous community of Madrid to guarantee an optimal conservation of vegetation in riverbanks and fluvial courses. This is due to the demands on quality of water and the conservation of habitats and aquatic species established by European and international regulations which are in force today (Framework Directive on Water, Ramsar Convention, Bonn Convention, Berna Convention, Habitat Directive or Bird Directive).

It can be said that the most important rivers in the Madrid region are affected by severe pollution problems and by radical changes in their surroundings, especially at the middle and final parts of their courses (Cubillo, F. et al, 1990). These rivers and their banks (see map) play a significant role as places of special protection for the conservation of the habitat, known as "Sites of Communitarian Interest" (SCI) and future areas of the Natura 2000 network. Water pollution is the most evident impact and is due to waste from industries and the more than 6 million inhabitants of the region. The occupation of water public domain and therefore the alteration of riverbank vegetation, has increased in recent years, firstly caused by growing agricultural land and subsequently by the urbanisation process.

The management of water resources by the responsible administrations (Ministry of Environment and the corresponding river basin Organism are losing the economic and social opportunities that recuperated river banks could represent (Friends of the Earth, 1998). Some projects presently supported by the Ministry of Environment, the River Tajo Hydrographical Confederation and the Regional Government are CAUCE (rehabilitation of riverbeds), LINDE (delimitation of water domain) and AGUA (actions for water management and use). Notwithstanding the above, some initiatives were not sufficiently backed by some of the ecologist groups ("El Soto" Ecologist Group, 1998).

The main recommendations included in the analysis the EU's water policy undertaken by WWF-Adena are focused on the need for better coordination, integration and a greater involvement of concerned non-governmental groups. The urgent measures are also present in the action plan for natural protected spaces: holistic management of the territory and an interaction of the stakeholders involved (EUROPARC, 2002).



Degradated riverbank in the Jarama River in the municipality San Sebastián de los Reyes (Madrid), Spring 2005

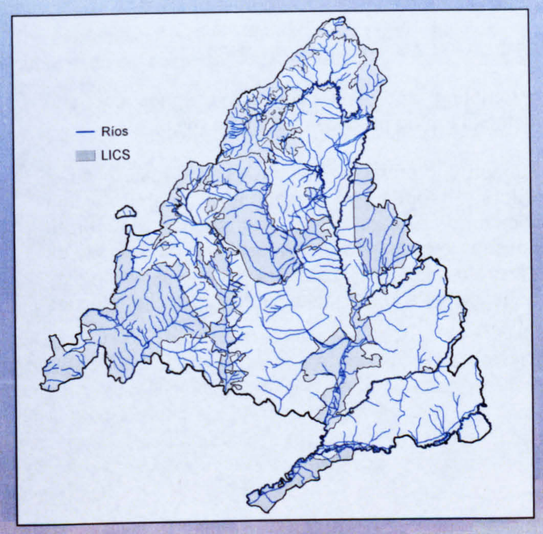
Initiatives

The proposal for a specific regional plan to restore fluvial courses would allow the natural resources guidelines to be integrated in a broader land planning context, establishing a reference framework for the region. It would also facilitate fulfilling the obligations established by international agreements such as the Ramsar Convention, the European Habitat Directives 92/43/EC, Birds 79/409/C and Framework Water Directive 2000/60/EC.

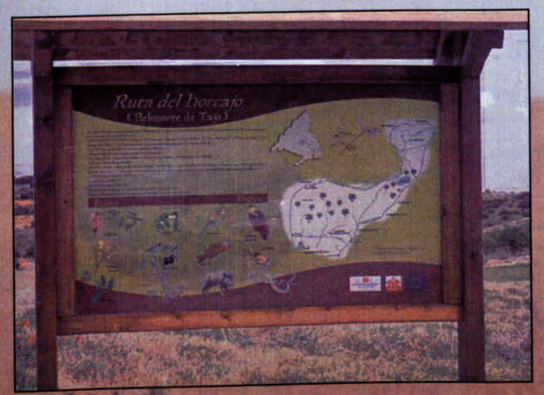
Complying with these Directives would improve the quality of water for its use in agriculture and it would also enable maintaining agricultural activity through the promotion of good farming practices. In addition, it could also involve the rehabilitation of riverbeds as ecological corridors, in line with the national strategy of conservation of Biodiversity. All these objectives,

POLICY INTERVENTION 4: RESTORATION OF RIVERBANKS

together with the creation of recreational areas with a network of paths for alternative tourism (cultural, gastronomic and natural) around the river would enhance the environmental quality and the citizens' lifestyle. This improvement would encourage population growth and consequently increased investment in the region.



SCIs and amin rivers of the region.
Source: Natura 2000 Network Technical Team, The Autonomous Community of Madrid, 1999.



Agro-touristic route the "Horcajo" in the municipality Belmonte de Tajo (Madrid)

Stakeholders and Recommendations

The specific policies recommended and the stakeholders who will take part in carrying out this initiative are as follows:

<u>At National and Regional Level</u>

Ministry of Environment

- To favour the coordination among the different institutions involved in the rehabilitation and conservation of riverbanks (Ministry of Environment, river basin Organisms, regional and local Governments).

- To favour and promote the application of the Framework Water Directive, though awareness campaigns, training and making resources available for its correct implementation. Some forums have already taken place, organised by Ecologist Groups (WWF-Adena) and the Ministry of Environment (Directorate of Water).

Ministry of Environment in coordination with the Regional Directorate of Environment and Land Planning (Department of Natural Areas, Department of Promotion and Environmental Control)

- To launch a **programme to restore fluvial courses**, which would be integrated with other innovations already under implementation, such as the CAUCE project (rehabilitation of riverbeds) and LINDE (delimitation of waterways of public domain) promoted by the Regional Directorate of Environment and Land Planning and the Ministry of Environment's Hydrographical Confederation of the Tajo river.

- Guarantee that the necessary economic, technical and human resources are provided to elaborate an updated diagnosis of the current situation of rivers and riverbanks of the Autonomous Community of Madrid. This information should be publicly available to researchers to help them in the studies carried out at different levels.

POLICY INTERVENTION 4: RESTORATION OF RIVERBANKS

At Regional and Local Level

Regional Directorate of Environment and Land Planning (Department of Natural Areas, Department of Promotion and Environmental conrol)

Regional Directorate of Economy and Technology (Department of Tourism)

Local Action groups

Ecologists groups

Municipalities

- **Recuperate** the ecological balance of degradated **riverbanks while linking the process with other environmental-friendly uses** in coordination with regional and local Governments, Local Actions groups and Tourism associations. An example of these kind of actions can be the creation of networks of paths to promote local tourism with gastronomic and cultural elements that invite visitors to consider over-night stays. The latter would provide added value to the services available in the area. These actions can be strengthened with advertising and awareness campaigns at the local and regional levels, combined with environmental education amongst the population, as happens for instance with the programme "Explora Madrid" and the Green Routes network.

- Promote and further coordination among institutions with responsibilities in the specific programme for recuperation of fluvial courses.

- Improve the present sign system on those paths that affect riverbanks and their surroundings in Madrid.

- Encourage environmental education in Madrid through local and regional campaigns.

At Local Level

Municipalities

- To provide support for the "Programme to Recuperate Fluvial Courses", promoting the conservation of these ecosystems and participating according to their responsibilities and possibilities in the restoration processes.

- To provide the local Governments with means and resources to maintain and improve the existing signs on paths along the riverbanks under their responsibility, with an aim to promoting eco-tourism in the municipality.

- To promote and support the creation of paths along the rivers in collaboration with local agents and SMEs, in order to improve the knowledge of the environment and the value of local heritage, through local touristic campaigns which include environmental education.

Associations of producers of organic food

Farmers´associations and cooperatives

Tourism associations

Small and medium sized enterprises (SMEs)

Agricultural and livestock Farmers

- Promoting and assessing good agriculture and livestock farming practices along the rivers.

- Support and promote the conservation-restoration of borders, hedges and wetlands located within agricultural estates to guarantee or recuperate landscape continuity, water quality and biodiversity as an instrument of conserving natural agents which play a beneficial role in, for instance, the control of plagues in crops.

POLICY INTERVENTION 5: INTRODUCTION OF QUALITY AGRO-ENVIRONMENTAL INFORMATION IN PLANNING AS WELL AS IMPROVING THEIR AVAILABILITY AND ACCESS

Current situation

Despite the fact that information on territorial planning exists in telematics, this information is lacking in some fields such as distribution of species in danger of extinction. Localization of fragile habitats and of areas with soil of high ecological value, defining boundaries of land of agricultural interests and of high ecological value etc. For these kinds of projects spatial information on a more detailed scale is necessary.

The availability of all this information, in a integrated way, in public and easily accessible data-bases would make it easier to draft the projects relating to planning and management of the territory on different spatial scales. At the same time, this availability of environmental information would save a lot of time and money as it would avoid duplicating economic and material tasks often created by having to do the same inventories of the physical and biotic environment several times for different projects.

This would make for more stable collaboration between research groups, management and institutions in the long run. Besides this information would improve the quality of the projects presented, which are often poor because they don't have access to detailed information for their studies. As they don't always have a sufficient budget to carry out an appropriate inventory, high value elements such as soil, species in danger, sensitive habitats, etc. are often overlooked.

On the other hand, the integration of the agro-environmental information would permit the research and application of indicators of environmental sustainability in relation to changes in land use, making it easier to follow up and to detect any changes in the environment earlier. The Spanish Observatory of Sustainability (OSE) plays a very important role in the integration of environmental information and research of indicators of sustainability at a national level. (Jiménez Herrero et al 2005).

Initiatives

The necessity to elaborate a more rigorous diagnosis leads us to improve the agro-environmental information, both in availability and in quality, for the planning and management of the territory. The main aim of this intervention is to carry out the integration and improvement of the quality of the agro-environmental information that the different Administrations involved possess, to make this more available to the public. On one hand, this would improve the physical planning on the territory and coordination between Administrations. On the other hand, this initiative would facilitate the implementation and fulfilment of international agreements such as "Agenda 21", the strategic agreement of biodiversity and the European Directive of Strategic Environmental Evaluation. Finally, the availability of this information would make the research and application of sustainability indicators in territorial planning of the Community of Madrid possible, in the same way as the Spanish Observatory of Sustainability.

Stakeholders and Recommendations

The specific policies recommended and the stakeholders who will take part in carrying out this initiative are as follows:

At Regional Level

Regional Directorate in Environment and Land Planning (Department of Planning and Urbanism, Department of Natural Areas, Department of Promotion and environmental control) in coordination with the Regional Directorate of Economy and Technology (Department of Agriculture and Rural Development)

- To create **databases available to the public that integrate the existing environmental and agricultural information on different working scales**, with exact cataloguing and zoning of the territory and its surroundings. In this way an overall vision of the ecological and agricultural value of the territory will be obtained. These databases could be used in the different areas of territorial studies: municipal and regional planning, environmental impact and projects related to the territory.

- To allocate a higher budget to create basic thematic information on the territory and a database on live organisms.

At Regional and Local Level

Regional Directorate in Environment and Land Planning, Regional Directorate in Ecnomy and Technology (Department of Agriculture and rural development) in coordination with:

Ecologists groups

Local Action groups

Experts (Professionals and Researchers)

- To establish appropriate sources to improve the accessibility of the information to the different organisms that work in the territory from local associations, research institutes, government organisms, private individuals, etc.

- Improvement and up-dating of the information on the distribution of species and habitats in danger, on an operative scale for the studies that are carried out on the territory, specially in the areas of ecological and agricultural interest.

Current Situation

In areas where agricultural use, urban use and conservation merge, conflicts sometimes arise about the territory that lead to a loss of natural and ecological values. This is often the fruit of a lack of coordination between the responsible institutions of the area and this could be avoided if the coordination was improved[3].

This improvement could be obtained through the creation of effective workshops, both within the departments and between the departments. The Regional Directorate in Environment and Land Planning, the Regional Directorate in Economy and Technology (Department of Agriculture and Rural Development and Department of Tourism) and the Municipalities (known as Town Councils) would all be involved in making these improvements.

The absence of an adequate coordination between the different administrations has generated an incoherent situation on classifying the land, the distribution of agro-environmental subsidy, the planning of protected areas and the new infrastructure networks. Besides, the regional administrations are not linked to the responsible municipal departments and thus fail to coordinate important matters.

Initiatives

One of the initiatives proposed consists in coordinating horizontal and permanent interventions on a territorial level, in agricultural, environmental and urban environments by having regular meetings in which they would draw up the overall plans of the territory. In these meetings the follow up and the evaluation of the said plans would be carried out.

The implementation of these measures would permit better coordination and coherence of the actions, a more efficient implementation of policies and a decrease in the economic and human resources necessary. Setting-up these joint meetings between the mixed committees and the workshops would create a source for the stakeholders to consult. These meetings should always be monitored by the responsible authorities.



Organic farmer and Technician from the Local Action Group "ARACOVE" in a meeting (Bodega Andres Morate, 2005)

Stakeholders and Recommendations

The specific policies recommended and the stakeholders who will take part in carrying out this initiative are as follows:

<u>At National Level</u>

Ministry of Environment (Directorate of Biodiversity)

Ministry of Agriculture, Food and Fisheries (Directorate of Rural Development and Directorate of Food)

- To encourage the creation of work groups within the territories and between the Regional Directorates, to participate in coordinating and to follow up functions and objectives.

<u>At Regional Level</u>

Regional Directorate of Environment and Land Planning (Department of Land Planning and Urbanism, Directorate of Natural areas, Directorate of Promotion and environmental Control)

Regional Directorate of Economy and Technology (Department of Agriculture and Rural Development, Directorate of Tourism)

- To **establish committees to coordinate within the territories** that would involve the representatives of the regional and local governments and the intermediary stakeholders.

- To **revive the draft of the Strategic Territorial Plan** involving all the regional directorates concerned, not forgetting the responsible departments in the Department of Agricultural and Rural Development

3. These statements were collected during the interviews to different stakeholders in the fieldwork done during the years 2003/2005 in the TiGrESS project.

POLICY INTERVENTION 6: COORDINATION OF ENVIRONMENT, AGRICULTURE AND URBAN FIELDS

who are now in the background in matters of planning as in the case of the Department of Land Planning and Urbanism.

- Also in the urbanistic planning environment to promote and encourage working together and ensure the meetings on the classification of the land as urban, non-urban and protected urban take place.

- In protected areas, to create active workshops that include managers, researchers and local groups with a view to making the meetings with the politicians in the regional government more effective.

- To **set up advisory networks to favour relations between environmental and agricultural sectors**. Supporting the local delegations as advisory organs (also known as The Chamber of Agriculture) and working in conjunction with the Farmers' trade unions, government representatives for protected areas and Local Action groups.

- To link the Tourist Promotion Plans of the region, devised by the Department of Tourism, to the agricultural and environmental aspects, involving the responsible departments. An example which already exists is the "Explore Madrid" programme, in which the departments of the Regional Directorate in Environment and Land Planning, in education and tourism, collaborate.

<u>At Regional and Local Level</u>

Ecologists groups

Farmers´trade unions

Experts (Professionals and Researchers)

Local Action Groups

Building Sector

- Participation of local agents and representatives of the large number of stakeholders involved in land planning, in agriculture, environment and in urban sectors, in mixed committees and workshops. This would facilitate the diagnosis of the land and the evaluation of the measures taken.

- To organize the committees at a regional and local level, to strengthen the participation of the local stakeholders, to coordinate the actors and stakeholders both at a regional and local level and mediate to reach an agreement on decisions taken.

<u>At Local Level</u>

Municipalities

Associations of Producers of Organic Food

Tourism associaions

Small and Medium Sized Enterprises (SMEs)

- To participate actively in setting up and making the local committees and workshops function, together with the rest of the stakeholders within the municipality and surrounding areas.

POLICY INTERVENTION 7: PROMOTION OF PUBLIC PARTICIPATION PROCESSES IN TERRITORIAL PLANNING

Current situation

The processes of public participation related to territorial planning reflect a failure to hold joint debates which leads to a decline in the efficiency of these processes. The inadequate identification of the stakeholders involved and the lack of the actor's implication in the elaboration of the necessary diagnoses, both at a local and regional level, are two important factors which affect the results of the public participation processes negatively. The period in which the participation takes place is very often reduced to a phase of allegations, once the plans have been drawn up and before they have been finally approved. The Law 2/2005 of the modification of the Land use Law of the Autonomous Community of Madrid (BOCM 87, 12/04) and the urban planning guidelines in the region resulting from the landuse Law 9/2001 /BOCM 177 17/07) which no methodology of public participation is established, is a clear example of the present situation.

Initiatives

The initiatives put forward propose the participation of the stakeholders involved in territorial planning and the elaboration and establishment of strategic territorial planning. Together with this measure, the establishment of periods of over two months for the phase of allegations is proposed. This series of initiatives is closely linked to the setting up of mixed committees and workshops between the different institutions and sectors. It would also allow for new ways of public participation in territorial planning to be established to agree on interests of the different groups involved.

A network of participative planning would be included in this initiative. This network would facilitate the implementation of the Local Agenda 21 in the municipalities, the sharing of information and experiences between the different groups involved and other international agreements that Spain has approved, for example, the Aarhus Agreement on participation in environmental themes.

Stakeholders and Recommendations

To carry out this proposal, the recommendations and the stakeholders who should be involved in putting it into practice, are as follows:

<u>At National Level</u>

Ministry of Environment (Directorate of biodiversity)

Ministry of Agriculture, Food and Fisheries (Department of Rural Development, Department of food)

- To revive the revision of the document of the National Strategy of Sustainable Developments as a integrating tool in land planning, permitting the participation of the stakeholders. It would also make it compulsory for the participative methodology of regional planning to be incorporated.

