

UNIVERSITY OF NEWCASTLE UPON TYNE
FACULTY OF HUMANITIES AND SOCIAL SCIENCES
SCHOOL OF GEOGRAPHY, POLITICS AND SOCIOLOGY

ENVIRONMENTAL JUSTICE AND PUBLIC PARTICIPATION:
A CASE STUDY OF NUCLEAR WASTE MANAGEMENT AND POLICY IN
TAIWAN

GILLAN CHI-LUN HUANG

THESIS SUBMITTED IN FULFILLMENT OF THE REQUIREMENT FOR THE
DEGREE OF DOCTOR OF PHLOSOPHY IN THE FACULTY OF HUMANITIES
AND SOCIAL SCIENCES SCHOOL OF GEOGRAPHY, POLITICS AND
SOCIOLOGY, UNIVERSITY OF NEWCASTLE UPON TYNE

9 OCTOBER 2012

Abstract

The politics and management of nuclear waste has always been a controversial issue. This research critically assesses the management and politics of nuclear waste in Taiwan using an environmental justice approach.

This research comprises three parts: first, the nature of radioactive waste; second, the theory of environmental justice; and third, the case study of nuclear waste siting policy in Taiwan. In the first part, background information is provided to understand what nuclear waste is; how it has been managed in different countries; and the difficulties and uncertainties of nuclear waste management.

In the second part of this research, the idea of environmental justice is employed as a theoretical framework to interpret nuclear waste policy and the policy process in Taiwan. Environmental justice is derived from the environmental justice movement in the late 1970s and early 1980s. Environmental justice issues are two-fold: distributive justice refers to the distribution of environmental risks among different communities, and procedural justice refers to the access of citizens to decision-making processes that affect their environment.

Finally, the case study of nuclear waste management and politics in Taiwan serves as the third part of this project. Through the lens of principles of environmental justice, the historical development of nuclear waste in Taiwan is examined. The process and progress of protracted attempts to site a new nuclear waste repository in Taiwan is investigated in considerable detail by conducting interviews with government officials, NGOs, and members of local communities. Particular attention was paid to the decision-making process and to the involvement of minority and low income

communities in that process.

The overall purpose of this project is to determine how far the ideas and principles of environmental justice have informed the nuclear waste management policies of Taiwan. By examining how consistent nuclear waste management in Taiwan complies with the idea of environmental justice, this project contributes to the growing literature on an urgent policy issue, and helps members of local communities, government officials and politicians to develop a greater awareness of the problems and issues of nuclear waste.

Acknowledgements

I would like to express my enormous thanks towards my Supervisors, Dr Derek Bell and Professor Tim Gray for their patience, enthusiasm, encouragement and valuable comments during the time of my doctoral study. No words can describe how grateful and how fortunate I am to work with them in my study. Also, I would like to thank the people in Wang-An and Da-Ren for their help with interviews. Without them, this thesis would not be complete. Thanks to Maggie and Chris Stringer in 13 Southcliff, Whitley Bay, for support and encouragement during the time of my study. Finally, please allow me to express my thanks to my parents, Han-Pin Huang and Shao-Jen Chang, and my girlfriend, Linda Ng, for their unconditional love and support throughout my research and writings.

Contents

| | |
|--|-----|
| Abstract | ii |
| Acknowledgements | iv |
| Contents | v |
| Lists of Tables | xiv |
| Glossary of Mandarin-Chinese and English Translation | xvi |
| Chapter1. Introduction | 1 |
| 1.1. Introduction | 1 |
| 1.2. Why is nuclear waste such a controversial issue? | 1 |
| 1.3. Management of nuclear waste | 2 |
| 1.4. Case study of Taiwan | 4 |
| 1.5. Research Questions | 5 |
| 1.6. Methodology | 5 |
| 1.6.1. Data Analysis | 9 |

| | |
|---|----|
| 1.7. Chapter outline | 10 |
| 1.8. Conclusion | 13 |
| Chapter 2. Nuclear Waste Disposal | 14 |
| 2.1. Introduction | 14 |
| 2.2. Nuclear waste | 15 |
| 2.2.1. Nuclear fuel cycle | 15 |
| 2.2.2. Classification of radioactive waste | 17 |
| 2.2.2.1. Very Low Level Waste (VLLW) | 17 |
| 2.2.2.2. Low Level Waste (LLW) | 18 |
| 2.2.2.3. Intermediate Level Waste (ILW) | 18 |
| 2.2.2.4. High Level Waste (HLW) | 18 |
| 2.3. Radiation | 19 |
| 2.3.1. Measurement of radiation | 20 |
| 2.3.2. Types of radiation | 20 |
| 2.3.2.1. Alpha | 21 |
| 2.3.2.2. Beta | 21 |
| 2.3.2.3. Gamma | 21 |
| 2.4. Health risks of nuclear waste | 22 |
| 2.4.1. ‘Deterministic’ and ‘stochastic’ effects | 23 |
| 2.4.2. Safe limits of radiation | 24 |
| 2.4.3. Epidemiological evidence | 25 |

| | | |
|-------------|---|-----------|
| 2.4.4. | Fear | 26 |
| 2.5. | Management of nuclear waste | 26 |
| 2.5.1. | Principles of nuclear waste management | 26 |
| 2.5.2. | Technical aspects of nuclear waste management | 28 |
| 2.5.2.1. | Pre-disposal | 29 |
| 2.5.2.2. | Disposal | 30 |
| 2.5.3. | Ethical aspects of nuclear waste management | 32 |
| 2.5.3.1. | Intereginal Inequality | 32 |
| 2.5.3.2. | Intergenerational Inequality | 33 |
| 2.5.3.3. | Compensation | 33 |
| 2.5.4. | Political aspects of radioactive waste | 34 |
| 2.6. | International comparisons of nuclear waste management practice | 35 |
| 2.6.1. | USA | 36 |
| 2.6.2. | Canada | 38 |
| 2.6.3. | The U.K. | 40 |
| 2.6.4. | Germany | 42 |
| 2.6.5. | France | 43 |
| 2.6.6. | Sweden | 45 |
| 2.7. | Literature review on the politics of nuclear waste | 48 |
| 2.7.1 | Single case studies | 48 |
| 2.7.2 | Comparative studies | 49 |
| 2.7.3 | Studies of oppositional groups | 49 |

| | | |
|--|--|-----------|
| 2.7.4 | Studies on environmental justice | 50 |
| 2.7.5 | Studies of environmental justice in Taiwan | 53 |
| 2.8. | Conclusion | 55 |
| Chapter 3. Storing Nuclear Waste – An Environmental Justice Perspective | | 56 |
| 3.1. | Introduction | 56 |
| 3.2. | The origin of environmental justice in the USA | 56 |
| 3.2.1. | Love Canal | 56 |
| 3.2.2. | Warren County | 59 |
| 3.2.3. | Consolidation of the environmental justice movement in the USA | 60 |
| 3.3. | Environmental Justice in Taiwan | 63 |
| 3.4. | The meaning of environmental justice | 66 |
| 3.4.1. | Concept of risk | 67 |
| 3.5. | Distributive environmental justice | 68 |
| 3.5.1. | Who are the recipients of environmental justice? | 68 |
| 3.5.2 | What should be distributed? | 68 |
| 3.5.3. | Principles of distribution | 70 |
| 3.5.3.1. | Equality | 70 |
| 3.5.3.2. | Priority | 73 |
| 3.5.3.3. | Sufficiency | 74 |
| 3.5.3.4. | Compensation | 75 |

| | |
|--|----|
| 3.6. Procedural environmental justice | 75 |
| 3.6.1. Non-discrimination | 76 |
| 3.6.2. Participation | 76 |
| 3.6.3. Information | 78 |
| 3.6.4. Local knowledge | 79 |
| 3.6.5. Trust | 80 |
| | |
| 3.7. Economic injustice | 81 |
| | |
| 3.8. Political injustice | 84 |
| | |
| 3.9. Cultural injustice | 85 |
| | |
| 3.10. Understanding the opposition: using environmental justice framework | 87 |
| | |
| 3.11. Conclusion | 88 |
| | |
| Chapter4. Taiwan – the Geo-Political Context | 90 |
| | |
| 4.1. Introduction | 90 |
| | |
| 4.2. The geography and demography of Taiwan | 90 |
| 4.2.1. Geography | 90 |
| 4.2.2. Demography | 91 |
| | |
| 4.3. Political history of Taiwan | 92 |