- To ensure that the international agreements are observed, such as the implementation of the Local Agenda 21and the Aarhus Agreement.

<u>At Regional Level</u>

Regional Directorate of Environment and Land Planning (Department of natural Areas, Department of Promotion and Environmental Control)

Regional Directorate of Economy and Technology (Department of Agriculture and Rural Development, Department of Tourism)

- To **incorporate participative methodology in the legislation of planning**, and later in the elaboration, implementation and follow-up of the plans and programmes of development in the region. This measure would be accompanied by an appropriate orientation for the groups involved and by an obligatory follow-up of the processes of participation.

- To set up a new process of discussion of the draft of the Strategic Territorial Plan, taking into account the different programmes of regional development and involving the different stakeholders of the region.

- To coordinate the creation of a network of regional participative planning tools to be integrated and the Local Agenda 21 to be put into practice.

- To establish an agreement on the time available for the allegations of the urban planning guidelines, without an increase in administrative paper work.

POLICY INTERVENTION 7: PROMOTION OF PUBLIC PARTICIPATION PROCESSES IN TERRITORIAL PLANNING

<u>At Regional and Local Level</u>

Ecologist groups

Building sector

- To participate in the implementation of the development and territorial plans in the different sectors of the region, besides promoting the revival of the draft of the Strategic Territorial Plan at the regional level, promoting the participative methodology.

Farmers´trade unions

Local Action groups

- To promote participative processes in the elaboration and discussion of the territorial planning programmes, both in rural development and in natural resources planning.

experts (proffesionals and researchers]

- To investigate the application of different participative methodologies in the programmes of regional development.

- To insist on the participation of the groups of experts in the elaboration of strategic plans of the different sectors and territories.

<u>At Local Level</u>

Municipalities

Associations of producers of organic food

Farmers´assotiations and cooperatives

Assotiations of Tourism

Small and Medium Sized Enterprises (SMEs)

- To encourage and propose participative methodology in the different programmes already in progress, and especially in the elaboration of the urban planning guidelines, thus favouring consensus between the different viewpoints of the stakeholders in the municipality. Likewise, to demand the reactivation of the strategic territorial guideline of Madrid.

STAKEHOLDERS AND THEIR COMPETENCES

NATIONAL GOVERNMENT

MINISTRY OF ENVIRONMENT

Directorate of Biodiversity

Their main function is to supervise the conservation of the biodiversity and promote sustainable development. By way of specific actions such as to ensure the observance of the national and international legislations related to natural conservation, the publication of atlases and red papers, the proposal of environmental indicators and so on. In the case of interventions derived from European regulations, such as Natura 2000 network, the role of the Department of Natural Conservation in the coordination of interventions with the Autonomous Regional Government responsible for these matters, is fundamental.

Directorate of Water issues

This institution is responsible for all functions related to the river basin organisms and the intercommunity basin administration. The elaboration, follow up and revision of the hydrological plan of the basin would be among its tasks. To project, build and exploit any work carried out, paid for by the organism's own funds or any others entrusted by the State, Autonomous Communities, Local Corporations or other public and private bodies are also its responsibility.

MINISTRY OF AGRICULTURE, FOOD AND FISHERIES

Directorate of Rural Development

Its main functions entail exercising responsibilities in matters of training for and fomenting new technologies in rural areas, as well as all those related to promoting associations and developing environmental activities linked to agrarian activities. These include agro-environmental measures, forestation of agrarian land and subsidies for deprived areas.

Directorate of Food

The elaboration of the basic state regulations, the development and coordination of activities related to industries and food markets are some of the more important tasks of this directorate. All of these are in cooperation with the autonomous communities. It is also responsible for the elaboration, in collaboration with the General Secretariat of Agriculture, of the proposals made by Spain to European Union.

STAKEHOLDERS AND THEIR COMPETENCES

REGIONAL GOVERNMENT IN COORDINATION WITH THE DIFFERENT DIRECTORATES

REGIONAL DIRECTORATE IN ENVIRONMENT AND LAND PLANNING

Department of Land Planning and Urbanism

Its responsibility lies in the development and follow-up of territorial planning tools. Another of its main functions is the development of an information technology programme designed to monitor regional urbanistic activities.

Department of Natural Areas

Its functions are directly focused on planning, protection, conservation and restoration of the regions' natural areas. They should cooperate and coordinate with other organisms in the management of common spaces in matters of natural resources and woodlands. Besides, they should also make decisions on the planning, management and follow-up of the protected natural spaces.

Department of Promotion and Environmental Control

Its functions are directly focused on planning, execution and follow-up of the activities related to education, training, information and environmental awareness. These are promoted with an aim to reaching sustainable development models, paying particular attention to those interventions focused on promoting socio-economic development in small towns in rural and natural areas.

REGIONAL DIRECTORATE IN ECONOMY AND TECHNOLOGY

Department of Agriculture and Rural Development

General responsibilities in the elaboration and execution of the course of action in matters related to agriculture, livestock farming, rural development and food-processing. It is also responsible for managing and coordinating development programmes in the region, that encourage the diversity and valuation of local products and development of rural areas. Other specific functions are the training and assessing in good agricultural practices, to support associations through the comarcal delegations and to promote quality control of local products.

Department of Tourism

Its responsibilities are related to the planning, management and promotion of tourist activity. This activity is coordinated with the town councils, SMEs and local associations. They must inform the administrations and institutions related to the sector of each activity.

ECOLOGIST GROUPS

These include local, regional and national groups in which all the non-governmental associations are brought together without any personal gain, with an aim to agree with the principals expressed in the Law 4/89 on the conservation of natural areas. "Friends of the Earth" and "Ecologists in Action" were among the groups consulted.



LOCAL ACTION GROUPS: RURAL OR LOCAL DEVELOPMENT GROUPS

The groups of rural development manage, coordinate and promote development programmes in the "comarcas", supporting local initiatives, besides promoting and activating the coordination between associations, town councils and responsible institutions of the regional government. They also share the tasks with the local development agents in the municipalities. These groups were set up on the initiative of the European Commission, as is the case of the "Leader and Proder" programmes.



STAKEHOLDERS AND THEIR COMPETENCES

FARMERS´ TRADE UNIONS

These are the farmers' trade unions whose main function is to represent the agricultural sector, making decisions at a national and European level. They also promote cooperatives and defend their role in political decisions. Some of the Trade Unions consulted are “Plataforma Rural” and “Coordinadora de Agricultores y Ganaderos-COAG”.



STAKEHOLDERS AND THEIR COMPETENCES

EXPERTS (PROFESSIONALS AND RESEARCHERS)

Within this group of stakeholders, all professional and researchers connected with land planning and management, natural conservation, rural development and agronomical and forestry sciences are included. These experts belong to research centres, public or private institutions, universities and consultancy firms.



STAKEHOLDERS AND THEIR COMPETENCES

BUILDING SECTOR

House and Infrastructure Builders, the main land ownership in the Autonomous Community of Madrid, are included within this group. The studios of architecture strongly linked to the elaboration of urban municipal guidelines are also included.



STAKEHOLDERS AND THEIR COMPETENCES

MUNICIPALITIES OR TOWN COUNCILS

The Local Government carries the management of the municipal resources, as its main function. It has a fundamental role in the municipal land planning because nowadays the urban municipal guidelines are being elaborated or reviewed under the current regional legislation, which is also in a process of revision. The Municipalities must be in coordination with the rest of Institutions related to this issue such as Department of Natural Areas, Department of Tourism, etc.



STAKEHOLDERS AND THEIR COMPETENCES

TOURIST ASSOCIATIONS AND SMALL AND MEDIUM SIZED ENTERPRISES (SMEs)

In this group of stakeholders, the small enterprises, who mostly invest locally, and other local tourists initiatives are included. Their businesses are related to adventure and sports, bed and breakfasts in rural areas, etc.



STAKEHOLDERS AND THEIR COMPETENCES

ASSOCIATIONS OF PRODUCERS OF ORGANIC FOOD AND SMALL AND MEDIUM SIZED ENTERPRISES (SMEs)

A wide variety of associations are incorporated in this group. They deal with anything from the quality, control and labelling of organic products, to backing alternative methods in agro-agriculture and self-sufficiency. The Organic Farming Committee of the Community of Madrid (CAECM), the Association of Organic Producers (APRECO), the San Yago Association of biodynamic Agriculture and the producers and consumers cooperatives are also included in this group.



STAKEHOLDERS AND THEIR COMPETENCES

FARMERS´ ASSOCIATIONS AND COOPERATIVES

In this group of stakeholders we include local, "comarcal", communal and regional associations dedicated to the management of public land, the production and commercialisation of farming products and their derivations. For example, the farming associations in charge of the management of the municipal pastures and the wine cooperatives, including the grape producers who transform and commercialise them, are part of this group.



STAKEHOLDERS AND THEIR COMPETENCES

AGRICULTURAL AND LIVESTOCK FARMERS

This group represents those independent farmers that do not belong to any association, but as owners, leasers and users of the land, are indispensable for the planning and management of the territory. Both conventional farmers and ecologists are included.



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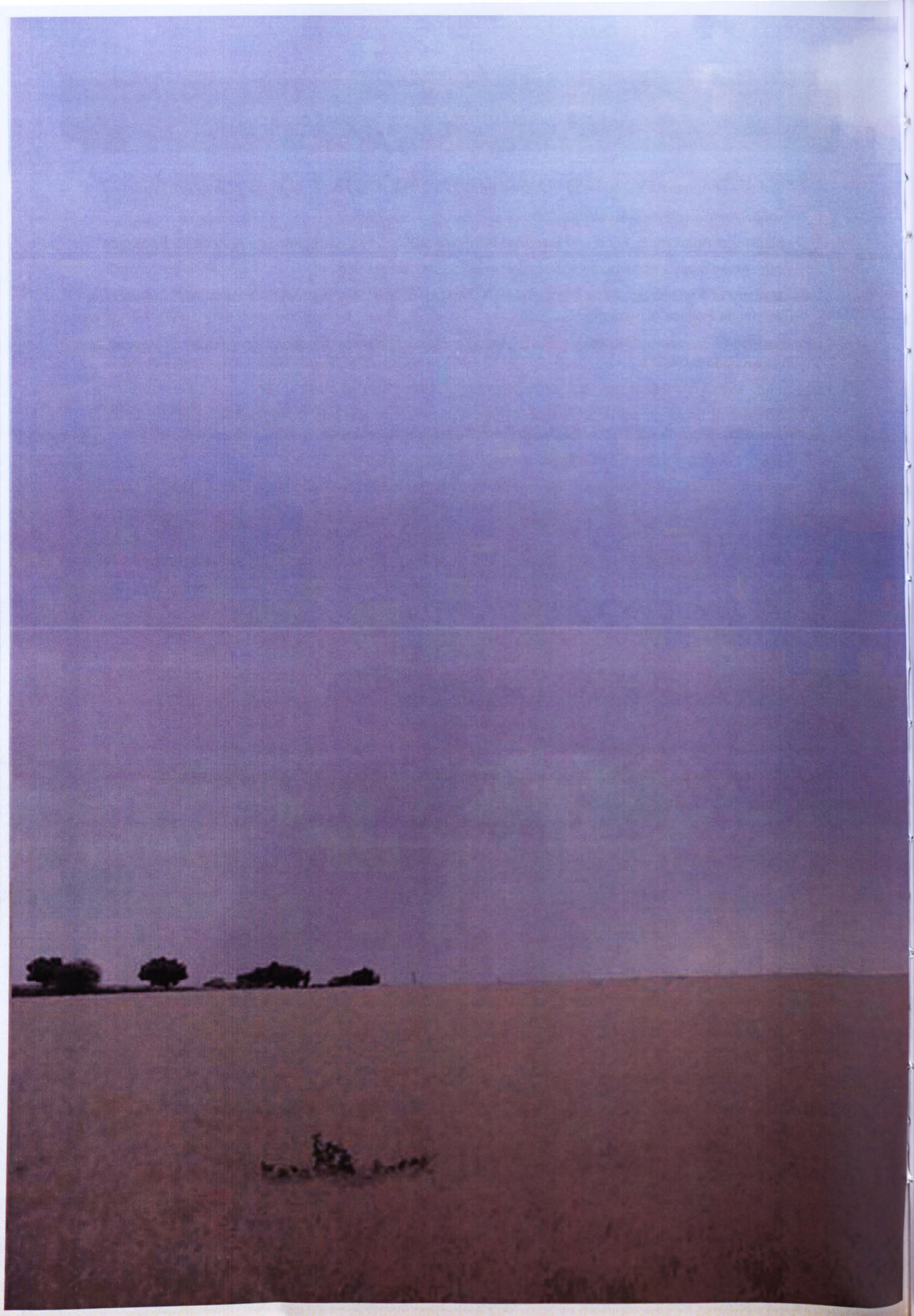
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APPENDIX 4

ISBP

SIXTH FRAMEWORK PROGRAMME
PRIORITY
NEST - Pathfinder



Contract for:

SPECIFIC TARGETED RESEARCH PROJECT

Annex I - "Description of Work"

Project acronym: **I.S.B.P**

Project full title: **Integrative Systems and the Boundary Problem**

Proposal **043199**

Related to other Contract no.: *(to be completed by Commission)*

Date of preparation of Annex I: Tuesday, 29 August 2006

Operative commencement date of contract: *(to be completed by Commission)*

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1. Project Summary

As the EU expands, our ability to integrate diverse cultures without overt 'cultural engineering' or suppressing cultural diversity will determine our success in finding peaceful solutions to problems of convergence. 'Convergence', in this sense, is the process of harmonising local administrative and political institutions with the principles of sound governance established for the Community as a whole.

Convergence invariably creates conflicts of interest on national, regional and local scales and the peaceful enlargement of the EU is probably the biggest challenge Europe has faced since the end of WWII. Investment in cultural research is clearly necessary, not least because the integrative challenges we face now will soon be dwarfed by those of economic globalisation. Any general lessons we can learn about cultural ecodynamics will obviously be of strategic significance later in the century.

Innovation involves work between epistemic communities that may bring physical, life and human scientists into contact with each other and stakeholder communities. It is hampered by clashes about whether ***boundary judgments*** - the definitions of systems and problems - are real and universal or expedient and socially constructed. ISBP will avoid extreme positions and explore ways of managing the tension between these ideas in integrative research.

At one end of the spectrum we will study issues in cultural and natural resource management to understand how negotiating new institutional and epistemic boundaries can reduce tension between stakeholder communities and promote social cohesion. At the other, we will explore the ways of characterising problems in natural science using heuristic data-mining methods to search for boundary judgments that help make problems tractable. We will study water management, asylum and immigration, environmental impact assessment and career structure in integrative research.

2. Project Objectives

- ISBP is a theoretically and methodologically challenging project that seeks to consolidate pre-existing European research capabilities by exploring the '***boundary problem***' (the negotiation of tacit or explicit system definitions that underpins a ***conceptual model***) in a range of quantitative and qualitative study-domains. We all know that different actors have different beliefs. ISBP will explore the relationship between these beliefs and the socio-political and geographical context in which that actor operates.

- It will help us to understand the processes of cultural change by investigating the concepts of ***receptivity*** and ***cultural embeddedness***, and investigate the impact of challenging new conceptual models both on society at large and within the research and policy communities. It therefore bears on situations where conflict between stakeholder communities is possible or likely.

- It will explore a new, integrative approach to cultural dynamics that enables diverse communities to interact without first engineering cultural uniformity or driving consensus. Its emphasis is on ***governance*** rather than ***government***. This is clearly relevant to the EU in the context of enlargement and globalisation.

- It will develop a new theoretical framework for understanding the relationship between culture, behaviour and environment that can be applied to ***hard*** (quantitative) and ***soft*** (qualitative) science contexts with equal facility. We take it as axiomatic that there are limits beyond which hard science provides no leverage, but where softer, qualitative methods can facilitate ***convergence***, enhance ***compliance*** and sustain social ***cohesion***.

- It will explore these concepts through a series of quantitative and qualitative case studies to determine whether the boundary problem provides a coherent intellectual framework for describing work across the boundary between social and natural systems; human and environmental science. Although our case studies are diverse, each of them bears on issues of ***sustainable developmen***t at the ***interface of culture and nature***. Our research, therefore, speaks to such major policy themes as Developing the ERA, Innovation in practice and theory, the Lisbon Strategy and EESD. However, we have put them together in a way that highlights cross-cutting problems that have not, hitherto, received the attention they merit. ISBP will explore the complex, co-dynamic relationship between culture and nature.

Background and State of Art

Growing concern about the consumption of non-renewable resources in the late 60s and early 70s fostered an interest in the role of subsidiarity. The sustainable use of non-renewable resources demanded policies tailored to local accidents of history and geography - small is often beautiful (Schumacher, 1973). Over the same period, notwithstanding the hubris and technological optimism of the day, system theorists, social scientists and humanists also came to understand that boundary judgments are value-laden.

Even an interest in abstract algebra is motivated by a value-judgment - a belief that this is worthwhile, perhaps, and that these objects are intrinsically interesting. Outside the problem-domains of pure research, however, boundary judgments are not merely value-laden, but develop ethical or even moral overtones. Competition for resources can create irreducible conflicts of interest and disputes about culturally embedded values. The war against terrorism is an extreme example, the tension between employers and trades unions a more mundane case. These disputes reduce social cohesion and frustrate attempts to negotiate consensus (Boulding, 1978; Churchman, 1979; Naess, 1989; Rittel and Webber, 1973; Vickers, 1965).