| | | |
|-------------------|--|------------|
| 4.3.1. | Pre-1945 | 93 |
| 4.3.2. | 1945-1975: Chiang Kai-Shek | 93 |
| 4.3.3. | 1975-88: Chiang Ching-Kuo and the end of martial law | 96 |
| 4.3.4. | 1988-2000: Lee Teng-Hui and Democratization | 97 |
| 4.3.5. | 2000-2008: Chen Shui-Bian and the DPP Government | 102 |
| 4.3.6. | Ma Ying-Jeou (馬英九) 2008- | 107 |
| 4.4. | Political Economy | 109 |
| 4.4.1. | Taiwan's economy 1945-1988 | 109 |
| 4.4.2. | 1988-2000 | 111 |
| 4.4.3. | 2000-2008 | 111 |
| 4.4.4. | 2008-to present | 112 |
| 4.5. | Civil Society in Taiwan | 117 |
| 4.5.1. | Presbyterian Church | 117 |
| 4.5.2. | Women's movement | 118 |
| 4.5.3. | Labour movement | 120 |
| 4.5.4. | Aboriginal movement | 122 |
| 4.5.5. | Environmental movement | 123 |
| 4.5.6. | Anti-nuclear movement | 127 |
| 4.6. | Conclusion | 135 |
| Chapter 5. | History of Nuclear Waste in Taiwan | 136 |
| 5.1. | Introduction | 136 |

| | |
|---|-----|
| 5.2. Regulatory framework | 137 |
| 5.3. Orchid Island national repository for radioactive waste | 140 |
| 5.3.1. Decision options | 140 |
| 5.3.2. A fish canning factory or a radioactive waste repository? | 144 |
| 5.3.2.1. Lack of trust in the government | 146 |
| 5.3.3. Protest against nuclear waste | 147 |
| 5.3.4. A two-faced approach? | 149 |
| 5.4. Siting for a final repository for nuclear waste | 156 |
| 5.4.1. Financial support – a nuclear backend fund | 156 |
| 5.4.2. Siting a permanent LLW repository in Taiwan | 158 |
| 5.4.2.1. Wuciou | 159 |
| 5.4.2.2. Da-Wu | 166 |
| 5.4.2.3. Da-Ren | 172 |
| 5.4.2.4. Wang-An | 173 |
| 5.4.3. HLW and spent fuel management | 175 |
| 5.4.4. Exporting Radioactive Waste from Taiwan | 176 |
| 5.4.4.1. China | 177 |
| 5.4.4.2. North Korea | 177 |
| 5.4.4.3. Marshall Islands | 182 |
| 5.4.4.4. Russia | 183 |
| 5.5. Conclusion | 186 |

| | |
|---|---------|
| Chapter 6. Understanding Opposition I: Empirical Analysis | 188 |
| 6.1. Introduction | 188 |
| 6.2. The selection of Da-Ren and Wang-An | 189 |
| 6.2.1. Identification of the potential sites | 189 |
| 6.2.2. Important opportunity to understand opposition | 191 |
| 6.2.3. Previous work on the environmental justice of nuclear waste storage in Taiwan | 192 |
| 6.3. The geo-political context of the two cases | 194 |
| 6.3.1. Geography and demography | 194 |
| 6.3.2. Economics | 199 |
| 6.3.3. Culture | 201 |
| 6.3.4. Local politics | 204 |
| 6.3.4.1. Local Politics in Taiwan | 204 |
| 6.3.4.2. Local politics in Taitung County | 206 |
| 6.3.4.3. Local politics in Penghu County | 208 |
| 6.3.4.4. Local nuclear waste politics | 210 |
| 6.4. Conclusion | 212 |
| Chapter 7. Understanding Opposition II: Thematic Analysis | 214 |
| 7.1. Introduction | 214 |

| | |
|--|-----|
| 7.2. Distributive injustice | 215 |
| 7.3. Procedural injustice | 224 |
| 7.4. Economic Injustice | 239 |
| 7.5. Political injustice | 243 |
| 7.6. Cultural Injustice | 246 |
| 7.7. Internal conflict in local communities | 252 |
| 7.8. Conclusion | 254 |
| Chapter 8. Conclusion | 255 |
| 8.1 Introduction | 255 |
| 8.2. Summary of the thesis's findings | 255 |
| 8.3 Future research directions | 261 |
| 8.4 Recommendations for policy-makers | 262 |
| Appendix I. Interviewee Lists | 265 |
| Bibliography | 269 |

List of Tables

| | | |
|-------------|---|-----|
| Table 2.1. | Total amount of nuclear waste in the Taiwan until 2008 | 15 |
| Table 2.2. | Nuclear Fuel Circle | 17 |
| Table 2.3. | Radiations | 22 |
| Table 2.4. | ICRP Risk Factor for Stochastic Effects | 24 |
| Table 3.1. | Results of Taiwan Environmental Consciousness Survey 2001 | 65 |
| Table 4.1. | Maps of Taiwan | 91 |
| Table 4.2 | Vote Shares of Major Political Parties in Legislative Yuan Elections 1992-2008 | 98 |
| Table 4.3. | Results of 1996 Presidential Election in Taiwan | 100 |
| Table 4.4. | Results of 2000 Presidential Election in Taiwan | 101 |
| Table 4.5. | Results of 2004 Presidential Election in Taiwan | 105 |
| Table 4.6. | Results of 2008 Presidential Election in Taiwan | 107 |
| Table 4.7. | Main economic indicators for Taiwan 1951-2009 | 113 |
| Table 4.8. | GDP per capita in Taiwan and other countries since 1961 | 114 |
| Table 4.9. | Unemployment rates in Taiwan and other countries 1981-2009 | 115 |
| Table 4.10. | Average disposable income per household by disposable income quintile in Taiwan from 1964-2009 | 116 |
| Table 5.1. | Amount of radioactive waste 1983-2010 | 139 |
| Table 5.2. | Map of Taiwan | 141 |
| Table 5.3. | Location of Taiwan and Wuciou | 160 |
| Table 5.4. | Maps of Taitung County | 172 |
| Table 5.5. | Maps of Penghu and Wang-An | 173 |
| Table 5.6. | Map of Marshall Islands | 183 |
| Table 5.7. | Map of Russia | 184 |

| | | |
|------------|---|-----|
| Table 6.1. | Land area, population, and population density in Da-Ren and Wang-An in 2009 | 195 |
| Table 6.2. | Population by age and gender in Da-Ren and Wang An in 2008 | 196 |
| Table 6.3. | Dependency ratio in Da-Ren and Wang-An in 2008 | 197 |
| Table 6.4. | Educational attainment of populations in Taiwan 2009 | 198 |
| Table 6.5. | Average income in five Townships/Districts in Taiwan in 2008 | 199 |
| Table 6.6. | Revenues and Payroll of Business Sectors in Taiwan | 201 |
| Table 6.7. | Paiwan tribe distribution and Paiwan Clothing | 202 |