A few decades ago, concern about environmental degradation was the preserve of the lunatic fringe and 'eco-freaks'. As the boundaries of reputable science shifted to accommodate some environmentalists, public concern about sustainable development (Brundtland, 1987), global warming, the management of the water cycle and the catastrophe at Chernobyl created a growing awareness of global and trans-national commons. By the time the Maastricht treaty was signed, subsidiarity had ceased to be the concern of a few environmentalists and become a high-profile political issue. Policy makers and citizens began to accept that, though small is often beautiful, large is sometimes necessary. You cannot mount an effective response to Global Warming at the level of the Village Council. Each system is bounded to respect different spatio-temporal scales, and human actors managing them must explore different possibility spaces.

The relationship between science and society has changed over the last century as communities and institutions field their tame experts to champion their own boundary judgments. Clashes of culture and values, though invariably correlated with political and economic conflicts of interest are now commonly explored in a scientific arena through proxy arguments about scientific objectivity and self-evident common-sense. The current debate about carbon emissions and global warming is a topical example.

Although hard-liners are fighting a spirited rear-guard action, it is now widely understood that the boundaries between culture and nature or subjective metaphysics and objective science, are artefacts of political rhetoric. Applied scientists have to contend with cultural ecodynamics, a complex, co-dynamic interaction of tacit belief, human action and environmental re-action that increasingly shapes the biosphere. Many practitioners now advocate an *integrative* approach, arguing that epistemic diversity plays a role in cultural systems comparable to that of biodiversity in natural systems. Epistemic diversity is a source of adaptive potential and system resilience.

So instead of pretending that one set of boundary judgments is more 'scientific' (i.e. objective and value-neutral) than another, or forcing people into consensus by draconian regulation, policy-relevant researchers now seek a rapprochement that enables epistemic communities to co-exist peacefully and, where possible, co-operate. This new emphasis is represented in the political literature as a semantic shift from 'government' to *governance*, the latter being more integrative and less dogmatic than the former, but respecting the principle of subsidiarity.

ISBP presumes a commitment to governance in the EU. It will explore the ways communities (including scientific communities) solve the boundary problem by negotiating and modifying boundary judgments. It will also explore the problems of integrating divergent beliefs across scales without paralysing political institutions or marginalising stakeholder communities. It will mount a 'top-down' study of the ***Cultural Determinants of Governance Boundaries*** studying the way institutions regulate the stakeholder communities below and a 'bottom-up' study of ***Adaptive Potential, Social Cohesion and Integrative Research*** that explores the way regulatory norms are received. These will consider issues of equality of opportunity in three policy domains: sustainable land-use, the training and career development of graduates and the treatment of asylum seekers. These 'soft' or qualitative approaches will be complemented by 'harder', quantitative studies on automatic model parameterisation and sustainable water management that explore the way computationally complex systems, particularly computerised Decision-Support Systems (DSSs) are bounded.

This inter-disciplinary mix provides scope for exploring issues of 'hybridity' - the role, in cultural ecodynamics, of diverse perceptual models - some quantitative and fixed, others qualitative and fluid. We will be able to explore decision cultures and, in the synthetic phase of our research, the concept of a DSS as a cultural artefact (which will be explored by WP5). WP3 will also explore decision standards as artifacts and processes of organisational culture.The critical link between all these case-studies will be that each speaks to an issue of cultural and/or natural resource management in which new boundary judgments and behaviours (i.e. innovation) is a prerequisite of sustainable development and where issues of social coherence, convergence or compliance are significant. The strategic aim of our research is to develop a coherent understanding of the ways communities and individuals form boundary judgments, and the relationship between these cultural processes and the natural world.

A boundary judgment, in this context, is a statement that characterises a system. It can manifest as a formal axiom (a *line* is the shortest curve connecting two points), as an observation or inference (*the annual growth rate* is 2%) or as an appeal to a tacit consensus or common sense (arsenic is a *hazardous* substance). Philosophers have known since the later mediaeval period that every noun and adjective implies a category of objects (a *system*, if you will) and that an exhaustive effort of formal definition is impossible. In order to use language at all, we have to presume a semantic consensus that cannot be demonstrated.

Research into cultural systems could be, and often is directed towards social and aesthetic conventions, behavioural mores, artefacts and buildings (so-called 'material culture'), language, ethnicity, economic behaviour and political identity. However, ISBP will specialise - focussing on **knowledge**, which we

explore not in terms of technical 'know-how' or 'organised facts' but more generally as tacit or explicit beliefs that enable people to co-operate. ***Culture***, as we define it, is an important type of knowledge - that which refers to systems whose boundary judgments have become 'locked in', making a community unreceptive to new ways of seeing the world.

Culture is the reason we do not even contemplate certain actions - why we do not defecate on the pavement or turn up to a funeral wearing only a G-string and two tassels. Culturally embedded beliefs, like any other boundary judgments, are auto-correlated with values and personal interests - often with catastrophic consequences. When individuals act in a way that seems to repudiate those beliefs, they can challenge the values and compromise the interests of their neighbours and destroy social cohesion.

With the exception of a small minority of socio-paths, every act of violence between communities can be expressed *either* as a conflict of political and economic interests *or* as a clash of cultures. Culturally embedded boundary judgments reduce adaptive potential, converting behaviours into habits that allow others to recognise members of their own community. It also sets individuals who ignore those conventions and violate taboos 'beyond the pale' (Midgely, et al, 1998) and is often used to justify punitive action.

Thus cultural lock-in is a two-edged sword. Without it, boundary judgments would change so fast that language would quickly become obsolete and our ability to co-operate would dissolve into chaos. However, cultural lock-in is also a factor in every human conflict. Every war, every act of terrorism and every socially or environmentally unsustainable behaviour pattern is justified by appeals to culturally embedded boundary judgments. Each of our case studies will explore the way boundary judgments are formed, become locked-in or are un-locked. Some will explore the relationship between semantics and values; others will explore the way boundaries are set in the parameter-space of a mathematical model. ISBP case studies will be integrated to explore three strategic themes:

- **Subsidiarity.** Are there any generalisations to be made about the types of boundary judgments formed and the spatio-temporal scales over which individuals operate?
- **Innovation.** Every innovation hinges on a perceived opportunity or threat that changes boundary judgments and underwrites new behaviour. As the stalled Lisbon Process has shown, politicians cannot drive innovation merely by creating opportunities or issuing threats. Culturally embedded boundary judgments cannot easily be un-locked. We will monitor our case studies for evidence of changing receptivity to see whether we can generalise about the circumstances under which culturally embedded (i.e. tacit) knowledge can be made explicit so people are free to discuss; to 'think the unthinkable' and even to innovate, changing the course of history by changing boundary judgments.
- **Complex Hierarchies.** Each of the systems we investigate can be located in a hierarchical context in which a recognisable, ontologically robust category of object occupies a restricted interval of space-time. This is so of people working in a university, for example, and of nodes in a network of water pipes. Each of those objects has an intrinsic *adaptive potential* - an ability to respond in an unpredictable or flexible way. That adaptive potential is itself constrained by factors that cannot be treated as discrete, observable objects in space-time. The socio-political milieu in which the university operates and the demographic flux that determines water demand, for example, are not localised, ontologically robust objects, but distributed and manifest only in their effects on the behaviour of individuals. Innovation demands an appropriate balance between constraint and adaptive potential. This is relatively easy to understand within a simple hierarchical system, but much more demanding when interacting systems operate on disparate spatio-temporal scales. An example would be the interaction between a village leader and the representative of a multi-national company seeking to build a factory nearby. ISBP will explore the circumstances under which disparate knowledge systems can and cannot be integrated by comparing and contrasting case studies.

3. Participant List

Partic.Role*	Partic. no.	Participant name	Participant short name	Country	Date enter project**	Date exit project**
CO	1	University of Newcastle upon Tyne	unew	UK	1 (start)	36 (end)
CR	2	Cranfield University	cran	UK	1	36
CR	3	Center for Clean Technology and Environmental Policy, University of Twente	cstm-ut	NL	1	36
CR	4	Universidad Politécnica de Madrid	upm	ES	1	36
CR	5	Technical University of Bari	poliba	IT	1	36
CR	6	University of Exeter	unexe	UK	1	36
CR	7	Imperial College London	icl	UK	1	36

*CO = Coordinator

CR = Contractor

** Normally insert "month 1 (start of project)" and "month n (end of project)"

These columns are needed for possible later contract revisions caused by joining/leaving participants

4. Relevance to the Objectives of the Programme

Cultural Ecodynamics is one strand among many in a remarkable intellectual convergence that has brought humanists, natural scientists and technologists together. Human Ecology, Landscape Planning and Ecological Economics are others. In France, Bruno Latour has described these initiatives as 'technoscience' - there is a journal of that name published in the US. The Norwegian philosopher Arne Naess linked environmental science to cultural values in a movement called 'Ecosophy' or 'Deep Ecology', while the Swedish Geographer Torsten Hägerstrand developed an approach known as 'Time Geography' that links demography to environment. In the US, CS Holling's (1973) work on 'resilience' spawned an influential American approach to natural resource management called 'Adaptive Management' that takes account of human agencies and institutions, while an international community known as the 'Resilience Alliance' is co-ordinated from Sweden. There is also a community of anthropologists linked to the Santa Fe Institute for Complex Systems, while in parts of the Netherlands, this integrative approach is sometimes called 'Delta Science'. Cultural Ecodynamics is not an isolated initiative, but a differentiated variant of what can fairly be described as a ***New and Emerging Science***.

Our work on Cultural Ecodynamics is a product of the Framework Programme (See Section **B.4** below). Like all strands in this skein it is concerned with the complex, co-dynamic interaction of human behaviour with the natural world. We have made progress in the exploration of culture (embedded beliefs) as a determinant of socio-natural dynamics. This is distinctive. It is relatively easy to explore the interaction of behaviour and environment, harder to say something non-trivial about the role of culture. ISBP will consolidate and enhance this European initiative, providing a firm basis for further research in the ERA, particularly in respect of energy, environment and sustainable development and cultural resource management.

Culture is not a concrete, observable 'thing' to be transmitted, conserved or modified, but a set of embedded beliefs that make us more or less receptive to new ideas and technologies - more or less open to change. The study of culture, as any anthropologist can testify, is always the study of continuity *and* change. Understanding the role of culturally embedded boundary judgments as facilitators of or obstacle to innovation will bear on issues ranging from poverty, social exclusion, criminality, terrorism, warfare, immigration and terrorism.

Our research involves a strong transdisciplinary component and demands a rich mixture of practical case-study and theoretical work. The latter is essential as a way of developing more precise and useful ways of using words (including the word 'culture' itself) rather than focussing on figures and data. By facilitating an understanding of the interaction between culture and nature, we aim to promote a cross-disciplinary approach to policy-relevant research at the interface of culture and nature.

ISBP will not only be an inter-disciplinary project - including both qualitative and quantitative case studies - its approach is integrative - treating epistemic diversity as a cultural resource. It therefore fits theme NEST-**2005-Path-CUL** perfectly. Additionally, work on cultural aspects of decision-making will contribute towards designing better (more appropriate, more useful) tools to support policy and management organisations involved in the implementation of European legislation, whilst work on automatic parameterisation of computer models will advance our methods for tackling complexity. In doing so, the project will address NEST-2005-Path-COM. Finally, our work on qualitative and political systems will characterise the social and political factors conducive to sustainable development. These factors cannot be measured directly. In this respect our proposal speaks to the theme NEST-2005-Path-IMP. ISBP is a risky project, our strategic aims are ambitious - involving a level of integration between disciplines and epistemic communities that has not been attempted before and committing us to developing a new theoretical framework for integrative research. The project has been designed to produce a stream of auditable deliverables from workpackages and protect the interests of Early Stage Researchers. Our more ambitious aims can be seen as the 'icing on the cake'.

5. Potential Impact

- **Contribution to Standards**

There are no internationally approved standards for integrative, policy-relevant research. There are, however, publications dealing with ethical, methodological and political issues, many of which are not well known outside the Integrative Research Community. We cite the following as examples: Beer, 1979; Checkland, 1993; Churchman, 1979; Flood and Jackson, 1991; Gibbons *et al*, 1994; Rosenhead and Mingers, 2001; Vickers, 1965; Winder 2005d). Additionally there is a valuable EURAB report (EURAB, 2005).

Access to these ideas has been complicated by semantic slippage and by the career structure established for contract-funded policy-relevant scientists. Young graduates entering this field have a very short professional life-expectancy. Many contractors quit long before they have had time to communicate effectively with the rising generation. Each generation of early stage researchers wastes time exploring the same well-trodden dead-ends as the one before. The boundary judgments that define epistemic communities are made because they are genuinely useful. You cannot improve compliance by inventing a crazy meta-discipline - forcing anthropologists to think like physicists. Neither can you predict the strain on a steel joist by brainstorming. Our report on career and disciplinary structures in the ERA (WP4) will contribute to the development of standards in the management and regulation of integrative research.

Disciplinary standards for evidence and reliability of method do not necessarily apply consistently or coherently across disciplinary boundaries, potentially making integrative research output assessment difficult for interested policy and management organisations. However, the points of conflict and mis-understanding between researchers and policy organisations have not been mapped out clearly with the consequence that integrative research output can remain relatively inaccessible to potential users. The WP3 comparative report on 'decision culture' within policy organisations will detail informal and formal aspects of due process and acceptable evidence within the European water governance system. In doing so the report will contribute to understanding variation in standards for process and evidence within water governance, and to the development of standards for reporting and transferring integrative research output.

- **Contribution to Policy Development**

In exploring the relationship between boundary judgments, innovation and knowledge integration, ISBP will address three strategic issues - the **'Three Cs'**, if you will. These are: Compliance (between local practices and EU targets), Convergence (the process of achieving compliance in new member states and strategically significant regions) and Cohesion (the principle of maintaining a peaceful, tolerant society in the face of manifest epistemic diversity). Not only is this consistent with the aims and objectives of DG-Research, the ability to achieve this level of integration is an unexpected by-product of earlier FP research. (See **B.4** below).

The way a person bounds a problem-domain is auto-correlated with value judgments, many of them culturally embedded. These, in turn, are conditioned by the spatio-temporal scale on which that person is operating and shaped by local accidents of history and geography. This is so of ordinary citizens, policy makers and scientists alike. For example, a research team on an arid plain that bounds 'the problem' in terms of aquifer salinisation is more likely to consider trans-catchment water transfer and artificial recharge than one that confronts 'the problem' of subsidies that encourage farmers to irrigate in arid regions, salinising aquifers.

Not only do different scientists have different values, those values leave them culturally aligned with different stakeholder communities and predisposed to act in ways that exclude or deny the legitimacy of alternative models. It also creates problems of 'cross-compliance', as policy interventions on one scale frustrate compliance on another. Reconciling the CAP to the interests of farmers and sustainability is a well-documented example among many. Even the definition of research communities and policy in respect of education and innovation can have such effects. The effects of these interventions on social

cohesion and cross-compliance are an unintended artefact of spatio-temporal and cultural incongruence. Trans-sectorial responses tailor-made to local accidents of history and geography cannot be managed at supra-national level, but they can be undertaken by local and regional agencies. This is the origin of the widespread tension between national, supra-national and regional government and the ultimate justification of the principle of subsidiarity.

- **Risk Assessment and Related Communication Strategy**

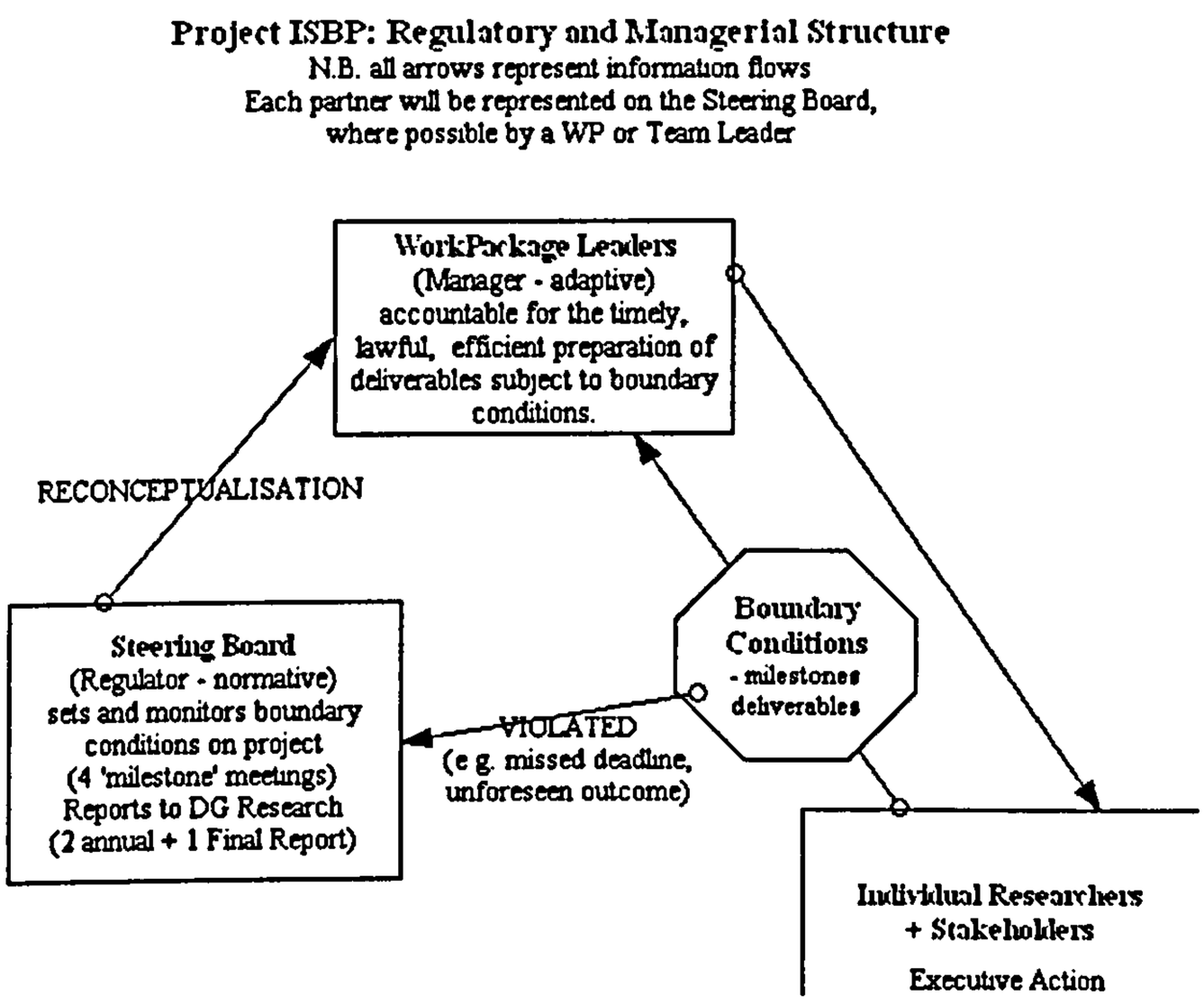
ISBP, in addition to undertaking a series of case studies, has a targeted dissemination strategy. Many of our deliverables are targeted at definite stakeholder communities and a number of targeted stakeholder meetings are also planned (see individual Workpackage descriptions). WP1 also contains a resource budget for preparing a monograph report and for the development of a targeted dissemination strategy based on the synergy established between the other WPs. As the work proceeds, WP1 will monitor progress and consider the possibility of further dissemination activities (possibly through SSAs or Co-ordination Actions) and of more conventional research initiatives under the mainstream themes of FP7. We intend and expect this to be a long-term initiative and see ISBP as an exercise in foundation building.