Glossary of Mandarin-Chinese and English Translation

Location:

| English Translation | Mandarin |
|------------------------------------|------------|
| Changhua County | 彰化縣 |
| Da- Ren (Daren) | 達仁鄉 |
| Da-Wu (Dawu) | 大武鄉 |
| Dungji | 東吉嶼 (村) |
| Dongyuping (Dongping Village) | 東嶼坪 (東坪村) |
| Fu Li | 富里 |
| Gongliao | 貢寮 |
| Green Island | 綠島 |
| Hualien County | 花蓮縣 |
| Huayu (Huayu Village) | 花嶼 (花嶼村) |
| I-lan County | 宜蘭縣 |
| Jade Mountain | 玉山 |
| Jiangjyunao-yu (Jiangjyun Village) | 將軍澳嶼 (將軍村) |
| Jing-Fong | 金峰 |
| Ju-kuwn | 莒光 |
| Keelung City | 基隆市 |
| Kinmen | 金門 |
| Lan Yu (Orchid Island) | 蘭嶼 |
| Little Ciou Yu | 小丘嶼 |
| Little Lan Yu | 小蘭嶼 |
| Lukang | 鹿港 |

| | |
|-------------------------------|-----------|
| Matzu | 馬祖 |
| Minsheng Villas | 民生別墅 |
| Mu-Dan | 牡丹鄉 |
| Peng Chia Yu | 彭佳嶼 |
| Penghu County | 澎湖縣 |
| Pingtung County | 屏東縣 |
| Siyuping (Siping Village) | 西嶼坪 (西坪村) |
| Tainan City | 台南市 |
| National Tsing Hua University | 國立清華大學 |
| Wang-An (Wangan) | 望安鄉 |
| Wuciou | 烏坵鄉 |
| National Yang Ming University | 國立陽明大學 |
| Yenliao | 鹽寮 |

Names

| English Translation | Mandarin |
|---------------------|----------|
| Chin-Sheng Chang | 張金生 |
| Chang Chau-Hsiung | 張昭雄 |
| Chun-Hsiung Chang | 張俊雄 |
| Hai-Yu Chang | 張海嶼 |
| Chiang Ching-Kuo | 蔣經國 |
| Chiang Kai-Shek | 蔣介石 |
| Lu-An Chen | 陳履安 |
| Chen Shui-Bian | 陳水扁 |
| Josephine Chu | 朱惠良 |

| | |
|----------------|-----|
| Dong Sen-Yun | 董森永 |
| Elmer Fung | 馮滬祥 |
| Pei-Tsun Hau | 郝柏村 |
| Frank Hsieh | 謝長廷 |
| Ching-Yuan Hsu | 徐慶元 |
| Lung-Fu Hsu | 許龍富 |
| Hsu Hsin-Liang | 許信良 |
| Ching-Piao Hu | 胡錦標 |
| Justin Huang | 黃健庭 |
| Chien-Pin Kou | 郭建平 |
| Li-Chen Kuang | 鄭麗貞 |
| Li Ao | 李敖 |
| Lee Teng-Hui | 李登輝 |
| Lien Chan | 連戰 |
| Lin Yang-Kang | 林洋港 |
| Pin-Kuan Lin | 林炳坤 |
| Lin Yi-Fu | 林義夫 |
| Annette Lu | 呂秀蓮 |
| Ma Ying-Jeou | 馬英九 |
| Paiwan | 排灣族 |
| Shih-Ching Pao | 包世晶 |
| Peng Ming-Min | 彭明敏 |
| Rao Ching-Ling | 饒慶鈴 |
| Su Tseng-Chang | 蘇貞昌 |
| Sun Yat-Sen | 孫逸仙 |
| Tang Fei 唐飛 | 唐飛 |

| | |
|------------------|-----|
| Chien-Hsing Tsai | 蔡見興 |
| Tsai Ing-Wen | 蔡英文 |
| Wang Ching-Feng | 王清峰 |
| Chien-Fa Wang | 王乾發 |
| Chun-Li Wu | 吳俊立 |
| Yami | 雅美族 |
| Chin-Tien Yang | 楊清田 |
| Ming-Sieng Yeh | 葉明縣 |
| Yen Chia-Kan | 嚴家淦 |
| Yu Kuo-Hua | 俞國華 |

Terminology

| Mandarin and Pronunciation | English Translation |
|----------------------------|-----------------------|
| 公平 Gong-Ping; | Fair, Fairness |
| 不公平 Bu Gong-Ping | Unfair, Unfairness |
| 正義 Zeng-Yi | Just; Justice |
| 不正義 Bu Zeng Yi | Unjust, Injustice 不正義 |

Chapter 1. Introduction

1.1 Introduction

The politics and management of nuclear waste has always been a controversial issue because nuclear waste is an on-going problem. Up to 2008, there were 440 reactors in 47 countries which made the total amount of nuclear waste accumulated since nuclear power generation started 30,260,371 square metres. Currently, there are about 200,000 square metres of low and intermediate level radioactive waste, and about 10,000 square metres of high level waste being produced worldwide by nuclear power generation facilities each year (IAEA. Managing Radioactive Waste Fact Sheet). Managing nuclear waste is a controversial issue. Many countries in the world have not yet found a permanent repository for their nuclear waste because of strong opposition from local communities. This thesis focuses on the opposition from several local communities in Taiwan to proposals from the government to site a permanent repository in one of them. It found that the opposition was not based on nimbyism ('not in my backyard'ism) but on principle, and it makes use of the theory of environmental justice to analyse the nature of that principle.

This introductory chapter discusses why the nuclear waste issue is so controversial; how it is traditionally managed; the case study of Taiwan; the methodology employed in the research; and the content of the remaining seven chapters of the thesis.

1.2 Why is nuclear waste such a controversial issue?

Nuclear waste is controversial partly because of public anxiety. The general public's fear about nuclear waste is about radiation, which can cause serious health problems to

human beings. The short-term effect of an acute dose of radiation is radiation sickness, causing nausea, vomiting, dizziness, and intense headache. Long-term effects of chronic exposure can cause cancer, reproductive failure, birth defect, genetic defect, and death (Openshaw et al. 1989: 8). Public anxiety is well-founded in the sense that the half-life of some radioactive substances could extend over thousands of years. Moreover, it is compounded by the myriad of arguments made by researchers, media, nuclear industries, government spokespersons and environmental groups about the safety of radioactive waste, which are often contradictory. It seems there is no accurate information that the general public can believe. Moreover, when nuclear accidents such as Three Mile Island in the US, Chernobyl in the former USSR, and Fukushima in Japan occur, though they were not directly related to nuclear waste, these incidents have a significant impact on public concern about the risk of nuclear energy and its consequent problems. Indeed, people are becoming aware that no absolute level of safety and security can be guaranteed by the management of nuclear waste and nuclear energy, despite the increasingly strict safety measures enforced both inside and outside radioactive waste repositories and nuclear facilities.

1.3 Management of nuclear waste

Since nuclear waste is a controversial issue, the management of nuclear waste has become a very important problem for countries which use nuclear energy. The most common method employed for the long-term management of nuclear waste is geological disposal. But because of the fear of nuclear waste, siting a nuclear waste repository is not an easy task for a country. Disposal of radioactive waste typically involves placing it in a repository to insulate it from any disturbance and prevent the escape of any waste material for hundreds, thousands or millions years. Safety of the disposal facilities can be achieved by placing conditioned radioactive waste in a suitable

natural environmental with disposal facilities. The facilities comprise the natural geological barrier provided by the host rock of the site together with an engineered barrier system such as a waste matrix, a container, the over-pack, buffer or backfill to a repository wall, and wall linings (Ojovan and Lee 2005: 130, 270, and 271).

The normal practice is that short-lived low level waste (LLW) and short-lived intermediate level waste (ILW) are given shallow disposal (near-surface disposal), while high level waste (HLW), long-lived LLW and long-lived ILW, are given deep disposal. Near-surface disposal in shallow trenches or engineered structures is for waste that will decay to harmless levels over a period of 200-300 years (Bayliss and Langley 2003: 8). The design of these facilities provides a multiple barrier system to prevent the waste returning to its radioactivity and to allow the monitoring of any activity over the time frame (Bayliss and Langley 2003: 8). Examples of shallow disposal of short-lived LLW and ILW can be found at Drigg (West Cumbria) in the UK, Centre de'Aube and Centre de la Manche in France, Rokkasho-Mura in Japan, and El Cabril in Spain (Bayliss and Langley 2003: 8). Some countries have not adopted the shallow disposal idea, but stored nuclear waste in somewhat deeper underground facilities. For example, facilities which to a depth of 100-500 metres in hard rock or underground salt domes host LLW and short-lived ILW are found in Olliluoto and Loviisa in Finland, Forsmark in Sweden, Morseleben in Germany, Himdalen in Norway, and Wellenburg in Switzerland (Bayliss and Langley 2003: 8). Even deeper disposal of long-lived waste (i.e., depths of >500 metres) is intended to reduce the risk of any return of radionuclides to the environment. In such sites, natural and engineered barriers also help to prevent radioactive discharge. Examples of very deep waste disposal sites are Waste Isolation Pilot Plant (WIPP) in New Mexico, Yucca Mountain in Nevada in USA, and Gorleben in Germany (Bayliss and Langley 2003: 8). Siting a repository for nuclear waste is, however, not easy for many countries, as we see in chapter 2, where the experiences from four countries will

be discussed.