Like all PATHFINDER projects, ISBP carries a measure of risk. Some of these have already been outlined, together with resourcing strategise to deal with them in section **B.4** (page 11). Given the nature of the call, we consider the challenge of integrating across epistemic boundaries, trying to develop a new theoretical and managerial framework for integrative research and disseminating the results as widely as possible constitute a sufficient challenge to justify funding under the call. However, the career and professional development of early stage researchers is paramount. Our workpackages will therefore run thematically and will be managed by experienced specialists in a relevant study domain. Deliverables are secure and auditable, so career and professional development of early stage researchers will not be compromised.

However, ISBP has been designed to innovate and we will be disappointed if it fails to do so. The key to mobilising the project's resources effectively is to develop a managerial strategy that fosters a 'no-blame' environment. Success within workpackages is measured in terms of auditable deliverables and milestones. Accordingly, the project will run on a model of delegation developed to facilitate innovation while ensuring compliance (Winder 2005c). See Section 6 below

6. Management, Exploitation and Dissemination

- **Project Management**



We distinguish project *regulation*, from project *management*. Regulation is intended to be normative - firm enough to satisfy legal and contractual obligations, but light enough to provide managerial 'wriggle-room'. An over-regulated project is unlikely to innovate. An under-regulated project usually lacks coherence and direction. Regulators act in respect of strategic norms, managers respond tactically to threats or opportunities. Balance is the key to sustained innovation.

ISBP will be regulated by a Steering Board of representatives from each contracting institution, which will delegate one voting member to the Board (usually the WP or team leader). The Project Officer appointed by DG Research will be invited to attend Board Meetings to represent the Commission's interests. That board will provide the direction, coherence and continuity needed for effective research, but will not manage the day-to-day business of ISBP. Its principal role will be to monitor progress in respect of the consortium's obligations to the Commission and to deliver on that contract.

The Steering Board will delegate managerial responsibility to WP Leaders who, in turn, will delegate to individual researchers. In this way we will ensure that ISBP meets its obligations under the contract and EU law while maximising the scope for innovation. Our aim will be to push executive responsibility and accountability as far down the project's administrative hierarchy as possible

The Steering Board will set 'boundary conditions' on executive action. While these indicators of compliance and quality are respected, managers are free to respond expediently. If, however, boundary conditions are violated or emergent ethical issues arise, the Board must be informed and invited to revise targets and re-evaluate the project.

Boundary conditions on ISBP will be expressed in terms of designated deliverables and milestones, the terms and conditions of the General Contract, National and European law. In practice, this will create two possible levels of response to a contingency. If it seems likely that a deliverable will be delayed or a milestone will not be reached at the designated time, the WP leader is encouraged to communicate this to the PI *before* the deadline is reached. PI and WP leader can then discuss tactical responses at a *managerial* level - consulting other steering board members only if required.

However, failure to attend a milestone, provide a deliverable on time or respect the terms of the contract, National or EU law would violate boundary conditions, requiring a formal re-evaluation of the Project's *modus operandi*. This would then become a *regulatory* issue to be discussed at the next Steering Board Meeting (there are four scheduled over three years) or, in an emergency, through extraordinary consultation. Regulatory action is usually straightforward - perhaps merely re-scheduling activities, but the board must be consulted if a deadline is missed.

- **Disseminating Knowledge**

Our dissemination strategy includes the preparation of scientific reports and publications, however, the European value-Added component of this project requires us to communicate effectively with policy makers and non academic stakeholders. Recent statements about the importance of scientific communication by Commissioner Potočnik (Cordis Focus **261**) and the scaled-down Lisbon Strategy have produced a new sense of optimism in the FP. The enlargement of the EU and increased focus on Global and Trans-National Commons chimes well with conclusions drawn by the TiGrESS consortium that one way of strengthening the ERA would be to shift resources to integrative problem-domains where subsidiarity demands a unified approach. Vertical communication in complex hierarchies is frustrated by culturally embedded boundary judgments. More research is needed here.

The management of vertical information flow between policy makers and scientists will be a key focus under FP7, as the recently launched SINAPSE initiative (Scientific INformAtion for Policy Support in Europe) amply demonstrates. We are considering the possibility of joint ventures with SINAPSE, possibly through the medium of an SSA directed towards the needs of Converging Regions, and areas qualifying for Structural Fund support in respect of technical RTD. Communication between scientists and policy makers would evidently be a key plank of this strategy.

- We will also explore the potential for using Wp5 deliverables to inform public debate and policy making. The expansion of the scope of Integrated Assessment Modelling – under the coordination of the UN/ECE Convention on Long Range Transboundary Air Pollution (CLRTAP) [UNECE 1979, 1999] – has given rise to a multitude of modelling and assessment issues relating to spatial and temporal scales, the inter-relationships between different processes, effects and human responses, and increasing complexity of the science which needs to be communicated to policy audiences. Additional models, greater volumes of data, increased spatial resolution (50km), a high degree of inter-relatedness between different policy issues at local, national and international scales, and the propagation of uncertainties in interpretation of results all demand enhanced science-policy interaction [ASTA 2005; Oxley & ApSimon (2006)].

- **Raising Public Participation and awareness**

WPs 2, 3 and 4 each involve a well-defined stakeholder community and stakeholder engagement programme. We have a range of booklets and stakeholder meetings built in to WP specifications. ISBP will have an active web presence and WP1 will oversee the preparation of a monograph of potential interest to early stage researchers and stakeholder groups. We are also committed to preparing a series of conference papers that will enable researchers to reach a wider audience. For details, see workpackage specifications below.

7. Workplan for the Project

- **General Description and milestones**

ISBP has a very simple project structure with three key milestones: the start-up meeting and two plenary meetings timed to facilitate the mid-term and final reports.

- **Workplanning & Timetable**

ISBPs workpackage structure has been designed to ensure that early stage researchers spend most of their time working with other members of their own, or a closely related epistemic community. This is to minimise the risk to their own careers in what must inevitably be seen as a high-gain, high-risk project. In each case experienced researchers will supervise their work and work with them to assure a satisfactory strategy for Career and Professional Development. Knowledge integration will take place at scheduled Milestone events timed to coincide with one of four plenary consortium meetings (to keep T+S costs down) and in the course of fieldwork.

Prior research has shown that success in these milestone meetings can be facilitated by providing a mix of formal meetings aimed at facilitating a definite outcome (a joint report or knowledge transfer) and informal social interaction. Trust is a prerequisite of innovation across epistemic boundaries. WP1 will work with the other WP leaders to facilitate these milestones and help develop an effective dissemination strategy.

Although we expect informal links and professional relationships to develop between WP groups, formal linkages will be timed to correspond to one of the milestoner meetings. Each of these milestones has been scheduled to predate a number of deliverables or contractual obligations (reports). WP teams are expected to arrive at those meetings with the reports and deliverables ready in provisional form, to use the meetings to shape and augment them and then to deliver the revised versions to WP1 for dissemination and exploitation (see embedded figure below).

In the 'harder' case studies concrete deliverables can be specified, audited and signed off. However, the softer case studies are all directed towards an effort of re-conceptualisation. Dissemination, then, is a key plank of our research strategy. We have, wherever possible, indicated a target audience for each of our reports so you can establish that these are part of a coherent knowledge-transfer strategy.

A chart summarising deliverables and milestones follows:

I.S.B.P. Summary of Project Deliverables & Milestones

(Deliverable numbers correspond to WP descriptions; milestones are shaded)

WORKPACKAGE	YEAR 1												YEAR 2												YEAR 3											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
WP1 Project Regulation & Management												1.1 1.2												1.3 1.4												1.5 1.6 1.7
WP2 Cultural Determinants of Governence Boundaries			2.1								2.2								2.3					2.4			2.5			2.6						2.7
WP3 Decision culture in European water governance										3.1							3.2																			3.3 3.4 3.5
WP4 Adaptive Potential, Socoial Cohesion & Integrative Research									4.11	4.6		4.1									4.13			4.2 4.3 4.7 4.14				4.8		4.9 4.15				4.4		4.5 4.10 4.16 4.17 4.18
WP5 Ontological boundaries & automatic parameterization										5.1	5.2								5.3 5.4			5.6		5.5							5.7 5.8						5.9 5.10

- Workpackage List

Work-package No[1]	Workpackage title	Lead contractor No[2]	Person-months[3]	Start month[4]	End month[5]	Deliv-erable No[6]
1	**Project Management and Regulation**	1	14	1	36	1.1 - 1.7
2	**Cultural Determinants of Governance Boundaries**	3	40	1	36	2.1 - 2.7
3	**Decision culture in European Water Governance**	2	46	1	36	3.1 - 3.4
4	**Adaptive Potential, Social Cohesion and Integrative Research**	1	169	1	36	4.1 - 4.18
5	**Ontological boundaries & Automatic Parameterisation**	6	114	1	36	5.1-5.10
	TOTAL		383			

[1] Workpackage number: WP 1 – WP n.
[2] Number of the contractor leading the work in this workpackage.
[3] The total number of person-months allocated to each workpackage.
[4] Relative start date for the work in the specific workpackages, month 0 marking the start of the project, and all other start dates being relative to this start date.
[5] Relative end date, month 0 marking the start of the project, and all ends dates being relative to this start date.
[6] Deliverable number: Number for the deliverable(s)/result(s) mentioned in the workpackage: D1 - Dn.

- **Deliverables list**

Del. no.[7]	Deliverable name	WP no.	Lead particip-ant	Estimated person-months	Nature[8]	Dissemination level[9]	Delivery date[10] (project month)
1.1	Mid-Term Scientific Report	1	1		rep	pu	
1.2	Mid-Term Management Report	1	1		rep	co	
1.3	Final Scientific Report	1	1		rep	pu	
1.4	Monograph on ISBP	1	1		rep	pu	
1.5	Final Management Report	1	1		rep	co	36
2.1	Report on the convergence mechanisms for policy change in the field of tourism and local sustainability in the Netherlands.	2	3	13	rep	pu	11
2.2	Report on the convergence mechanisms for policy change in the field of floodplain restoration and spatial planning.	2	3	13	rep	pu	19
2.3	Stakeholder Consultation Meeting (Date to be decided; nominally Month 24)	2	3	1	o	pu	24
2.4	Report on the convergence mechanisms for policy change in the field of water resource protection and water supply, in the Netherlands.	2	3	13	rep	pu	27
2.5	Contribution to Technology	2	3	<1	o	co	36

[7] Deliverable numbers in order of delivery dates: D1 – Dn

[8] Please indicate the nature of the deliverable using one of the following codes:

R = Report
P = Prototype
D = Demonstrator
O = Other

[9] Please indicate the dissemination level using one of the following codes:

PU = Public
PP = Restricted to other programme participants (including the Commission Services).
RE = Restricted to a group specified by the consortium (including the Commission Services).
CO = Confidential, only for members of the consortium (including the Commission Services).

[10] Month in which the deliverables will be available. Month 1 marking the start of the project, and all delivery dates being relative to this start date.

	Implementation Plan (TIP) a memo delivered to WP1						
3.1	Review of receptivity and decision-making models and theories	3	2	10	rep	pu	10
3.2	Report on decision culture research method	3	2	14	rep	pu	18
3.3	Report on the comparative influence of decision culture on WFD implementation	3	2	17	rep	pu	36
3.4	Report relating discourse and decision culture-based approaches to understanding WFD implementation – to be completed in collaboration with WP2	3	2	3	rep	pu	36
3.5	Contribution to Technology Implementation Plan (TIP) a memo delivered to WP1	3	2	<1	o	co	36
4.1	Review of existing structural and administrative differences between France, Germany and the UK	4	1		rep	pu	12
4.2	Mapping of boundary judgements of the three stakeholder groups	4	1		rep	co	24
4.3	D4.3: Paper for international conference	4	1		o	pu	?24
4.4	Monograph report which will be sent to UKGRAD, Research Councils UK, UK HERD, EURAB, the German Trade Union and the Hans Böckler Stiftung	4	1		rep	pu	35
4.5	Contribution to Technology Implementation Plan (TIP) - a memo delivered to WP1	4	1		o	co	36
4.6	Paper on immigration policy	4	1		rep	pu	10
4.7	Methodological working paper	4	1		rep	pu	24

4.8	Working paper on results	4	1		rep	pu	28
4.9	Final Report to WP1 for co-ordination	4	1		rep	pu	30
4.10	Contribution to Technology Implementation Plan (TIP) a memo delivered to WP1	4	1		o	co	36
4.11	Report on research framework, data sources and methodology	4	4		rep	pu	9
4.12	Scientific Report on the value of farming areas on Environmental Impact Assessment studies and statements	4	4		rep	pu	15
4.13	Report on characterization of stakeholders and networks	4	4		rep	pu	21
4.14	Scientific Report on land use conflicts	4	4		rep	pu	24
4.15	Report on the convergence mechanisms for policy change in sustainable land planning	4	4		rep	pu	30
4.16	Report on stakeholders' map and policy implications	4	4		rep	pu	36
4.17	Dissemination Report on relevant results addressed to the key stakeholders involved in the land planning process in both regions: Environmental, Agricultural and Regional Planning Directorates, the UPM and UAB, Universities researching in this specific topic, Local Action Groups (two in Barcelona, three in Madrid), Plataforma Rural, UCAM, Parc Agraris Xarxa as farmer trade unions and associations, ADENA, Ecologistas en Accion and local groups as environmentalist NGOS, FEM and FEPEM as	4	4		rep	pu	36

	national groups of towns and villages & municipalities						
4.18	Contribution to Technology Implementation Plan (TIP) a memo delivered to WP1	4	4		o	co	36
5.1	formal specification of SSDIM framework and software prototype and dynamic air pollution model.	5	7	5	o	re	9-10
5.2	first year report delivered to WP1	5	7	1	rep	pu	11
5.3	Adaptive CA and automatic parameterisation algorithms.	5	7	12	o	re	18
5.4	Local Air Pollution Model and Wastewater Infrastructure Model integrated in SSDIM	5	6		o	re	18
5.5	Housing development and landuse model and Catchment watercourse Model integrated in SSDIM	5	6		o	pu	24
5.6	Final working report to WP1 for co-ordination. This includes two reports on case studies for different component models and four scientific publications submitted for publication.	5	7	2	rep	pu	30
5.7	Integrated SSDIM for air pollution and water pollution (Month 30)	5	7	8	rep	pu	30
5.8	Contribution to Technology Implementation Plan (TIP) - a memo delivered to WP1	5	7	3	o	co	36
5.9	D5.10: limited domain version of integrated SSDIM for study area (Month 36)	5	7	1	0	pu	36
			TOTAL				

- **Work package descriptions:**

Decision culture in European water governance

Work package number	1	**Start date or starting event:**			Mont h 1	
Activity Type[11]	Management					
Participant id	UNEW	CRAN	CSTM-UT	UPM		
Person-months per participant:	9	2	1	2		

Objectives

To provide tactical support to WP leaders and individual researchers, thereby facilitating innovation (where possible) and enhancing European Value-Added.

To ensure the effective dissemination and exploitation of results and, where necessary, ensure the consortium is represented at conferences or meetings in the ERA.

To develop an effective 'Technology Implementation Plan' (TIP) and facilitate the exploitation of results.

To implement and maintain the regulatory / managerial structures described in Section B.5 above and facilitate project Milestones, particularly (but not exclusively) the start-up meeting and AGMs.

To co-ordinate all technical and scientific reports to the Commission in respect of this project and work with WP managers, assure the quality of research deliverables.

To co-ordinate managerial reports and maintain links with DG Research and external stakeholders.