1.4. Case study of Taiwan

The case study of the present thesis is the politics of nuclear waste in Taiwan, which is pervaded by the idea of the environmental justice. The time frame of this research started in the 1980s when environmental groups discovered that Taipower had dumped nuclear waste in Lan Yu. As the study of the politics of nuclear waste in Taiwan has been relatively rare, especially in the English language, this research helps to fill a general gap. It also provides an insight into how local opponents of nuclear waste constructed their opposition and the experiences they encountered in the decision-making process. In particular, the research is designed to improve our understanding of the values, beliefs, motives and discourses of opponents of nuclear waste storage sites in Da-Ren(達仁鄉), Taitung(台東縣) and Wang-An(望安鄉) in Penghu (澎湖縣)in Taiwan. Finally, this study will help to examine the usefulness of ideas of environmental justice as a way of interpreting oppositional perspectives.

Three features of this case study indicate its originality. First, it provides a picture of the development of nuclear waste policy in Taiwan during the last 30 years – a picture that has not been provided before. Second, it studies the issue of nuclear waste storage sites at a particularly propitious time. In March 2009, the government announced two potential sites for hosting nuclear waste in Taiwan - Taitung and Penghu. This announcement provided a unique opportunity to undertake qualitative interviews with local people in these two candidate sites to understand local opposition to nuclear waste in Taiwan and, in particular, to explore how local opponents conceptualized and constructed their opposition. The data gathered from interviews will be analysed in the context of environmental justice in order to examine the usefulness of ideas of

environmental justice as a way of interpreting the oppositional perspective. Third, because over 90% of the population of one of the case study communities is made up of an indigenous people, this research can connect with indigenous Indian communities in Native America as well as other indigenous people elsewhere in the world on the issue of siting nuclear waste repository.

1.5. Research Questions

The aim of this research is to critically assess the management and politics of nuclear waste in Taiwan using an environmental justice approach. Firstly, this research looks into the history of nuclear waste management to see if the past politics of nuclear waste policy in Taiwan reflected an idea of environmental justice. Secondly, by looking into the current siting process of a nuclear waste repository in Taiwan, this research explores how the latest controversy over siting reflects the ideas and principles of environmental justice. Thirdly, this research hopes to provide suggestions about what could be done to improve the extent of environmental justice in the siting of the nuclear waste repository in Taiwan.

1.6. Methodology

To understand the nuclear waste situation in Taiwan, this research conducted two sets of qualitative interviews. The first set of interviews was carried out in December 2003 and January 2004, with government officials, anti-nuclear campaigners from Lan Yu (Orchid Island) (蘭嶼鄉) and Da-Wu (大武鄉), and members of environmental NGO such as Taiwan Environmental Protection Union. The second set of interviews was carried out in September and October 2009 in order to understand the opposition to nuclear waste in Da-Ren and Wang-An, focusing on local people's experiences of the siting process.

The long gap between these two sets of interviews was because of the protracted nature of the policy development in Taiwan for siting nuclear waste repository. Before 2006, there was no legal basis for siting a new nuclear waste repository in Taiwan. Since 2002, government and legislators started to discuss and drafted the ‘Act on Sites for the Establishment of Low Level Radioactive Waste Final Disposal Facility’. This Act was not enacted until April 2006. The details of the policy process will be discussed in chapter five. .

For the 12 interviews carried out in 2003 and 2004, interviewees were identified from newspapers, magazines, and websites, and contacted by emails and telephone to confirm the date and time for the interview. The interviewees included 2 government officials (at the same time) from the Fuel Circle and Material Administration, 7 anti-nuclear waste campaigners from Lan Yu(蘭嶼), 1 anti-nuclear waste campaigner from Da-Wu (大武), and 3 members of Taiwan Environmental Protection Union (TEPU). Government officials were asked to view the interview questions before the interviews, because I suspected that otherwise they might not want to provide any information which would not be in the government’s favour. 4 interviews were conducted face to face in Taipei (台北), 6 in Lan Yu (蘭嶼), and 2 in Taitung (台東). Most interviewees agreed to allow their affiliations and names to be revealed, but two interviewees from Lan Yu asked to keep their details anonymous. Interviews lasted between one and two hours and the language used in the interviews was mandarin. Government officials were contacted after the interviews as they requested to see the transcription.

For the interviews conducted in 2009, news about nuclear waste siting published in newspapers and websites was searched for in order to identify potential interviewees who were the key players in the campaign against nuclear waste storage in the two areas before the interviews. Those key players in Da-Ren and Wang-An were contacted by

telephone or email to explain to them the purpose of the research and to request interviews from them. Several interviewees asked to see the interview questions before the interviews. I also used interviews as a snowballing method to get more opponents of nuclear waste to talk about their feelings and experiences about the siting process, asking interviewees to recommend people they knew were keen to talk about the issue of nuclear waste. This method was very helpful in increasing the interview numbers as well as locating some key players who had not been identified by the media. Two interviewees who did not live in Taitung and Penghu were also interviewed, because they were longstanding environmental campaigners against nuclear waste, and could offer a different perspective from the local campaigners. During September and October 2009, a total of 32 interviews were carried out by telephone. Because Wang-An and Da-Ren are in relatively remote areas in Taiwan, face-to-face interviews would have been very costly in terms of money and travelling time. The interviewees included members of local communities, members of local environmental groups, local village leaders, local county councillors, environmental lawyers, and a local geologist.

In Wang-An, the opposition to nuclear waste were led by local villagers, and these leaders were interviewed. In Da-Ren, where Christianity was the main religion in the local communities, local campaigns were led by the Paiwan (排灣) Anti-Nuclear Waste Union which was established by priests from Paiwai Presby of the Presbyterian Church in Taiwan. Also, the Taitung Branch of Taiwan Environmental Protection Union played a very important role in Taitung areas. Members of both of these groups were interviewed during September and October 2009. The number of interviewees from the Taitung area was 25, of whom 11 belonged to the aboriginal Paiwan tribe, while in Penghu, the number of interviewees was 7, all of whom were either local residents or people from the Wang-An area (see Appendix for the list of interviewees). The reason that Da-Ren has more interviewees than Wang-An was because the population who live

in Wang- An are less than in Da-Ren. Most locals in Wang-An moved out in search for work.

All interviewees were kept anonymous on the list in the appendix (See Appendix I) in order to protect their identities. Interviews lasted between 30 minutes and one hour, and were semi-structured in form. The main objective of the interviews was to explore how respondents perceived the prospect of hosting nuclear waste, and what their perceptions were of the decision-making procedures, including the holding of referendums. Moreover, the interview questions were designed to look at themes of environmental justice, both distributive and procedural, including the issue of compensation. All the interviews were conducted and recorded in Taiwanese or mandarin Chinese; transcribed in full in mandarin Chinese; then translated into English in order to provide quotations for the thesis.

Generally, the interviewees could comprehend the interview questions during the telephone dialogue, but without face-to-face contact, it was not easy for me to understand the emotions of the interviewees. The degree of willingness and openness of interviewees varied: some interviewees from local indigenous communities in Da-Ren questioned the purpose of the interviews, making it clear that they did not want to be interviewed by anyone who represented Taipower or the government. After I explained the purpose of the research to them, and assured them that their identities would always be anonymous, they were willing to be interviewed. Indeed, interviewees were generally eager to talk about their experience, which might be because they felt that their voices had been neglected by the authorities in the siting process and they would like other people to listen to them.

However, neither set of the interviewees included officials from Taiwan Power

Company Co. Ltd¹. (Taipower). This is because of lack of access. Officials from Taipower were contacted, but no one was willing to be interviewed. This suggested a closed attitude on the part of Taipower. Evidence has shown that Taipower see nuclear waste as a matter to be kept secret because nuclear waste is a very controversial and sensitive issue. Another characteristic of Taipower was lack of information, both about nuclear waste and the policy process of nuclear waste management. Members of local communities often claimed that Taipower did not provide them with accurate information about nuclear waste and they had no access to Taipower about the policy process of nuclear waste management. In addition, Taipower has been accused of often bribing local political elites in exchange for their support for accepting nuclear waste. Details of Taipower's behaviour can be found in Chapter 5 on the previous siting for a nuclear waste repository in the 1980s, and in Chapter 7 for the later siting for a nuclear waste repository in Taiwan in 2009.

1.6.1. Data Analysis

All interviews were recorded and transcribed in full. The transcripts were read carefully several times, because transcribing interviews and translating the results into different languages is not easy. In order to identify the main themes in the context of environmental justice, words and phrases were directly translated. For example, interviewees rarely mentioned the words justice and injustice (正義 Zeng-Yi; 不正義 Bu Zeng Yi). Instead, many interviewees mentioned the words fairness and unfairness (公平 Gong-Ping; 不公平 Bu Gong-Ping). In the transcripts, the latter terms were faithfully reproduced.

¹ Taiwan Power Co. Ltd (Taipower) is a state-owned company which is under the management of the Ministry of Economic Affairs. All nuclear power stations in Taiwan are administrated by Taipower. Hence, Taipower is the biggest producer of nuclear waste in Taiwan.

In the data analysis, the main themes of environmental justice were searched for and divided into distributive and procedural perspectives. Interviewees' feelings implicit in expressions such as 'why choose us as a candidate site?' were analysed as part of the distributive environmental justice discourse, in which the feeling of unfairness about carrying a disproportionate health risk by hosting nuclear waste while other parts of the country benefitted disproportionately from electricity which nuclear power generated, was explored. Issues of compensation and generational justice were also analysed using the distributive environmental justice framework

The procedural environmental justice framework was also a core element in the data analysis process of themes raised in the interviews - such themes as the transparency of the government and Taipower; Taipower's attitudes and strategies to engage local communities; the form of public consultation; and issues about the scale of referendums. Also, the interview data was used to test whether behind these perceptions of distributive and procedural injustices in the nuclear waste decision making process lay more general senses of injustice such as economic injustice, political injustice, and cultural injustice. For example, economic injustice was identified by interviewees in the way that Taipower and government officials exploited local poverty by offering compensation; political injustice was identified in the interviewee's criticism of the absence of proper public consultation; and cultural injustice was identified in the experiences of most aboriginal interviewees encountered in Da-Ren, who complained that government officials did not respect their culture in the siting process.

1.7. Chapter outline

Chapter two is about the politics of nuclear waste management. The aim of this chapter is to offer background ideas about the politics of nuclear waste management from

experiences in several different countries. The chapter starts from the different management options of nuclear waste management which have been implemented in different countries. The experience of how these countries developed their strategies on nuclear waste siting will also be discussed in this chapter. Next, this chapter will discuss different aspects of uncertainty in the politics of nuclear waste management which make the issue of nuclear waste very difficult to find a solution to deal with. The chapter also includes a literature review of the issue of nuclear waste management and environmental justice from previous researches. The final part of this chapter will discuss the published literature on the politics of nuclear waste, including studies of opposition groups and analyses of environmental justice

Chapter three will look at environmental justice and issues of nuclear waste in the context of environmental justice. This chapter is divided into three parts. The first part covers notions of environmental justice, looking at social justice theories and theories of environmental justice that are racial, procedural, and distributive, to establish a framework of environmental justice. In the second part of the chapter, the environmental justice framework will be discussed in relation to nuclear waste. The environmental justice of nuclear waste management also includes more general justice issues, and economic, political, and cultural justice will therefore be discussed in this part of the chapter. The last part of the chapter is about the environmental justice implications of the opposition to nuclear waste.

In Chapter four, the thesis begins to examine the case study in Taiwan. However, we cannot discuss the politics of nuclear waste in Taiwan without understanding the politics of Taiwan. The overall political, social and economic situation in Taiwan will be discussed from 1624 to the present. The general political situation in Taiwan, political economy, foreign relations, and democratization will be discussed in order to give a

picture about politics and society in Taiwan.

Chapter five is about the political history of nuclear waste policy development in Taiwan, focusing on the dumping of nuclear waste by the Taiwanese government on an indigenous people's island during 1982-1996. Chapter five will also examine the decision-making process and the response from the local communities, how the local communities were affected by dumping nuclear waste in their homeland, and how these communities negotiated with government.

Chapter six is about understanding current opposition in the case study communities which have been most recently affected by the siting process. This chapter is based on the second set of interviews which I conducted in September and October 2009. Taiwan. In April 2009, the development of nuclear waste policy in Taiwan reached a new stage, when two new potential sites were nominated by the government of Taiwan. This chapter provides background information about the siting criteria and siting process in Taiwan which led to the decision of these two potential sites being made in April 2009. It also provided information about the geological, demographic, and socio-economic situation of these two communities in order to analyse the siting process in the context of environmental justice.

Chapter seven discusses the results of the case study, using qualitative data gathered from interviews to examine the decision-making process of siting new nuclear waste repositories in Taiwan. The whole siting process is analysed to see how well the policy and management of nuclear waste in Taiwan complies with the idea of environmental justice as well as economic, political, and cultural justice. The main concern of this chapter is how local communities feel about the environmental justice in the siting of new repositories of nuclear waste in Taiwan.

Chapter eight, the final chapter of this thesis, has three objectives. Firstly, it discusses the importance of this research based on the evidence provided in the previous chapters. Secondly, the chapter will endorse the value of using environmental justice as a framework in the analysis of nuclear waste management policy. Finally, this chapter will show how lessons on the environmental justice of nuclear waste management and policy can be learnt from the experience of policy makers in Taiwan and other countries

1.8. Conclusion

This thesis is an investigation into the environmental justice of nuclear waste policy in Taiwan. It focuses on two cases – Taitung and Penghu – to tease out the environmental justice perspectives of the oppositional groups in these two communities. In doing so, the thesis not only contributes to our understanding of the politics of nuclear waste management in Taiwan, but also offers an insight into the way in which the concept of environmental justice can articulate the reasons for local opposition to nuclear waste site proposals. One such insight is that behind the interviewees' perceptions of environmental injustices (both distributive and procedural) lay wider perceptions of economic, political, and cultural injustice.

Chapter 2. Nuclear Waste Disposal

2.1 Introduction

The disposal of nuclear waste during the last 65 years has presented the world's nuclear powers with a growing problem. Its development in power generation, arms, medical and industrial applications have all led to an increasing concern over how to dispose of the radioactive waste produced. The National Safety Council of the USA has identified different kinds of nuclear waste in the form of gases, liquids and solids, all with their own specific disposal problems; different sources of nuclear waste from isotopes to equipment contaminated as a secondary result of manufacture or use during processes utilising radioactivity; and different levels of radioactivity - very low (VLLW), low (LLW), intermediate (ILW), and high (HLW).

By far the biggest nuclear waste disposal problem is that posed by the nuclear power generation industry. The International Atomic Energy Agency has confirmed that 30,260,371 square metres of nuclear waste have been generated since nuclear power generation started and there are now 200,000 square metres of low and intermediate level radioactive waste, and about 10,000 square metres of high level waste being produced worldwide each year (IAEA. Managing Radioactive Waste Fact Sheet). In Taiwan, huge amounts of waste have accumulated: 232,460 barrels (26,681 are HLW and ILW, 205,779 are LLW) of nuclear waste since the first nuclear power station began to operate in 1978. This chapter defines radioactive waste; discusses the different types of radiation and how dangerous they are to human beings; explains the specific health risks of radioactive waste and the management of those risks; rehearses the experiences of some countries in dealing with this controversial issue; discusses the published literature on the politics of nuclear waste, including studies of opposition groups and

analyses of environmental justice; and investigates the particular characteristics of radioactive waste that make dealing with it so problematic.