To facilitate institutional and individual development. Early stage researchers and contract staff are crucial to the success of this project and the future of the ERA. We will pay particular attention to career and professional development and work to ensure that both consortium and individual contractors benefit materially from their engagement in this project. This exercise will be co-ordinated as part of the project's 'Technology Implementation Plan' (TIP) which will also decide how the results of computer modelling studies will be exploited and negotiate a dissemination strategy for the substantive results of the other WPs. Each WP is required to submit at least one memo describing achievements to date and future plans to WP1 in month 36

To produce a monograph on integrative systems and the boundary problem aimed at policy makers, practitioners, NGOs and stakeholder groups interested in the management of cultural and natural resources. This monograph to make a substantial contribution both to the theory and practice of integrative research.

[11] For STREPs/STIPs each WP must relate to one (and only one) of the following three possible Activity Types: RTD/Innovation activities, Demonstration activities, Management activities.

Description of work

ISBP will not be able to innovate if it cannot communicate with external stakeholder communities. Our strategic success, then, will be determined by our ability to incorporate the results of ISBP research into an effective dissemination strategy. We have budgeted dissemination (including press releases) and the preparation of the monograph, D1.6. (see **Annexe 2).** Additionally, WP1 will help with targeted dissemination at WP level through conference presentations, publications and stakeholder meetings. ISBP will be anFP6 project, but will co-exist with FP7. The information networks for knowledge transfer under FP7 are being formalised right now. We will maintain a 'watching brief' on these developments and tailor our response to the opportunities that emerge from them.

The PI will convene a Steering Board to capitalise on developments within the project, facilitate innovation, regulate the project, manage IPR and represent institutional interests, particularly in respect of 'joint and several liability'. The Board will consist of one voting member from each partner institution and a representative of DG Research. Other members of the research team and representatives of stakeholder groups may be invited to join the board in an advisory capacity, at the discretion of the Board. The Board will hold four Ordinary Meetings to coincide with Plenary Meetings of the whole consortium (Milestones 1 to 4) below.

WP1 will also be responsible for assisting with synthesis, dissemination and knowledge transfer, *within* the project. Much of this work will focus on the integration of the softer, qualitative studies (WP2 and WP4) with the harder, quantitative studies. In this context, WP3 on decision culture in water governance will also play a pivotal role. It links directly to WP2's work on floodplain management and will provide a series of resonances and exemplars that WP2 and WP4 can exploit. The work of synthesis will be undertaken through a series of milestone meetings organised 'back-to-back' with the four plenary meetings of the whole consortium. The start-up meeting and AGMs will be two-day events. Typically, one day will be given to project management and co-ordination; the other to synthesis, dissemination and knowledge transfer through a series of informal 'break-outs' and facilitated bi- and tri-lateral meetings between WPs.

The delegation structure of the whole project will be formalised at the first Board meeting. Board members who are also workpackage leaders will be encouraged to maintain a clear distinction between their normative, regulatory roles and their adaptive, managerial responsibilities. Our strategic aim is to protect the interests of the consortium and its clients (including DG Research) while delegating responsibility and accountability to individual researchers and task leaders.

Between Board Meetings the PI will liase with WP leaders to provide logistical support and advice and keep the Board apprised of insurmountable difficulties, where necessary facilitating links and milestone events between WPs and, on occasions, with stakeholder groups. All reports and deliverables to the EU will be copied to or, in the case of annual reports, co-ordinated by WP1, which will also develop a web presence and accept responsibility for dissemination and the communication of results.

It is expected that each partner institution will have its own procedures in place for professional development and its own equal opportunities policy. However, WP1 will provide advice and guidance to any researcher planning a personal exit-strategy, for example by guiding them towards funding and professional development opportunities and helping them develop spin-off initiatives.

In practice, WP1 activities fall into two categories. Fixed activities revolve around statutory reporting, milestones and deliverables - they can be budgeted with some confidence. Expedient activities, however, demand a responsive mode. WP1 seeks to smooth stochastic noise out of the project by budgeting for expedient activities across WPs - carrying a small contingency budget to respond to the threats and opportunities every integrative STREP throws up from time to time - particularly in Years 2 and 3. We envisage that most of the managerial effort will be in year 3.

Staff from Cranfield (2 months), CST-UT (1 month) and UPM (2 months) will assist the PI in this work.

Deliverables

D1.1: First Scientific Report (Month 18)

D1.2: First Year Management Report (Month 18)

D1.3: Final Scientific Report (Due for submission within three months of Project end date; i.e. Month 36)

D1.4: Monograph Report on Integrative Systems and the Boundary Problem (Edited Volume, Month 36)

D1.5: Final Management Report and TIP (within three months of Project end date; i.e. Month 36)

Milestones[12] and expected result

Start-Up meeting (Month 1)

First Plenary Meeting to co-ordinate Mid-Term Report (Month 15)

Second Plenary Meeting to co-ordinate Final Report (Month 30).

Our Completed Project, in addition to the completed deliverables listed in the workpackages below, will contribute substantially to understanding in the field of knowledge integration, innovation, integrative research management, receptivity and knowledge transmission. Its policy-relevance has already been established (see B.73 above)

We will direct our attention towards policy in respect of cultural and natural resource management, particularly in respect of the 'Three Cs' - Convergence, Cohesion and Compliance.

We envisage that our work will contribute materially to the aims and objectives of DG-RTD by helping shift its focus from direct cost-benefits to externalities. Although the stalled Lisbon Process suggests that driving direct growth by investing in RTD is not practicable, we will explore the theory that research of this type can enhance compliance, reduce the costs (and conflicts) of convergence and help maintain cohesion in an expanding Europe.

[12] Milestones are control points at which decisions are needed; for example concerning which of several technologies will be adopted as the basis for the next phase of the project.

Cultural Determinants of Governance Boundaries

Work package number	2	Start date or starting event:	Month 1
Activity Type[13]	RTD		
Participant id	CSTM-UT		
Person-months per participant:	40		

Objectives

This work package will pursue theoretical and empirical work in order to underpin the role of policy brokers as innovation oriented mechanisms, in generating convergence between advocacy coalitions and policy change.

Our analytical framework is based on Sabatier and Jenkins-Smith (1993), Dryzek (1997), and Kuks and Bressers (2001, 2003). We assume that advocacy coalitions are formed around a set of key values, interests, core-beliefs, policy beliefs and perceptions, underlined by available information on the problems, choices, and options debated. They form the cultural determinants based on which discourses are built. We also assume that cultural determinants have a certain degree of flexibility, and want to explore the factors and circumstances that can open up and harness this flexibility. In order to facilitate the convergence of coalitions, policy brokers stimulate changes at the level of cultural determinants so as to enable a minimum level of agreement between the opposing discourses. The investigation of the types of cultural determinants underlying discourses and their flexibility should therefore include case studies that offer variation in terms of the discourse-types that are clashing. This way we will generate lessons in terms of policy brokers and their role in change to innovation. In this work-package the analytical framework will be further elaborated and made operational. We distinguish among three cases.

The ***first case*** is on the sustainable development in the tourism and recreation sector in the Netherlands, focusing on the clash between the market-orientation, and the people orientation coalition. It is expected that Netherlands will have to accommodate much higher volumes of tourists in coming decades, while tourism and recreation already have some significant negative environmental and local-social impacts.

The questions we will address include:

- What are actually the negative impacts of tourism - now and in the future - and what is sustainable tourism: how should this be designed and conceptualized?
- How to avoid that the growth of the economic importance of tourism in the Netherlands negatively affects local sustainability? Do we need a national level policy? If yes, then what aspects should be nationally regulated and what should be better left at local level?
- Do we need the reshuffling of the entire national governance structure surrounding tourism – in terms of the scale of the governance structure, actors and responsibilities, distribution of resources?

[13] For STREPs/STIPs each WP must relate to one (and only one) of the following three possible Activity Types: RTD/Innovation activities, Demonstration activities, Management activities.

The *second case* is on floodplain restoration versus spatial planning. The policy community involved in floodplain restoration is focusing on space for water (room for the river) and claiming it should be a guiding principle in spatial planning, while the spatial planning community itself considers it as just one of the claims on space, advocating that spatial planning is a process of general democracy and not functional democracy. In the Netherlands this is an ongoing clash.

The *third case* is on water supply (market orientation) versus water resource protection (expert oriented). In the Netherlands there are numerous examples of such clashes (institutional rivalry) in which the water suppliers want to produce drinking water out of the cleanest groundwater resources (which is less expensive for them than using surface water as source), although this affects ecosystems which are vulnerable to water depletion. In the Netherlands water resource protection is in the hands of water boards, while water supply is in the hands of water supply companies.

All case studies will be focus on the Netherlands, where the institute has good contacts across a very wide range of stakeholders, and an already very good understanding of the governance structures in the tourism and water management sectors.

After completion of the three case studies we will draw lessons in terms of convergence mechanisms and the way they work. Late in Year 2 we will explore potential synergies between the case study on tourism in this WP and work on sustainable land-use management in Spain (WP4)

In the final phase of the work package will be in cooperation with the UK-team of WP3 for a *fourth case study* on the implementation of the European Water Framework Directive through. Through this last case we want to identify the discourses and related advocacy coalitions in the local implementation of the EU-WFD. We also want to develop innovative work in terms of underpinning convergence mechanisms that could help to solve conflicts between the three distinguished advocacy coalitions and their discourses, facilitating this way the implementation of the directive.

These consultations will inform our dissemination strategy and technology implementation plan (TIP). See Milestones list below. At some stage in the research process (nominally Month 24, though we expect to revise this date) we will organize a stakeholder consultation meeting in respect of one or more of the three case studies described above. The precise format of that consultation will be determined by that consultation process.

The matrix below shows the distribution of the three discourses across the three case studies.

	Expert oriented discourse	Market oriented discourse	People oriented discourse
1. Tourism and local sustainability		X	X
2. Floodplain restoration and spatial planning	X		X
3. Water resource protection and water supply	X	X	

Description of work

The work package will start with a further elaboration of the analytical framework, for which three months will be allocated. Then the following analytical steps will be taken to answer the central research question of the work package for the first three case studies – tourism and local sustainability; floodplain restoration and spatial planning; water resource protection and water supply:

a) Mapping the stakeholders belonging to each discourse type, and underpinning their argumentation lines and the cultural determinants of clashing arguments (values, beliefs, perceptions, and information underlying this)

b) Mapping the policy brokers their dynamics in terms of how are they engaged in and disengaged from the interaction between the two coalitions;

c) Underpinning what is the role of policy brokers in the convergence between coalitions and their outcomes. Here the outcomes are considered to be the changes occurring for each of the five elements of governance structures. What are the features of a successful broker successful? How does it impact on the cultural determinants of the two coalitions? What lessons can be learnt about the flexibility of cultural determinants and about the factors and circumstances that could affect these?

d) Conceptual work looking at how do the findings of the three case studies compare in terms of:

   - the nature and flexibility of cultural determinants for the three types of discourses: are coalitions carrying market discourses more in/flexible than those carrying people/expert discourses? Is this flexibility originating in the same or different cultural determinants (e.g. is information availability more important than beliefs?)

   - the mechanisms by which various factors and circumstances (associated with, incorporated by, or carried out in the process by policy brokers) could positively affect cultural determinants to enable convergence.

After the findings of the first three case studies have been conceptualized, the research will investigate the question: what can the findings and lessons from the 3 case studies be used to facilitate convergence between the advocacy coalitions representing the three discourses emerging in the NL in the implementation of EU Water Framework Directive?

Deliverables

D2:1: Report on the convergence mechanisms for policy change in the field of tourism and local sustainability in the Netherlands. (Month 11)

D2.2: Report on the convergence mechanisms for policy change in the field of floodplain restoration and spatial planning. (Month 19)

D2.3: Stakeholder Consultation Meeting (Date to be decided; nominally Month 24)

D2.4: Report on the convergence mechanisms for policy change in the field of and water resource protection and water supply, in the Netherlands. (Month 27)

D2.5: Contribution to Technology Implementation Plan (TIP) a memo delivered to WP1 (Month 36)

Milestones[14] and expected result
Start-Up meeting (Month 1)
Co-ordination meeting with WP3 to discuss potential synergies. (Month 1)
First Plenary Meeting to co-ordinate Mid-Term Report (Month 15)
Co-ordination meetings with WP5 to discuss potential synergies. (Month 15)
Second Plenary Meeting to co-ordinate Final Report (Month 30).
Co-Ordination Meeting with WP4 to discuss relationship between sustainable tourism and land planning in Madrid (Month 30)
Final AGM (Month 30). Co-ordination meeting with WP3 to discuss future plans and Technology Implementation Plan in respect of water governance issues.

[14] Milestones are control points at which decisions are needed; for example concerning which of several technologies will be adopted as the basis for the next phase of the project.

Decision culture in European water governance

Work package number	3	Start date or starting event:	Month 1
Activity Type[15]	RTD		
Participant id	CRAN		
Person-months per participant:	44		

Objectives

Implementing European environmental legislation like the Water Framework Directive (WFD) is a complex process involving the interaction of a range of organisations over a range of scales from the European Commission down through National Governments, responsible authorities at national and regional levels and other organisations with influence on river basin water quality. The response of organisations within member state water governance systems to new European legislation can be viewed as a response to innovation.

Knowledge transfer research articulates the way in which organisations respond to innovation in terms of ***receptivity*** and has developed a number of conceptual models[16] to describe such processes. The notion of receptivity is based on the idea that innovation is primarily about exposure to new knowledge, and about how an individual or group of people associate and exploit new knowledge around their existing knowledge, activities and objectives (i.e. their adaptive capacity). In the context of the WFD, receptivity can be defined as the ability of an organisation to interpret, and to effectively negotiate and adapt to changes in regulation and practice imposed by new legislation.

Although the processes which influence organisational receptivity to new legislation are not well understood (existing models of receptivity were not developed for this purpose) it can be said that they will operate as a filter, emphasising some aspects and de-emphasising others. Variation in emphasis between organisations may have a significant impact on the successful achievement of legislative objectives. Are such variations observed within the European water governance system, what causes them and what effect might they have on the implementation of legislation?

We propose that understanding the processes that affect how legislative innovations are interpreted for particular purposes by organisations within a governance system will be essential to identifying variations in WFD implementation at different scales (national → regional → local), and for understanding their impact on key policy objectives like improving river basin water quality.

More specifically we propose that organisational culture in the form of formal and informal standards for procedure and evidence, that which we will term ***decision culture***, will be evident in, and exert an influence on organisational receptivity to new legislation. This in turn will impact how new legislation is implemented.

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[15] For STREPs/STIPs each WP must relate to one (and only one) of the following three possible Activity Types: RTD/Innovation activities, Demonstration activities, Management activities.

[16] For example, the AMR model of Seaton & Cordey-Hayes (1993), Technovation 13:45-53, and the 4A model as elaborated by Trott *et al.* (1995), Technovation 15:25-43, and by Jeffrey & Seaton (2004), Environmental Sciences 1:277-300.

Decision culture refers here to two aspects of organisational decision-making:

- the way in which organisations engage in processes of problem formulation, option generation and selection, and internal innovation, and;
- the standards of process and evidence which they utilise and adhere to in doing so.

Problem formulation is a bounding process in which external issues (like the WFD) are perceived as being relevant to an organisation and developed into a conceptual understanding, or statement of a problem, amenable to and requiring of action. Problem formulation may occur over extended periods of time, and may occur in parallel or iteratively with the generation and selection of solution options.

Throughout problem formulation, option generation and option selection, constraints imposed by cultural beliefs (organisational, or function – e.g. engineer or accountant norms) about due process and acceptability of evidence will exert an influence on decision-making and eventual action. Different organisations, and potentially different parts of single organisations, will have different formal procedures and different informal rules of conduct – variations in what is considered a legitimate, or proper way for members and the organisation as a whole to engage in activity. Similarly, when it comes to defending particular problem formulations or the selection of particular options there will be different views on what constitutes valid or acceptable evidence in terms of data and information.

Standards of process and evidence will influence the implementation of the WFD as the legislation is interpreted at different scales by different organisations, but the role of decision culture is not well understood:

- How does decision culture relate to and influence the receptivity of organisations to legislative innovation?
- What impact do variations in decision culture have on the implementation of European environmental legislation?

The aim of WP3 will be to develop the concept of decision culture in the context of European water governance, as a means of understanding the role that culture plays in the implementation of environmental legislation, and as a means of moving towards an improved understanding of the advantages and disadvantages of different approaches to (i.e. different cultures of) group decision-making and action. More specifically, the objectives of WP3 will be to:

1. Map out the governance system for WFD implementation in the context of a member state case study;
2. Identify the major factors and processes which influence receptivity to new legislation for organisations within the mapped governance system;
3. Identify formal and informal aspects of decision culture and explain how they relate to and influence receptivity to new legislation for organisations within the mapped governance system;
4. Assess the impact of variations in decision culture at the scale of water and wastewater service providers (WWSPs) within the mapped governance system, on the implementation of European environmental legislation;
5. Identify and discuss the relative advantages and disadvantages of different decision cultural practices in terms of the local context (objectives, activities and responsibilities) of each organisation, and more broadly in terms of European water governance (common objectives, standards and practices);
6. Develop a conceptual model of organisational receptivity to new legislation that incorporates decision culture, and relate the notion of decision culture to more

standard models and theories of organisational decision-making and innovation.

To achieve these objectives WP3 will undertake a mixture of literature review, governance systems analysis and qualitative interview-based fieldwork. The United Kingdom (UK) will be used as a member state case study for empirical study. Within this case study WP3 will focus on studying organisations from the EC (DG – Environment) down through national government departments (the UK Department for Food and Rural Affairs – DEFRA) and the UK environmental regulator (the Environment Agency – EA) to the level of WWSPs (responsible for treating and discharging wastewater). A comparative study between three major UK WWSPs (all private companies but of different scale and catchment properties) will be undertaken. Other major organisations involved in WFD implementation within the UK will be identified as part of the research.