Table 2.1. Total amount of nuclear waste in Taiwan until 2008

| Type of Waste | LLW | HLW and ILW | Total |
|------------------|--------|-------------|---------|
| Amount (barrels) | 205779 | 26.681 | 232,460 |

Sources: Republic of China (Taiwan). Fuel Circle and Material Administration, FAMA.

2.2 Nuclear waste

2.2.1 Nuclear fuel cycle

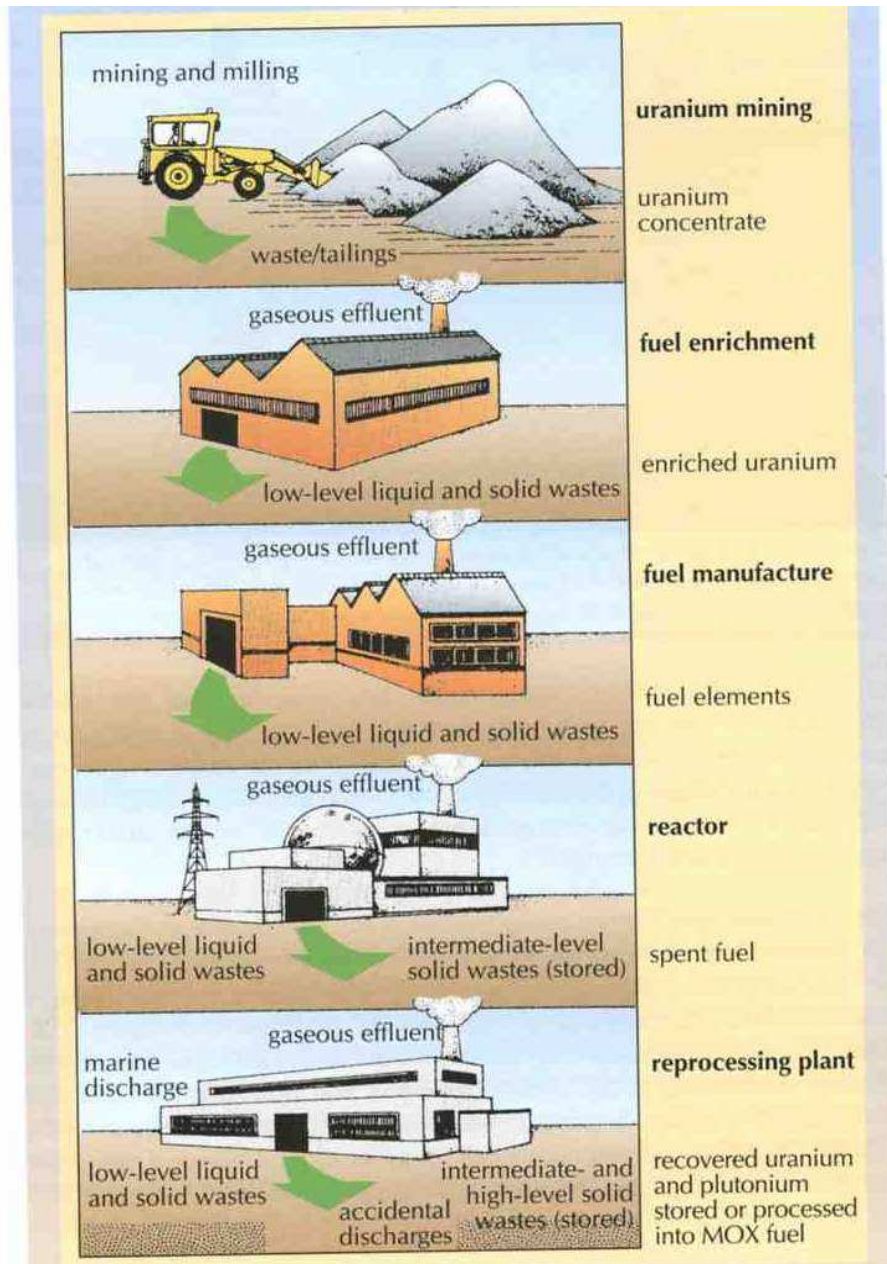
Radioactive waste is the main source of radioactivity, and it is produced in three ways: from mining, enriching, and reprocessing. There are five main stages in the civil nuclear fuel cycle, as shown in Table 2.2. In the first stage, uranium mining, uranium is extracted from sandstone, shale and rocks. Experts calculate that only five pounds of uranium can be extracted from each ton, and so the mining of uranium creates a huge amount of liquid and solid waste such as radium and thorium which contain long-lived radionuclides (Blowers et al 1991:8). Furthermore, mill tailings in the mining site may be dispersed off-site by wind and rain and cause additional hazards to the environment and people. The second and third stages - fuel enrichment and fuel manufacture - create minor quantities of waste. The fourth stage, electricity production by the nuclear reactor, is the major source of radioactive waste in the nuclear fuel cycle. This stage creates large volumes of waste which are highly radioactive including spent fuel, intermediate level solid wastes and low level liquid and solid waste. In the fifth stage, reprocessing of the spent fuel generates large amounts of hot liquid radioactive waste and large volumes of solid waste. Moreover, after the nuclear fuel cycle is finished, the level of

radioactivity has not stopped increasing, because after nuclear power plants are closed, a large amount of nuclear waste will be caused by the process of decommissioning (Blowers and Elliot 2003: 106).

Reprocessing is a form of chemical processing or recycling of spent fuel. Originally, reprocessing developed to recover uranium and plutonium for nuclear fuel (Blowers and Elliot 2003: 1076). Russia, USA, Pakistan, the UK, and France are the countries in the world which reprocess spent fuel for commercial use of nuclear substance. The clients of UK and French reprocessing plants include Belgium, Germany, Switzerland, and Japan. As the last section has mentioned, spent fuel has been categorised as HLW, and reprocessing releases large volumes of nuclear waste in solid, liquid and gaseous forms. According to a European Parliament report, 80 per cent of nuclear waste in France results from reprocessing and 90 per cent of nuclide emissions and discharges in the UK result from reprocessing activities (European Parliament 2001: 34 and 59).

Reprocessing has become a highly controversial issue. It began during the 1950s because raw materials for nuclear power were not as easily available as now, and reprocessing was an option to supply raw material for both nuclear weapon and nuclear power generation. But now, commercially, the cost of new uranium ore is cheaper than reprocessing and the previous reprocessing and decommission of nuclear weapons had accumulated enough plutonium for civic nuclear power. Worries about environmental risks from the large volume of nuclear waste generated by reprocessing led many environmental NGOs and local communities to request the shutting down of reprocessing plants. However, both UK and France are tied into many international commercial contracts to reprocess spent fuel, and it is not easy for them to withdraw from these contracts quickly.

Table 2.2. Nuclear Fuel Cycle



Source: Blowers and Elliot 2003: 112

2.2.2 Classification of radioactive waste

Nuclear waste can be broken down into four accepted categories as follows:

2.2.2.1 Very Low Level Waste (VLLW)

This is waste with an extremely low level of radiation, arising from a variety of sources including medical and industrial processes. The UK Department of Trade and Industry has stated that VLLW can be disposed safely directly at landfill site or indirectly after incineration (Great Britain. DTI).

2.2.2.2. Low Level Waste (LLW)

This can be identified as lightly contaminated materials, which includes metals, soils, building rubble, clothes, paper towels, and laboratory equipment. Decommissioning of nuclear power plants will produce large volumes of LLW in the forms of building materials and redundant plant (Blowers et al 1991:8). Virtually everything that is used or is in contact with radioactive substances eventually ends up as LLW. Though very little LLW is considered threatening, some of it will remain radioactive for very long periods of time (Openshaw et al 1989: 22).

2.2.2.3. Intermediate Level Waste (ILW)

This is the waste originating from processes which closely relate to energy production and reprocessing. It includes fuel cladding, control rods, filters, slugs and resins from cooling system (Blowers et al 1991: 10). The major component of ILW is metals and organic materials with small quantities of cement, graphite, glass and ceramics (Great Britain. DTI). ILW is subdivided into long-lived and short-lived with the division base on the half-lives more or less than 30 years. ILW can be extremely radioactive but it is more stable than HLW.

2.2.2.4. High Level Waste (HLW)

HLW has the greatest concentration of radioactive materials and produces substantial quantities of heat. HLW is generated when the uranium and plutonium have been removed from spent nuclear rods through the reprocessing process (Blowers and Elliot 2003: 109). In some countries where spent fuel is not reprocessed, it is classified as HLW. The temperature of HLW may rise significantly so it needs to be cooled before being stored. HLW is highly dangerous, containing the most radioactivity: 0.1 cubic meters of HLW contains 99% radioactivity, by contrast to one cubic meter of ILW which contains only 1% of radioactivity, and four cubic meters of LLW which contain 0.001% of radioactivity (Blowers and Elliot 2003: 109).

2.3 Radiation

Radioactive waste contains radioactivity which is dangerous to health and the key problem of management. Radiation is the main concern which brings fear to the public. As Lash (1979) stated, 'Unlike the disposal of any other type of waste, the hazard related to radioactive waste is so great that no element of doubt should be allowed to exist regarding safety' (Blowers et al 1991: 8 and Lash 1979)² In this section, types of radiation are discussed; how radiation works is outlined; and what health risks it brings are considered. Radiation is the energy transferred by nuclear fission or a similar process as particles or waves through space or from one body to another (Blowers et al. 1991: 2). The reaction inside a nuclear reactor will irradiate non-radioactive materials, yielding an 'activation product' in the surrounding air, water, pipes and containment building, and thereby making them all radioactive. This 'activation product' returns these media or objects to their normal stable state over time when they release their own

² Quote from Blowers, A., Lowry, D., and Solomon, B (1991) *International Politics of Nuclear Waste*, London: Macmillan. originally from Lash, T. (1979) "Radioactive Waste: Nuclear Energy's Dilemma", *Amicus*, Vol.1, No.2, Fall 1979, pp 24-34.

radiation.

The rate of radioactive decay of unstable atomic nucleus is measured by 'half-life'. Half-life is the time which an unstable atomic nucleus takes to decay to half its original mass. The half-life of plutonium is 24,000 years and that of uranium is billions of years. But one half-life does not mean that the radioactive materials are no longer hazardous - atoms remain radioactive after one half-life, so it may take several times of a substance's half -life before it becomes not hazardous (USA. National Safety Council 2002: 3).

We can only prevent radiation from nuclear waste by burying or disposing of radioactive substances or by minimising its production in the first place. It is very difficult for scientists to conduct empirical experiments to test different types of procedures for treating nuclear waste because safety can only be proven after repositories for nuclear waste disposal have been constructed and begun to operate, and have been monitored over several generations of time.

2.3.1 Measurement of radiation

Generally, a Sievert (Sv) is the unit to measure the effective dose of radiation, normally expressed in millisiverts (mSv). $1 \text{ mSv} = 0.001 \text{ Sv}$. In the UK, the average exposure from background sources of radiation is around 2.6m Sv per year. Over 1,000m Sv per year could cause serious illness such as genetic disorder, increasing the probability of early death (Hinchliffe and Blowers 2003: 13).

2.3.2. Types of radiation:

Some radioactive substances can be more damaging to living cells than others, and to reflect this, radiations are scientifically divided into three types:

2.3.2.1 Alpha

Alpha radiation is the least penetrating but most dangerous form of radiation. It is unable to penetrate skin but severe cell damage can occur if an alpha emitter such as plutonium enters the human body (Blowers et al. 1991: 2). Alpha radiation must be in touch with living tissue to cause harm, and it slows down rapidly when it enters living tissue, but it leaves a much larger quantity of energy than any other type of radiation. Alpha radiation is roughly 20 times more effective at causing cell damage than beta or gamma radiations. However, Alpha radiation is easier to prevent than the other forms of radiation – indeed, it can be stopped by a piece of paper (Blowers et al. 1991: 3).

2.3.2.2 Beta

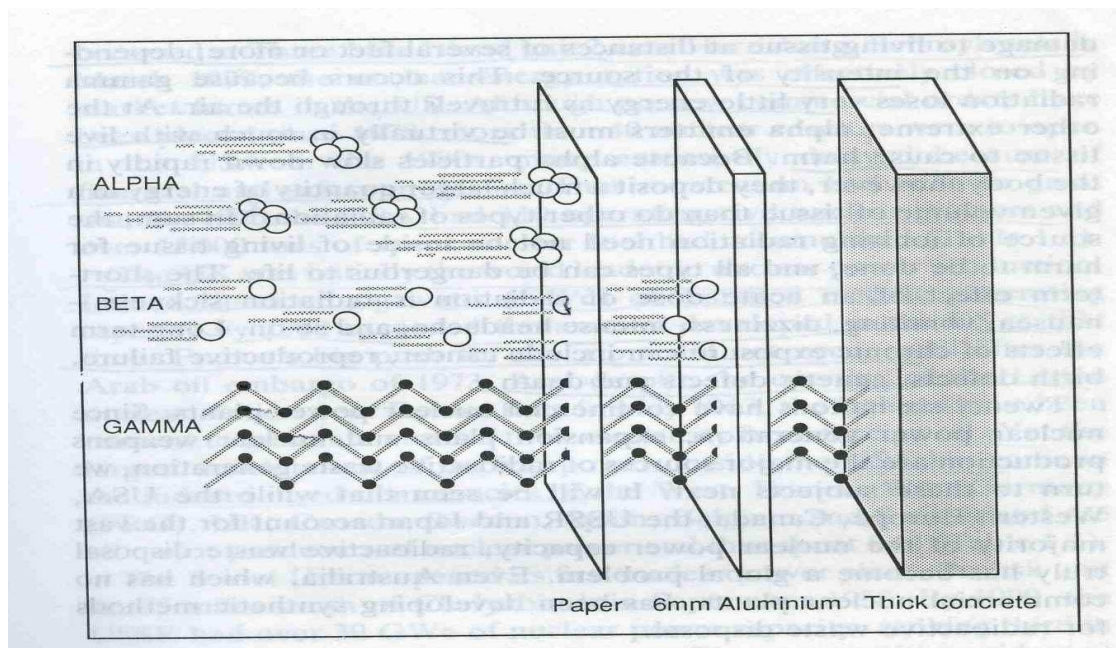
Beta radiation can cause skin burns (Blowers et al 1991: 3). It is less effective than Alpha but it can travel meters in the air and can moderately easily penetrate human skin to the "germinal layer," where new skin cells are produced (USA. DOE). If beta-emitting contaminants are allowed to remain on the skin for a prolonged period of time, they may cause skin injury. Clothing gear provides some protection against most beta radiation, while a sheet of aluminium foil can also block it (Radioactive Waste Management [http:// www.uic.com.au/waste/ht](http://www.uic.com.au/waste/ht)). Turning gear and dry clothing can keep beta emitters off of the skin.

2.3.2.3 Gamma

Gamma rays usually accompany alpha and beta radiations. Gamma rays are highly penetrating - they can travel through several feet of concrete in the walls of a containment building. Gamma rays can cause damage to living tissue at several feet of distance or more, depending on the intensity of the source. Pocket chamber (pencil) dosimeters, film badges, thermo luminescent, and other types of dosimeters can be used to measure accumulated exposure to gamma radiation (USA. DOE).

Table 2.3. Radiations

Source: Blowers et al. 1991: 3



2.4 Health risks of nuclear waste

Radiation can cause serious health problem to human beings. The short-term effect of an acute dose of radiation is radiation sickness, which causes nausea, vomiting, dizziness, and intense headache. The long-term effect of chronic exposure can cause cancer, reproductive failure, birth defect, genetic defect, and death (Openshaw et al. 1989: 14). According to the International Atomic Energy Agency (IAEA), we are

exposed to ionizing radiation from natural sources in two ways: (1) we are surrounded by naturally-occurring radioactive elements in the soil and stones, and we are bathed in the cosmic rays entering the earth's atmosphere from outer space; and (2) we receive internal exposure from radioactive elements which we take into our bodies through food and water, and through the air we breathe. In addition, we have radioactive elements (Potassium 40, Carbon 14, Radium 226) in our blood or bones. On average, our radiation exposure from all natural sources amounts to about 2.4 mSv a year - though this figure can vary, depending on the geographical location by several hundred percent. In homes and buildings, there are radioactive elements in the air (IAEA. Factsheets & FAQs). So we live surrounded by natural radioactive sources, in that there are radioactive isotopes in our bodies, houses, air, water, and in the ground. Since radiation and radioactive substance are natural and permanently exist in the environment, the risk associated with radiation can only be limited, not eliminated entirely.