Description of work

3.1 – Water Framework Directive review (2.5 person months CRAN)

A review of the WFD will be undertaken to provide up to date context on the history, objectives, implementation plans and progress so far. The review will focus on establishing and understanding the objectives of the legislation and accompanying implementation plans as stated in the WFD and associated literature, and through identifying key decision nodes and the bases under which particular options were selected (specific research, expert advice, links to other policy initiatives). This task will form the start-up activity for the WP. This task will contribute to D3.3 and D3.4.

3.2 – Water governance system mapping (4.5 person months CRAN)

The water governance system for the UK national scale will be mapped out using the five dimensional conceptual framework of Bressers and Kuks[17] - levels, actors, problem perception and objectives, strategy and instruments, responsibilities and resources. This will provide basic contextual information for the WP and will form the second task to be run in parallel with task 3.3. This task will contribute to D3.3 and D3.4.

3.3 – Receptivity and decision-making review (4 person months CRAN)

A review of receptivity and decision-making will be undertaken, focussing on established literature from organisational management, knowledge dynamics and innovation across Europe including material on Sweden, Germany, America and Japan. Attention will be paid to identifying similarities / differences between, and relative strengths / weakness of current models. In addition the way in which different types of private and public sector organisations and agencies have responded to environmental policy interventions will be examined under an input – transform - output analysis. This task will be undertaken in parallel with task 3.2. D3.1 will be produced during this task.

3.4 – Decision culture and receptivity framework development (6 person months CRAN)

Running throughout the research and particularly in tandem with the fieldwork element (task 3.6), this task will seek to develop a coherent and consistent conceptual model of decision culture and its relationship to the concept of receptivity to legislative innovation. Focus will be on developing models of what is going on inside organisations, decision processes, norms and norm forming, characteristics of organisational functions, disciplines, and the institutionalisation of science and engineering within organisations.

[17] Bressers, H.Th.A. & Kuks, S.M.M. (2003), The meaning of governance, From conception to elaboration, In: H.Th.A. Bressers & W.A. Rosenbaum (eds.), *Achieving sustainable development : the challenge of governance across social scales*, Praeger, London.

3.5 – Fieldwork and interview design (7 person months CRAN)

Interview-based fieldwork will be carried out with organisations identified as relevant to the implementation of the WFD within the UK by task 3.2, as outlined under the 'objectives' section. Sampling and interview design will be carried out within this task, with the aim of carrying out 6-10 interviews per organisation, per issue (as initially identified by tasks 3.1 and 3.2). Interactive interview methods will be used to identify key actors within the decision sequence of each issue. Elicitation and mind mapping techniques will be used to explore respondent's formal and informal roles within each decision sequence. Knowledge dynamics mapping techniques will be used to identify formal and informal knowledge contributions from each actor. D3.2 will be produced during this task.

3.6 – Interview fieldwork, data management and analysis (15 person months CRAN)

Data will be recorded in note/tape format and explored through maps/diagrams derived from Open University systems techniques[18] – and through notations developed for BT in Knowledge Dynamics in R&D. Use will be made of Qualitative Data Analysis (QDA) software for data exploration, analysis and management.

3.7 – Assessment of impact of decision culture on WFD implementation (5 person months CRAN)

An assessment be made of the impact of variations in decision culture within organisations (cross-functional) and between organisations on response to the introduction of WFD as legislative innovation, and the consequent impact on achievement of the goals of the WFD. The focus will be on UK WWSPs and the UK EA. D3.3 and D3.4 will be produced by this task, with D3.4 providing the context for collaboration with WP2.

Deliverables

Four deliverables will be produced by WP3:

D3.1: Review of receptivity and decision-making models and theories (month 10)

D3.2: Report on decision culture research method (month 18)

D3.3: Report on the comparative influence of decision culture on WFD implementation (month 36)

D3.4: Report relating discourse and decision culture based approaches to understanding WFD implementation – to be completed in collaboration with WP2 (month 36)

D3.5: Contribution to Technology Implementation Plan (TIP) a memo delivered to WP1 (Month 36)

Milestones[19] and expected result

M3.1 – start-up project meeting (Month 1)

M3.2 – co-ordination meeting with WP2 to agree collaboration (Month 2)

M3.3 – interview participant selection (Month 12)

M3.4 – project meeting (Month 14)

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[18] see Malcolm Craig (2000), "Thinking Visually – Business Applications of 14 Core Diagrams", Continuum, London ISBN 0 8264 4833 X

[19] Milestones are control points at which decisions are needed; for example concerning which of several technologies will be adopted as the basis for the next phase of the project.

M3.5 – research design completed (Month 16)

M3.6 – research fieldwork completed (Month 28)

M3.7 – Final project meeting & co-ordination meeting with WP2 to discuss TIP (Month 30)

WP3 will contribute to understanding decision culture and its influence on variety in the modes of implementation of the WFD. In doing so it will improve our understanding of how European environmental legislation is implemented and what effect the choice of delivery mechanisms and agencies has at the national and sub-national scales in light of the influence of different decision cultures.

WP3 will identify the process and standards by which relevant organisations acquire, manipulate and utilise information to support decision-making and taking action. In doing so it will contribute towards designing better (more appropriate, more useful) tools to support policy and management organisations involved in the implementation of legislation like the WFD.

WP3 will give some indication of how technology innovation might be stimulated in pursuit of WFD, how new scientific and technology knowledge is embedded in institutional science (EU, who standards, Codes of Practice etc) and how scientists and engineers influence policy formulation.

WP3 will also produce suggestions for further development of receptivity modelling, knowledge dynamics and innovation.

Adaptive Potential, Social Cohesion and Integrative Research

Work package number	4	Start date or starting event:	Month 1
Activity Type[20]	RTD		
Participant id	UNEW	UPM	
Person-months participant:	99	70	

Objectives:

To understand the role of boundary judgments in policy domains where manifest conflicts of interest disrupt social cohesion, particularly in respect of human rights, prosperity and health.

To undertake three focussed case studies on the effects of policy in respect of (1)career and disciplinary structures in integrative research, (2) asylum and immigration, and (3) sustainable landuse. These studies to pay particular attention to unconscious ethnic, gender or political discrimination arising as a consequence of boundary judgments made at all levels in society.

To explore the changing relationship between science and society and the role of integrative research. We will concentrate on ways of promoting social cohesion, convergence and compliance with European policy. Our research will be focuses on cultural and natural resource management and the need to respect and protect cultural diversity.

To explore fundamental issues of subsidiarity in cultural and natural resource management. Reconciling policy initiatives effecting global and trans-national commons, requires intervention at Supra-National level. These must be reconciled with the needs of diverse communities at local and regional levels, where social cohesion is critically determined by adaptive potential and action across sectors and epistemic communities.

Background:

We will undertake three, parallel case studies, each producing a separate stream of deliverables and reports. These will be linked, both with each other and with outputs from other workpackages to develop a more general model of the impact of boundary judgments on social cohesion and adaptive potential.

1. **Career and Disciplinary Structures in Integrative Research.** The European Union and its member states encourage young people to enter university, on the premise that graduates are needed for the aspired 'knowledge based Europe' and a successful economy. This has created a number of problems linked to an imbalance between supply of graduates and demand for their services:

   Graduates enter a discouraging circle of un- or underpaid internship to escape unemployment.

   The majority of university graduates within the EU earn their degree in social sciences, humanities and education. This seems to stand in discrepancy with the needs of the employment market (technology & science graduates). Shall we aim to influence the interests of young people or does the labour market need to be convinced about the value of social scientists and other non-technological specialism?

   There is a manifest gender bias between the social and natural sciences: in France, for example, only a third of all science and technology graduates are women, in Germany the share is below 25%. Policy makers have been aware of this gender discrimination for quite some time but no successful solution has been found so far.

   The Bologna declaration of 1999 aimed at creating common boundary condition for young academics in the EU by reforming each higher education system. It has been a partial success, but deeply rooted institutional differences as well as different quality measures make the creation of a 'common ground' difficult.

This research will consider three major stakeholder groups: graduates seeking employment, potential employers and EU officials working in the educational sector. Our strategic aim is to define policy tools that harmonise the interests of these three stakeholder groups.

2. **Asylum and Immigration**. Immigration policy is designed to accommodate a variety of migrants with very

[20] For STREPs/STIPs each WP must relate to one (and only one) of the following three possible Activity Types: RTD/Innovation activities, Demonstration activities, Management activities.

different needs, expectations and aims as regards the migration process, while balancing this with the requirements of the host nation. Although the migrant types and flows have been chronicled in some detail and adjusted for accordingly within immigration policy, this has been in a general and categorical way which has often not been adaptive to the differing social, cultural and political drivers functioning in the home nations of the migrants. This case study will contextualise Asylum seekers, as a highly identifiable group, within the context of migration as a whole and will investigate how they sit within the immigration policy framework. It will be directed towards policy in three nation states, Britain, Germany and one other (possibly Sweden). This to be decided in the first three months of the project

3. **Sustainable Landuse, Planning and Environmental Impact Assessment**. The Madrid Autonomous Community and Barcelona (one of the four regions of Catalonia) are in a remarkable moment because of the application of European policy initiatives to the National and Regional guidelines, such as sustainable development strategies, rural development national strategy plan within the new European Agricultural Fund for Rural Development (EAFRD), CAP reforms, biodiversity conservation, Natura 2000 network, Local Agenda 21, the Aarhus Convention which deals with participation in environmental issues, etc. Both regions have high rates of convergence, by growing more than two points over the EU average. Barcelona and Madrid regions keep similar EU-funding (some areas receive support from the Structural Fund, Goal 2), economical development characteristics and a sharp process of urbanization. In spite of it, both regions have different spirit as in the political and administrative structure, and in the groups of stakeholders, based on the distinct cultural heritage. Therefore we can observe a different compliance with the character of the EU legislation.

This Project will research on "cultural and natural boundaries" in land planning and in the governance structure, taking into account the different perceptions of "boundary conflict" within the complexity of both regions. Natural protected areas (the protected sites), strategic faming areas (the typical Mediterranean agro-ecosystem) and new or potential urbanised areas, shape and share the territory.

The UPM in the WP-4 will look and understand the cultural and natural differences in Madrid and Barcelona regions, through the implementation of the work cases below described, which will investigate the political and geographical boundaries. Our strategic aim will be to harmonize policy frameworks that integrate the sustainable land planning aspects within the decision system structure in public planning and policy development.

Synthesis. The three case studies we plan to undertake each refer to the impact low down the administrative hierarchy of regulatory norms constructed at a higher level. Each study has a comparative element - it is mounted simultaneously in two or more regions - and each study looks at the way accidents of history and geography condition the response to policy norms of stakeholders in those regions. WP4 will co-operate with WP2, which deals with policy from the top-down and has a similar comparative structure to develop a coherent model of policy intervention and reception that takes account of boundary judgments at a range of spatio-temporal scales. This work will be facilitated by WP1 (q.v.) and will focus primarily on Milestone meetings (timed to coincide with consortium AGMs to reduce costs) and will feed into the final report of the ISBP project as a whole.

Description of work

Career and Disciplinary Structures in Integrative Research.

Policies that aim at regulating career structures within the EU have to consider a number of often conflicting boundary judgements acting on different levels (individual, national and EU). The work package will take the following steps to create the basis for such policy tools:

- Review the cultural, administrative and regulatory differences between three European countries (France, Germany and the UK).
- Identify the boundary judgements of the three stakeholder groups (graduates, employers, EU officials) from the literature and through qualitative research. We will design a portfolio of elicitation methods to identify the boundary judgements involved. The groups of graduates will be recruited from landscape research departments, as they contain social as well as natural scientists.
- Fieldwork at the Géographie-cités department of the Universités Paris 1 and 7 will be used to gain a deeper insight into the situation in France.
- Mapping of the existing 'boundary conflicts'.

The results of the qualitative fieldwork will be used to identify which interferences at different levels of the

administrative hierarchy would be most effective and create least hassle for all the groups involved. The results will be distributed to a number of organisations that are involved in supporting graduate careers (UK GRAD, EURAB, German Trade Union).

Asylum and Immigration.

The study will use a comparative basis to consider how the immigrants view their own needs, expectations and motivations and how this relates to the categories and restrictions that are imposed on them. In order to allow an understanding of the way in which different policies function within different countries in the EU, we will explore the possibility of contacting Asylum seekers across three European countries with distinctive immigration histories – the UK, Germany and one other.

This will provide an insight into the reasons why some immigrants concentrate in certain countries and others do not (highlighting the relative influence of drivers in the home nation, individual motivations and policy in the receiving country and EU). The migrant study groups will be identified through a detailed investigation of immigration policy and literature identifying key groups in the three case study nations. Qualitative research methods will be used to investigate the immigrants' expectations of the migration process and perceptions of the nations and localities in which they now live.

The work will begin with a review of social immigration literature and history of policy in Germany, Sweden and the UK. Consideration of how EU policy has been translated and implemented differently in different countries and in relation to certain groups and why this is the case.

Contact will be made with a suitable study group in a third country (probably Sweden) to identify three target case study groups and key paths of inquiry. A framework to contact gatekeepers and specific individuals to be involved in the primary research will be considered and an exploration of associated ethical issues will be undertaken.

This will be followed by a period of fieldwork – primary research with key immigrant groups in the UK, Sweden and Germany, leading to a period of analysis and a formal report.

Sustainable Landuse, Planning and Environmental Impact Assessment.

We will explore the differences between these two regions through the three following cases:

- **Land use conflicts.** Different problem perspectives and objectives will be the pathways which addressed and drove land use changes in the rural and urban areas.

Land use changes and land use conflicts will be reviewed and analysed. Both issues will be related to population growth and urban and infrastructural expansion. A previous work on gathering information about land use in the region of Madrid will support the beginning of this stage (TiGrESS, 2003-2006). (9 person months)

Firstly, the value of farming land and rural areas in Environmental Impact Assessment studies and statements under the European Directives, Environmental Impact Assessment- EIA (85/337/EEC, 97/11/EC) and Strategic Environmental Assessment-SEA (2001/42/EC) will be compared. Recent policy development will be studied in the SEA. (10 person months)

Secondly, the research will be based on the current land planning and management processes, the municipal and regional planning tools referring to land use and key ecosystems. Experiences like the *Parc Agrari de Baix Llobregat* in Barcelona, an agrarian protected area threatened by the urban growth, will be studied (12 person months).

- **Stakeholders, participation networks** and different decision systems, as well as their roles, values, believes and perceptions in the territory, as transitional rural-urban areas, peri-urban areas and rural areas.

  The map of stakeholders and key information flows between them will be identified and discussed, through a mixture of literature review of the governance systems and a consultation interview-based fieldwork that will be undertook. (4 person months + 18 person months)

  The UPM will facilitate engaging stakeholders in the different levels of the administrative hierarchy and will have a key role in local out-reaching, searching for potential linkages between the most relevant groups of stakeholders (such as environmentalists NGOs, farmers trade unions, Local Action Groups, managers of protected areas, economic stakeholders, tourist associations, municipal and regional planners) to dynamize the coordination and participation as well as to raise awareness of sustainable planning in the regions (9 person months).

- The third case is on policy implementation. After finding out the cultural and natural differences between both regions, we will study their implications for policy change. We will investigate the links between land conflicts and the decision system to identify the influence of cultural and political boundaries on compliance with International, European and National policies. More specifically, in the sound area of land planning,

regarding to infrastructural development, natural conservation habitats, strategic environmental assessment, sustainable tourism or water policy (10 person months).

Synthesis A series of two- and three-way meetings between WPs will be organised to coincide with AGMs. These meetings will explore strategic issues, dissemination strategy and are intended to enhance the European Value-Added Component of the Project.

Deliverables

Career and Disciplinary Structures in Integrative Research.

D4.1: Review of existing structural and administrative differences between France, Germany and the UK (month 12)

D4.2: Mapping of boundary judgements of the three stakeholder groups (month 24)

D4.3: Paper for international conference

D4.4: Monograph report which will be sent to UKGRAD, Research Councils UK, UK HERD, EURAB, the German Trade Union and the Hans Böckler Stiftung (month 35)

D4.5: Contribution to Technology Implementation Plan (TIP) a memo delivered to WP1 (month 36)

Asylum and Immigration in the UK.

D4.6: Paper on immigration policy (Month 10)

D4.7: (Methodological working paper) (Month 24)

D4.8: (Working paper on results) (Month 28)

D4.9: Final Report to WP1 for co-ordination(Month 30)

D4.10: Contribution to Technology Implementation Plan (TIP) a memo delivered to WP1 (month 36)

Sustainable Landuse, Planning and Environmental Impact Assessment.

D4.11: Report on research framework, data sources and methodology (month 9)

D4:12: Scientific Report on the value of farming areas on Environmental Impact Assessment studies and statements (month 15)

D4.13: Report on characterization of stakeholders and networks (month 21)

D4.14: Scientific Report on land use conflicts (month 24)

D4.15: Report on the convergence mechanisms for policy change in the field of sustainable land planning to be discussed with stakeholders (month 30)

D4.16: Scientific Report on stakeholders' map and policy implications (month 36)

D4.17. Dissemination Report on relevant results addressed to the key stakeholders involved in the land planning process in both regions: Environmental, Agricultural and Regional Planning Directorates, the UPM and UAB, Universities reasearchin in this specific topic, Local Action Groups (two in Barcelona, three in Madrid), Plataforma Rural, UCAM, Parc Agraris Xarxa as farmer trade unions and associations, ADENA, Ecologistas en Accion and local groups as environmentalist NGOS, FEM and FEPEM as national groups of towns and villages at municipal level (month 36)

D4.18: Contribution to Technology Implementation Plan (TIP) a memo delivered to WP1 (month 36)

Milestones[21] and expected results

M1. Start-up meeting (month 1).

M2. First plenum and coordination with WP4-Netherlands to discuss potential synergies (month 15)

M3. Second AGM and coordination with the WP4 to find out relationships between sustainable tourism and sustainable landuse (month 21)

M4. Final plenum and coordination for the Technology Implementation Plan (month 30)

[21] Milestones are control points at which decisions are needed; for example concerning which of several technologies will be adopted as the basis for the next phase of the project.

Work package number	5	Start date or starting event:				Month 1	
Activity Type[22]	RTD						
Participant id	UNEXE	ICL	POLIBA				
Person-months participant:	54	32	24				

Ontological boundaries & automatic parameterization

Objectives

Cultural Systems and Natural Infrastructural Systems are different. However, the boundary problem recurs in both domains. WP5 will look at the way formal computer models are parameterised by bounding regions in a definite parameter space. This is the point in the scientific process where socially constructed theory encounters empirical data and we will use a range of data-driven and computational methods to develop new 'automatic parameterisation' procedures for application to natural resources management - particularly in respect of water and atmospheric pollution. Our two case studies have been chosen to represent different approaches to problem-bounding, but are linked by their geographic focus in the M11 corridor, a region of intense demographic pressure in the South East of England. Air pollution and water management are particularly significant here because the M11 corridor is densely populated and semi-arid - a low rainfall area with serious water management problems.

The water pollution case study will model the complex relationship between proposed housing development and wastewater pollution incident control. The impact of new development on existing watercourse is currently a statutory requirement in most EU countries and commonly comes under the umbrella of environment impact assessments (EIA). However, most EIAs are performed acyclically which provides little feedback to the proposed development. Hence there is a need to be able to model the complex interaction between infrastructure system (such as housing development and sewer networks), natural systems (such as catchment and watercourse) and social system (impact of flooding on livelihood).

The air pollution case study will investigate the relationship between proposed housing development, air pollution, patterns of vehicle ownership and modes of travel. For example, how will housing development along the M11 corridor influence road usage, emissions from transport and local air quality? How will the vehicle mix be affected by the development of high or low quality housing? Where does land-use planning policy come into conflict with air pollution and climate policies?

A suite of methodologies and tools based on artificial intelligence (evolutionary computation, data mining, multi-agent system, fuzzy logic) will be developed to assist us in bounding the above problems and system parameters. These methodologies will be embedded in the form of a stochastic system dynamics integrative model (SSDIM) System dynamics is a high level but rigorous method of system description that facilitates feedback analysis usually via a simulation model of the effects of alternative system structures and control policies on

[22] For STREPs/STIPs each WP must relate to one (and only one) of the following three possible Activity Types: RTD/Innovation activities, Demonstration activities, Management activities.

system behaviour. In this WP, system dynamics will be extended as SSDIM to incorporate different deterministic and dynamic simulation models .

SSDIM functionality will focus on providing the capabilities for:

- Integration of component models via cyclic dynamic feedback relationships;
- Quantifying the behaviour of different component models and sub-cyclic systems with SSDIM;
- Understanding the system behaviour and its boundaries;

Description of work

Work will be undertaken in three institutions: Centre for Water Systems at the University of Exeter (UNEXE), Technical University of Bari (POLIBA) and Imperial College London (ICL). UNEXE will lead the team and will co-ordinate the work on water pollution, with ICL coordinating the work on air pollution and POLIBA providing support on SSDIM. The system dynamics model must be capable of providing dynamic feedback relationship between (1) air or water pollution incidents, (2) population growth and demographic change, and (3) infrastructure provisions.

Wastewater infrastructure planning and management (WIPM) is undergoing significant rethinking – sewer performance, asset maintenance, flooding due to sewer overflow and the costs associated with provision of acceptable wastewater infrastructure services are beginning to play an important role when proposed housing developments are being considered (WaterUK, 2005). The problems associated with deterioration of wastewater infrastructure and the consequences of inadequate maintenance plan are far from obvious; the occurrences of water pollution events are normally good indicators of sewer failures but the price to pay may be too high. Hence, there is a growing advocate that WIPM should be incorporated into landuse plans. There is a strong case for sewerage service providers to demonstrate that their WIPM practices can deliver robust performance that meet regulatory requirements and that investments are sustainable as well as economically, socially and environmentally justifiable. There are still gaps in understanding the interrelationship of physical and economic behaviour of the wastewater infrastructure, how to model the infrastructure, and the impact of different management strategies (Wirahadikusumah et al, 2001). Even less well understood is the relationship between proposed land development and risk of water pollution events such as flooding caused by wastewater infrastructure failure.

Air pollution modelling has developed considerably since the 1985 Helsinki Protocol (to reduce Sulphur emissions) and the 1988 Sofia Protocol (Nitrogen). However, in order to meet current policy objectives for air pollution it has become necessary to address non-technical measures for pollution abatement in addition to the technological measures already captured by Integrated Assessment Models. Such measures tend to provoke behavioural responses from individuals and society [ASTA, 2005; AQEG, 2006] and a challenge for *quantitative* integrated assessment modelling is to capture these *qualitative* socio-cultural dynamics in a way that informs the formulation of abatement policies designed to promote change through behavioural responses. The dynamic integration within this workpackage of land-use and road-network models with existing air pollution models will help us to understand the effects both of land-use change and housing development, and the behavioural characteristics of populations and potential cultural 'lock-ins' upon both background and roadside (traffic) emissions and the resultant aerosol concentrations and Nitrogen deposition patterns.

The methodology developed for this workpackage is structured to be transferable to ISBP partners involved. The framework for SSDIM should be applicable to other workpackages

should the need arise.

In outline, SSDIM will comprise of these functional components:

1. housing development and landuse model (HDLM);
2. road network model (RNeM);
3. Local air pollution model (LAPM);
4. Wastewater infrastructure model (WIM);
5. Catchment/ watercourse model (CaWM)

The housing development and landuse model (HDLM) will allow the housing densities, types, locations etc. to be characterised and projected forward in time. It will be bounded geographically within the study area and socially via population preference of housing and affordability. It is envisaged that the HDLM will be multi-agent based.

The road network model will be GIS based, and will incorporate expansion potential. Since road planning tends to be fairly long term but with lots of uncertainty caused by local sentiments and conditions, we expect RNM to be of network representation but layout constrained by HDLM.

The local air pollution model (LAPM) will allow the calculation of local air quality in relation to airborne particles and secondary inorganic aerosols, together with deposition patterns of acidic or eutrophic compounds. Background levels respond to emissions changes resulting from changing land-use, demographic projections and housing development patterns, and foreground levels to changing road networks, travel patterns and vehicle types.

The wastewater infrastructure model (WIM) will be used to model the flow hydraulics and system performance in terms of dry weather flows, wet weather flows (WWF) and sedimentation. A major operational concern for urban drainage systems is their performance under WWF and especially the onset of hydraulic incapacity in system and any resultant flooding. This issue is being approach by reference to a series of design events with a range of return periods with the ability to alter the duration of the events. The proposed performance measure for hydraulic incapacity under WWF is based on a modified *performance assessment system* (Cardoso et al, 2002)

The catchment/ watercourse model will allow the accounting of total water budget within the study area. It will have a hydrologic model that accounts for the amount of inflow and discharge, links to HDLM, RNM and WIM to account for runoff within the system. It will provide the main driver for any occurrence of sewer flooding.

An important and innovative aspect of this WP is the proposed use of automatic parameterisation techniques to allow component models to change dynamically, to connect sub-systems flexibly, and to infer different cyclic or acyclic relationships of cause and effect of sub-systems. Although system dynamics model allows for dynamic behaviour, flows occur between objects

Automatic parameterisation is commonly "defined" as the process of determining parameter values of a model via an automatic routine, when the values of these parameters are not known a priori. However, in recent research, "parameters" are no longer restricted to numerical values but has been broaden to include topological and symbolic representations (see examples in Parmee, 2002; Zhang and Miles, 2004). In architectural design, parameters can refer to a line, surface, shape or other objects, and combinations are searched to obtain designs that encapsulate certain desired quality successfully. In such cases, new models and designs "emerge" from automatic parameterisations.

Many models, particularly those based on cell-space ideas, cannot be easily tuned to the local context and, until this is possible, they remain as interesting but rather theoretically orientated

tools for demonstrating principles rather than for applications (Batty, 2004). This WP will attempt to allow cell-based models (HDLM, LAPM and CaWM) to be tuned via automatic parameterization and provide local context to these models.

The following specific, auditable tasks are included in the methodology and are also reflected in the deliverables and milestones:

1. Develop framework for SSDIM. System dynamics models can be effectively developed using available object oriented software. We will devise formal specification and documentation of component model functionality, interfaces, and data exchange protocol. Research on available software for each of the SSDIM component model will be carried out. The resultant framework will provide a platform for partners to develop their component models across standardised platform. (12MM) - UNEXE(9MM)/BARI(3MM)
2. Data collection from Environment Agency, consultants and water companies and preparation – different component models will require different data but there must be a concerted effort to minimise the effort in collection, ensure compatibility and transferability, and user fatigue. It is expected that data collection will be on-going and iterative process as component models are better defined as the project progresses. (9MM) UNEXE
3. Algorithms for adaptive strategies for cellular automata – Primarily the responsibility of UNEXE, this task will be to investigate the co-evolution of CA. A population of CAs will be generated and different parameter settings will be tested on each CA. CAs will learn from itself and its opponents moves and adapt strategies (parameter settings) accordingly (Hercog and Fogarty, 2001). The resultant algorithm will be tested on hypothetical problems and different types of cell-based component models within WP5 and other WPs. (12MM) - UNEXE
4. Algorithms for automatic parameterisation – this task will require re-evaluation existing calibration techniques that are based on AI techniques. This will include (1) multi-objective genetic algorithms (di Pierro et al., 2006); (2) Bayesian calibration (Kennedy and O'Hagan, 2001); and (3) hierarchical multi-objective genetic algorithms (Haubelt et al., 2003). (15MM) – BARI(12MM)/ UNEXE(3MM)
5. Wastewater infrastructure model, housing and landuse model and catchment model – this task require the re-application of existing models (Khu et al., 2005) to a larger spatial scale and has the capability to consider the provision of infrastructure such as roads and different forms of housing developments, as well as impact to the environment. (18MM) UNEXE(12MM)/ BARI(6MM)
6. Road network model and local air pollution model (LAPM) - this task will require the re-application of existing models (Oxley *et al.* 2003, 2006) to a finer resolution and adaptation to dynamically respond to changing land-use, an expanding road network and changes in the vehicle mix.
    a. Adaptation to respond dynamically through changing emissions patterns (6MM) ICL
    b. Re-application and integration with SSDIM framework (12MM) ICL
    c. Calibration of emissions changes in response to LUM and RNeM models (6MM) ICL
7. Analysis of alternative land-use and behavioural (eg. energy efficiency, vehicle preferences etc) scenarios modelled using SSDIM through their effects upon air pollution dynamics. Evaluate the significance of the cultural lock-ins driving these

behaviours in relation to local and national air pollution policy objectives. The synergies and conflicts we identify between socio-cultural lock-ins, ontological modelling tools and policy aims and effects will be reported in a peer reviewed journal. (9MM) ICL

8. Integration of component models to the system dynamics framework, and testing and analysis of results. This will be an ongoing process, with phase integration of different components. Recalibration of component models may be necessary to generate suitable scenarios (15MM) UNEXE(9MM) / POLIBA(3MM)/ICL(3MM)

Contribution to the advances in science and technology:

We envisaged that contributions to the advances in science and technology will be in these areas:

1. extending system dynamics to cope with complex and self referencing systems, typically found in socio-natural-machine interfaces;
2. extending the concept of automatic parameterisation and allowing models to evolve emerging behaviour; and
3. allowing cell-based models to tune itself to local context when necessary.

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8. Project Resources and Budget Overview

- **STREP Effort Form - Full duration of project**

Project number (acronym): …ISBP……

STREP/STIP Activity type							
	Participant 1 short name	Participant 2 short name	Participant 3 short name	Participant 4 short name	Participant 5 short name	Etc.	TOTAL ACTIVITIES

RTD/Innovation activities							
WP name							
WP name							
WP name							
Etc							
Total research							

Demonstration activities							
WP name							
WP name							
Etc							
Total demonstration							

Consortium management activities							
WP name							
WP name							
Etc							
Total consort. management							

TOTAL per Participant							

Overall TOTAL EFFORTS							

- **Overall Budget for the Project**

Forms A3.1 and A 3.2 follow:

- **Management Level description of Budget**

SIXTH FRAMEWORK PROGRAMME
NEST-2004-Path-HUM



Annex to the CPF

Specific Targeted Research Project

Detailed Description of Anticipated Costs

We do not expect budget details to change substantially in the course of the project, though small adjustments are likely. We will inform the Project Officer of any substantial adjustments.

PARTNER 1 UNEW (AC)		
Specification		**Cost €**
Personnel		
Travel+Subsistence		
Consumables		
Management		
Indirect Costs		
Total		
EC Contribution		

PARTNER 2 CRAN (AC)		
Specification		**Cost €**
Personnel	45 person months	143852
Travel+Subsistence	Meetings and fieldwork	24,000
Consumables	Computing equipment & software	6000
Management	Audit certificates	3200
Indirect Costs	@ 20%	34,771
Total		211,823
EC Contribution		**211,823**

PARTNER 3 CSTM (FC)		
Specification		**Cost €**
Personnel	40.0 Person months	221723
Travel+Subsistence	All meetings and fieldwork	12.860
Consumables	Paid from overheads	-
Management	Audit + WP1 co-ordination work 1.4 months	20247
Indirect Costs		170473
Total		425303
EC Contribution		**222755**

PARTNER 4 UPM (FC)		
Specification		**Cost €**
Personnel	70 person months	237440
Travel+Subsistence	meetings, fieldwork (Barcelona & Madrid) + conferences	43500
Consumables		16800
Management	2 p. months on wp1 + audit	10784
Indirect Costs		101153
Total		409676
EC Contribution		**210230**

PARTNER 5 POLIBA (AC)		
Specification		**Cost €**
Personnel	24 person months	96000
Travel+Subsistence	All meetings and consultation	15000
Consumables	IT + Consumables	4000
Management	Audit	5000
Indirect Costs		23000
Total		143000
EC Contribution		**143000**

PARTNER 6 UNEXE (AC)		
Specification		**Cost €**
Personnel	42 person months	226800
Travel+Subsistence	All meetings and consultation	21800
Consumables	IT + Consumables	6592
Management	Managerial duties + Audit	6120
Indirect Costs		51038
Total		312350
EC Contribution		**312350**

PARTNER 7 ICL (AC)		
Specification		**Cost €**
Personnel	32 person months	157714
Travel+Subsistence	Plenary meetings and bilateral consultation	10611
Consumables	computer +consumables	5893
Management	Audit	6213
Indirect Costs		34115
Total		214546
EC Contribution		**214546**

9. Ethical Issues

There is no expectation that the project will create data subject to privacy legislation. However, in problem-domains where stakeholder communities are in conflict there may be issues of privacy to consider, particularly in published reports and papers. Workpackage leaders (to whom responsibility for publication and dissemination will be delegated) are advised to seek guidance from the Steering Board if any ethical issues are raised. If the Steering Board cannot resolve these questions, it will seek guidance from DG Research and professional bodies.

10.Gender issues:

We are committed to equality of opportunity and our work on Educational and Professional opportunities for young graduates will address equal opportunities issues in two ways. We will look directly at the impact of disciplinary and career structures on career prospects. In particular, the widespread use of fixed-term contracts and the emergence of 'Generation Praktikum' disrupt career structures in precisely those years when most younger people are establishing families. We will explore the hypothesis that women feel the effects of this differentially. We will also look again at the hard science / soft science split. It is well understood that the proportion of women training in the hard sciences is relatively small.

It is certainly arguable that policy in respect of cultural and natural resource management is biased towards technical and infra-structural investment in a way that effectively denies socio-natural complexity. Put bluntly, policy makers are working with an understanding of science that was already looking a little flaky at the end of the nineteenth century. An effort of re-conceptualisation would not only reduce the likelihood of unforeseen and damaging consequences, but could help alleviate this gender bias.

Our work on asylum seekers in Britain also bears directly on issues of gender equality. In Britain and, we suspect, in other European countries, our eagerness to stem the inflow of refugees from Sub-Saharan Africa has caused us to neglect systematic patterns of abuse. Men are more likely to be killed than women; women are more likely to be imprisoned and raped. Children are more likely to be kidnapped and pressed into military service or trafficked. We will look for evidence to test the hypothesis that, by treating each incident as an isolated act, we have built tacit gender, ethnic and age discrimination into administrative structures.

These results will not just bear on the three Member States selected for study; we expect them to be of potential interest to other Member States and candidate countries. It is clear from provisional research that the human rights of asylum-seekers are not adequately protected under European law. They do not seem to have equal access to the European Court of Human Rights, for example. This is *de facto* ethnic discrimination. Our impression is that there is a strange double-bind at work here. In order to gain access to the court, they have to establish their right to remain in the EU, yet they cannot establish their right to remain without access to the courts. ISBP will check the empirical and documentary evidence and report to NGOs and policy-makers.

Every generation has unacknowledged stakeholders. Today it is asylum seekers. Two centuries ago the idea that women had a legitimate stakeholding in governance or higher education was risible. This is still true in much of Africa and the Third World. Culturally embedded boundary judgments had to be un-locked before that stakeholding could be acknowledged. Before women began to organise, they were simply non-people. Gender discrimination is one example among many. The emancipation of slaves, the abolition of public executions, bear-baiting and cockfighting, legislation to protect health and safety in the workplace or protect natural resources, controls on the advertising and distribution of harmful recreational drugs like alcohol and tobacco - all hinged on conceptual adjustments - revised boundary judgments - that changed our collective understanding of who or what must be considered a legitimate stakeholder. Each of these reforms was opposed on the grounds that the new ontology flew in the face of common sense and denied the natural order of things. What is common sense to one person, to another may seem more like institutional bigotry. ISBP is intended to help un-lock boundary judgments and so facilitate innovation.

Appendix A: Consortium Description

- **Participants & Consortium**

Success in the individual workpackages, though challenging enough in its own right, will not meet all our strategic targets. You cannot establish a synergy between natural scientists and humanists by herding them together. Our managerial and regulation strategy is the key to making this work. Success will be facilitated through the interaction of staff with deep, domain-specific experience (engineers, political scientists, water scientists, sociologists, agronomists and geographers) with specialists in integrative research able to facilitate effective communication across the boundaries. This combination of depth and breadth demands experience. It is not a job that can be delegated to graduate students - apart from anything else the risks of failure are too great for someone at the beginning of their career to shoulder. This section is to demonstrate the competence and experience of the consortiums.

As you will see from the CVs that follow, the ISBP consortium is uniquely well-qualified to mount this research. However, the principal risk we envisaged when this project was being designed was that constraints on eligibility for funding and competing demand for time would force us to over-delegate, transferring responsibility for 'mission-critical' tasks to doctoral students. A supplementary risk we face is that the computing effort of WP4 demands a high level of expertise. We will be competing in the commercial market. We have a two-pronged strategy for managing this risk. Firstly, we have very few doctoral students on the project. Although most of our personnel will be early-stage researchers, each will have had experience of at least one successful project. Although our programmer salaries are relatively low, we have decided not to use a graduate student for this work. It is simply too demanding to be delegated to novices.

The second prong of our risk-management strategy has been in the provision of support-services from senior scientists. The level of buy-in from individual experts has been very high, despite the fact that relatively few of us are drawing salary from the project. However, we have underwritten provision of support by writing two experienced contractors into the project. The PI (Nick Winder, NCL) and Dr RAF Seaton (Cranfield) are both contractors. Between them they have over fifty-five years experience of competitively tendered, contract-funded research. Winder, as PI is costed into the project for 36 months (9 in management and the balance in research) and Seaton is costed in for a further twelve months. These are not 'sleeping partners' or passive, figureheads. Both are responsible for a substantial effort of synthesis and research leading to concrete deliverables - Winder on WPs 1 and 4, Seaton on WP3.

Dissemination is a particular challenge. In our WP descriptions we have, wherever possible indicated the target audience for each of our deliverables and envisage targeting EU, international and national-level industry and sector specific publications throughout the lifespan of the project to establish and to maintain a profile for each WP and the project as a whole. This if course will be done in addition to the traditional academic publication dissemination route for key research outputs. However, we are aware that the communications strategy for FP7 is currently under review (Cordis Focus 261). It would be perverse to fix the details of our dissemination strategy before this review is complete. WP1 has been tasked with maintaining a 'watching brief' on these developments and will develop an appropriate dissemination and communication strategy in response. WP1 has a contingency T+S budget to maintain links with partners and the Commission to facilitate project-level dissemination within the emerging EC strategy.

Finding the right balance between workpackages has involved negotiating rather stringent trade-off between financial constraints, the content of the call itself and personal commitments. Our reading of the call has been that the Commission really wants an integrative effort that combines quantitative with qualitative approaches. We welcome this, but must balance it against the infrastructural costs of the computational project (WP5) and our won feeling that this must not be a 'token' effort. We want WP5 to push the envelope of automatic parameterisation so that when we come to integrate, we are linking the very latest social science methods to a state-of-art project on the computational side. The focus on automatic parameterisation resonates rather beautifully with that of problem-bounding in the cultural domain and provides an unparalleled opportunity for integrative research. WP2, though much smaller than WP5 is a critical link between the water-management issues of WP5 and WP3 on Decision cultures in water governance. WP5 also has a substantial link to water, as water management is a key determinant of sustainable land use in Spain.

WP4 (Adaptive Potential, Social Cohesion and Integrative Research) is very substantial, exceeding even WP5 in its resource requirements. It is, in effect, the social science engine of ISBP within which four distinctive case studies will be linked thematically through the efforts of the senior scientists involved. In contrast, WP3 is more modest. In this case, we have taken advantage of the unique advantages brought to the consortium by cstm-ut. Professor Bressers and Dr Kuks have unique experience both in the theory and practice of governance and the RA who will work full-time on the problem is an expert linguist well able to mount parallel case studies in different member states and to collaborate with colleagues on WP4.

To conclude, we feel that ISBP, even if fully resourced, will be a demanding and even risky project. Without careful attention to resource allocation, it could quickly become impossible. This is not a project that can be designed in modular form, by constituting four or five more or less equally resourced WPs and making each cut its suit to fit the cloth provided. All our costings are based on figures derived by the central accounting service of our respective institutions. For further details about the basis of these costings and resource budgets see Annexe 2, the STREP Project Effort Form an Form AIII accompanying this document.

The following are key players.

Principal Investigator: Nick Winder, University of Newcastle upon Tyne will lead WPs 1 and 4: Winder was an environmental archaeologist, who moved from contract-based work in a field Unit to the university of Cambridge in the late 80s. He already had substantial experience of inter-disciplinary research as an osteo-archaeologist and worked as a specialist in statistical and computer methods. Although funded independently, Winder worked with the Archaeomedes project from the outset, initially on human-environment interaction in the later Pleistocene. In less than a decade he went from post-doctoral Research Assistant to Assistant Director of Research and was managing his own projects.

The tension between quantitative and qualitative approaches was aggravated by post-war dismay about the role of physical and social scientists in times of war, the ill-conceived policy of funding project-based, Big Science initiatives to solve complex social problems, and a growing fear that this policy drives environmental degradation. Winder has been active in research intended to integrate hard and soft science communities both in the humanistic and policy-relevant (Framework) research (Winder, 2000; 2005c; 2005d). Over the last ten years the focus of his research has shifted from extinct to contemporary systems.

Winder worked for three years as Director of SMC (Spatial Modelling Centre) in Kiruna, Sweden. In 2002 he resumed his career as a research manager. He is based at Newcastle; as PI of the TiGrESS project (Time Geographical Approaches to Emergence and Sustainable Societies) funded under EESD. He is an experienced systems modeller, having built pure research models and contributed to integrated DSSs. He will co-ordinate the research effort on ISBP, facilitate Milestones and some fieldwork, organise the project's managerial and dissemination activities and lead WP4 (Adaptive Potential, Social Cohesion and Integrative Research.

He will be assisted in this by **Dr David Pereira.** David Pereira is Senior Lecturer in Environmental Impact Assessment, Rural Planning and Landscape Planning and Management, within the Rural Planning Department at the Polytechnic University of Madrid (UPM). His main research interests are:

- Land-use changes, land tenure and farmers´changing role in rural areas and in rural-urban transitions. Key references in this field are a study on Rural Areas in Spain from territorial inequalities and social and economics changes (Pereira et al, 2004a, 2004b)

- Environmental Impact Assessment and Strategic Environmental Assessment methodologies focused on Regional Development (Oñate, Pereira & Suarez, 2003; Pereira et al. 2005) and the social perceptions of environmental values

In this project he contributes with his experience in land and territorial changes related with social and politics issues and with Strategic Environmental Assessment of policy changes.

Prof.dr. Hans Th.A. Bressers (1953) will lead WP2 on Cultural Determinants of Governance Boundaries. He is professor of Policy Studies and Environmental Policy at the University of Twente in the Netherlands and scientific director of the Center for Clean Technology and Environmental Policy of that university.

He was vice-chairman of the official permanent Evaluation Committee of the Environmental Management Act, which advises the Minister regularly on the efficacy of Dutch environmental policy. He was also the chairman of the Advisory Committee to the Dutch Minister for the Environment for the implementation of environmental policy by local government (1991-2001) and has been chairman of the Dutch social science association for environmental and energy research, SWOME.

He was a member of the Program Group III of the National Research Programme on Climate Change. He chaired for three years in the nineties one of the two review committees of the Dutch national science foundation, that judge research proposals on the field of political science, public administration and law (REOB) and did the same in 2003 for the MAGw 'open competition'.

He is an independent scientific member of the Commission on Sustainable development of the Dutch Social-Economic Council (SER). Furthermore he is a member of the editorial board of the Dutch policy studies journal 'Beleidswetenschap'.

He has been researcher and project leader of numerous externally funded projects, including several projects funded by EU research frameworks, Dutch national science foundation, Dutch ministries, etc. (See, for example, Bressers *et al* 2005).

He will be assisted by **Dr Stefan Kuks** a Senior Researcher at CSTM. Dr. Stefan M.M. Kuks is senior research associate and lecturer at the University of Twente in the

Netherlands (www.utwente.nl). At the School of Business, Public Administration and Technology he is affiliated with the Centre for Clean Technology and Environmental Policy (CSTM) and the Institute for Governance Studies (IGS). His research and educational work is focusing on institutional developments in water management. His PhD-dissertation has been on 'Water Governance and Institutional Change'. Besides his affiliation to the university, Stefan Kuks holds has an elected position as vice-president of the executive committee of Waterboard Regge and Dinkel (www.wrd.nl). His portfolio includes water system planning and management, finance and economic affairs (second term: 2005-2008). Kuks' Employment record is as follows:

- 2002-2005: Task leader in the European research project AQUADAPT - 'Strategic tools to support adaptive, integrated water resource management under changing utilisation conditions at catchment level: a co-evolutionary approach' (www.aquadapt.net, funded by the European Commission under the 5th Framework Program for Research).
- Since 2003: participation in the European Cluster on the Human Dimension in Water Management, in which many European projects in the field of socio-economic research on water management cooperate.
- 1999-2003: Project coordinator of the European research project EUWARENESS – 'European Water Regimes and the Notion of a Sustainable Status' (www.euwareness.nl, funded by the European Commission under the 5th Framework Program for Research).
- 1995: Visiting scholar at Department of Political Science, University of Florida - USA (supported with a grant from the Netherlands Institute of Government).
- 1993-1997: Project coordinator of the European research project 'Water Supply Authorities Preventing Agricultural Pollution' (funded by the European Commission under the 4th Framework Program for Research).
- 1992-93: Visiting scholar at Department of Political Science, Auburn University - USA (supported with a grant from the Dutch Science Foundation).
- 1993-2000: Director of the MBA Program 'Environmental Management', University of Twente.

WP3 (Decision Culture and European Water Governance) will be co-ordinated from the School of Water Sciences at Cranfield. Cranfield University is an international centre of excellence in research and teaching in strategic areas of science, technology and management directed by the needs of industry. This applied emphasis is unique among UK universities. Its mission is to transform world-class science, technology and management expertise into viable, practical, environmentally desirable solutions that enhance economic development and the quality of life. Cranfield is a recognised world leader in natural resource management, including the management of water quality, and is strongly focussed on the needs of industry and Government. SWS is an internationally recognised centre of excellence that undertakes consultancy, research and training in science, technologies and governance issues associated with the improvement of water quality to protect and enhance natural, human and industrial environments. This includes industrial and municipal wastewaters, potable water, and pure and ultra-pure water. The School is a corporate member of British Water, the Foundation for Water Research, the International Association of Water Quality and the International Water Association.

Dr. Brian McIntosh will lead the School of Water Sciences contribution to IBSP. Dr. McIntosh is an Academic Fellow and Course Director within the School. He possesses a first class Honours degree in 'Ecology' from the University of Stirling, and a PhD in 'Ecological Modelling Technology Design' from the University of Edinburgh. Dr.

McIntosh has worked on a range of EC funded FP4, FP5 and FP6 projects including MODULUS, VIRTUALIS, AQUADAPT, TiGRESS and DESURVEY (where he leads a Workpackage on understanding organisational use of information). He has broad experience of research in policy-relevant science and brings a suitable range of social enquiry, qualitative and quantitative analysis and inter-disciplinary research skills to the project. His particular research interests involve understanding information use in the context of environmental policy and management organisation decision-making; the design of tools to support water and environmental policy and management processes, and integrating water resource, water supply and land-use planning sectors for the purposes of improving resource management and regional development planning.

Dr. Roger Seaton will work with the School of Water Sciences as a Senior Research Officer to provide expert advice on researching organisational receptivity, to assist in governance system mapping and to lead collaboration between WP2 and WP3. With degrees in 'Civil Engineering' and 'Transport Studies', and a doctorate in 'Technology Policy', Dr. Seaton specialises in research design and methods for trans-disciplinary policy relevant research across a range of environmental and sustainability issues. He has over thirty-five years experience of research and project design in academia, for research councils, agencies, industries and the EC. In the context of DG Research, he was a prime developer of the concept of policy relevant environmental research in ARCHAEOMEDES I and II, and of integrative research and knowledge dynamics about policy delivery in EPPM and the Concerted Action on Environmental Communication. He has recently been a research advisor on "Knowledge Dynamics and Governance" for AQUADAPT and on "Receptivity to formal Time-Geography models" for TiGRESS. He has also undertaken work within four large projects on transport policy and the environment for DG TREN and IPTS, and is currently working on Technology Policy in the UK Waste Sector.

Dr. Paul Jeffrey will support the work of Drs. McIntosh and Seaton during the project. Dr. Jeffrey is Principal Research fellow with Water Sciences. He has first and higher degrees in 'Science & Society' and 'Energy and Environment' and a doctorate in 'Technology Policy' from Cranfield University. Following his PhD studies he spent two years as a post-doctoral research fellow in Sustainable Development based at the Hebrew University of Jerusalem, returning to Cranfield in 1996. A Fellow of the Chartered Institution of Water and Environmental Management (FCIWEM), Dr. Jeffrey lectures on Environmental Impact Assessment, Human Dimensions of water use, Stakeholder Engagement processes, water management and sustainable water use. He has worked on EC funded projects under FP4, FP5 and FP6 on water management issues including ARCHAEOMEDES II, EPPM, CATCHWATER, GOUVERNe, VIRTUALIS, AQUAREC and NewWater. He was recently coordinator of the FP5 AQUADAPT project.

Soon Thiam Khu, University of Exeter will lead WP5 (Ontological Boundaries and Automatic Parameterisation) Dr. Khu's research interest is in the area of application of soft computing techniques in water resources engineering, and in particular, the application of population-based techniques in model calibration and optimisation. His main work focuses on modelling catchment and rainfall-runoff processes using Genetic Programming, optimisation of catchment simulation systems and real-time updating of rainfall-runoff models. His other research interests are: neural networks and non-linear predictive models (for pattern analysis and forecasting); combination of fuzzy logic + possibility theory; and reliability studies of population-based calibration techniques.

He will be assisted by Prof. Giustolisi at Technical University of Bari who leads a group of 10 personnel, including 5 academics and 5 PhD Students and post-doctoral research fellows. Giustolisi's group is involved in a number of international research projects related to the management and planning in water systems some in collaboration with the Centre for Water Systems in the University of Exeter (UK). The group is well-established in what today is known as ***Hydroinformatics.*** The particular expertise of the group is in *data-driven environmental modelling, multi-objective analysis, decision support, water system rehabilitation and pressure system modelling.* The group produces 15-20 international publications per year and it is involved in a relevant international activity that is demonstrated by continuous reviewing for the following international journals Hydrological Science Journal (IAHS), Water Management Journal (ICE) and Journal of Hydroinformatics (IWA-IAHR), Journal of Water Resources Planning and Management (ASCE) and by the participation of Giustolisi (as leader) of a number of international conferences' Scientific Committee. Among these two examples are the conference Computer and Control in the Water Industry (held September 2005) and the 7th Conference on Hydroinformatics (to be held in September 2006).

Air Pollution Modelling will be directed by Dr Tim Oxley who has a background in complex systems modelling involving the spatial and temporal dimensions of the interactions between humans and their natural environment. This has involved the use of integrative research methods and the development of interactive decision support tools for integrated environmental assessment. His expertise lies in the integration of phenomena which stretch beyond disciplinary boundaries, and the identification of discontinuous processes which may indicate unexpected changes in the socio-natural environments being modelled. These interests are being developed further in the context of Integrated Assessment Modelling, long-range transboundary air pollution and micro-scale urban population exposure.

At Cranfield University he built up a track record in integrative modelling techniques and multidisciplinary research, working with a network of research institutes across Europe on a number of EU research projects including Archæomedes II, Ermes, Catchwater and Modulus. These involved the development of dynamic integrated models of hydrological, biophysical and social-economic phenomena, of integrative modelling frameworks, and interactive decision support systems incorporating models from five other Framework projects. At the Spatial Modelling Centre in Kiruna he then worked with existing micro-simulation models, evaluating the ways in which humans move through and interact with their environment, and the emergence of qualitatively new socio-natural structures, using *Time-Geographical* modelling techniques. Now at Imperial College he has redeveloped the UK Integrated Assessment Model to provide the flexibility to address the policy issues arising from the Task Force on Integrated Assessment Modelling, the National Emissions Directives, and other air quality objectives and policy priorities as determined by DEFRA.

- **Sub-contracting:**

None.

- **Third parties:**

N/A.

- **Funding of Third country participants:**

N/A