2.4.1 'Deterministic' and 'stochastic' effects

Radiation causes two basic types of harmful effect - 'deterministic' effect and 'stochastic' effect. The deterministic effect has a threshold dose, above which the frequency and severity of the effect increase with increasing doses (Bayliss and Langley 2003: 8). The most common examples of deterministic effects are erythematic and hair loss. Stochastic effects have a proportional relation to the radiation dose: higher doses increase the probability of diseases such as fatal cancers and severe hereditary abnormality in offspring. The International Commission on Radiological Protection (ICRP) produced quantitative data on such harmful effects, which it calibrated as 'health detriment'. In summary, ICRP risk factors show that overall health detriment following exposure to low doses of radiation amount to $\sim 7.3 \times 10^{-2} \text{ Sv}^{-1}$. The risk factor for an exposed working population, aged 18-64 years, is slightly less at $5.6 \times 10^{-2} \text{ Sv}^{-1}$

(Bayliss and Langley 2003: 8).

Table 2.4. ICRP Risk Factor for Stochastic Effects

| Detriment | Adult workers | Whole Population |
|---------------------------|----------------------|----------------------|
| Fatal Cancer | 4.0×10^{-2} | 5.0×10^{-2} |
| Non fatal Cancer | 0.8×10^{-2} | 1.0×10^{-2} |
| Severe Hereditary effects | 0.8×10^{-2} | 1.3×10^{-2} |
| Total | 5.6×10^{-2} | 7.4×10^{-2} |

Sources: Bayliss and Langley 2003: 8

Research by ICRP on the acute effects of radiation on humans for a single whole body dose is as following:

At ~ 1 Gy, symptoms of radiation sickness will be apparent, but the patient will almost certainly recover (but with an enhanced risk of later stochastic effect);

at 4Gy, there is a 50 % chance of death;

at ~8Gy, death will occur within 2 months, due to bone marrow failure;

at ~ 15Gy, death will occur within 2 weeks, due to gastrointestinal tract failure; and

at ~40 Gy death will occur within 2 days, due to central nervous system failure (Bayliss and Langley 2003: 8).

2.4.2 Safe limits of radiation

The International Atomic Energy Agency (IAEA) has set a standard of dose limit to protect the human body. For the members of general public this should not exceed 1mSv in a year - equivalent to a dose to the lens of the eye of 15mSv in a year, and a dose to the skin of 50 mSv in a year (IAEA 1996: 91) For workers, occupational exposure should not exceed a dose of 20 mSv averaged over five consecutive years or a

dose of 50 mSv in any single year - an equivalent dose to the lens of the eye of 150 mSv in a year, and to the extremities (hands and feet) or skin of 500 mSv in a year (IAEA 1996: 92). For apprentices of 16-18 years of age who are training for employment involving exposure to radiation, and for students of age 16 to 18 who are required to use radiation sources in the course of their studies, the occupational exposure should not exceed to a dose of 6 mSv in a year, an equivalent dose to the lens of the eye of 50 mSv in a year, and to the skin of 150 mSv in a year (IAEA 1996: 92).

2.4.3 Epidemiological evidence

Research has shown a link between doses of radiation received and certain types of disease such as cancer and leukaemia. In the UK, Craft et al. (1993) examined the incidence of cancer in young people under 25 years of age, and found that the incidence of leukaemia near Sellafield nuclear installation was higher than normal. The study showed that in Seascale which is 3km south to Sellafield, there were four cases of leukaemias while only 0.4 were statistically to be expected. In another village, North Egremont, which is 7km north of Sellafield, four cases of leukaemia were discovered while only 0.4 case were expected (Craft et al.). Also, a team led by an epidemiologist, Martin Gardner, from the University of Southampton, estimated that a dose of 100mSv or more received by a father could lead to a six-fold increase of leukaemia in children born subsequently (Gardner et al.). Similarly, a research study conducted in 1999 by the University of Newcastle found that the exposure of radiation is associated with a greater risk of fathering stillborn children (BBC News 1999). In France, the same results were obtained in a study of an area of about 10 km around the La Hague nuclear installation where there were 3 cases of leukaemia observed while only 0.46 were expected (European Parliament 2001: 63). In 2008, a study in Germany funded by German Federal Office for Radiation Protection suggested that children under 5 years of age

who lived within 5 kilometres of a nuclear power station were 2.19 times as likely to be diagnosed with leukaemia as those living outside (Petel et al. c.f. Fleming 2008). In the meantime, children under 5 years of age living within 10 kilometres were 33 percent more likely to have disease than those living further away (Petel et al. c.f. Fleming 2008).

2.4.4. Fear

In addition to the effect of radioactive waste on physical health there is also an effect on human emotional or even mental health arising out of the fear which the threat of radioactive waste causes to people in certain areas. People's anxiety about nuclear waste is partly because of the health risk that it poses, and partly because of the uncertainty generated in their minds by the confusing picture of scaremongering by the media and reassurance by the nuclear industry and government. Popular anxiety is compounded by the fact that symptoms of illnesses generated by exposure to radiation may not manifest themselves for many years after the exposure, and indeed genetic effects may not reveal themselves until subsequent generations of children mature.

2.5 Management of nuclear waste

How are these risks to be managed? The key issue in the management of radioactive waste is safety, and this is not only about how to achieve safety, but also how to make people believe that safety is being achieved.

2.5.1 Principles of nuclear waste management

The objective of radioactive waste management is to deal with radioactive waste in a

safe way to protect human health and the environment now and in the future without imposing an undue burden on future generations (Ojovan and Lee 2005: 73). In 1995, IAEA published a document entitled 'The Principles of Radioactive Waste Management' as a guide to help countries develop a national regulatory programme on radioactive waste. This document stated nine principles as follows:

Principle 1 Protection of human health

Radioactive waste shall be managed in such a way as to secure an acceptable level of protection for human health.

Principle 2 Protection of the environment

Radioactive waste shall be managed in such a way as to provide an acceptable level of protection of the environment.

Principle 3 Protection beyond national borders

Radioactive waste shall be managed in such a way as to assure that possible effects on human health and the environment beyond national borders will be taken into account.

Principle 4 Protection of future generations

Radioactive waste shall be managed in such a way that predicted impacts on the health of future generations will not be greater than relevant levels of impact that are acceptable today.

Principle 5 Burden on future generations

Radioactive waste shall be managed in such a way that will not impose undue burdens on future generations.

Principle 6 National legal framework

Radioactive waste shall be managed within an appropriate national legal framework including clear allocation of responsibilities and provision for independent regulatory functions.

Principle 7 Control of radioactive waste generation

Generation of radioactive waste shall be kept to the minimum practicable.

Principle 8 Radioactive waste generation and management interdependencies

Interdependencies among all steps in radioactive waste generation and management shall be appropriately taken into account.

Principle 9 Safety facilities

The safety of facilities for radioactive waste management shall be appropriately assured during their lifetime (IAEA 1995).

The document urged each country where radioactive materials are handled to establish a national waste management programme and to ensure continuing communication between the regulatory authorities, the operators, and the public, in order to implement these nine principles. It is worth noting that Principles 4 and 5 affirm a concept of generational justice.

2.5.2 Technical aspects of nuclear waste management

Since nuclear power plants generate nuclear waste at every stage of the nuclear fuel circle, waste management must map on to each stage. In 2001, a consultation paper published by the UK government stated fourteen ways of managing nuclear waste, including above-ground storage, underground disposal, underground storage, partitioning and transmutation, disposal at sea, sub-seabed disposal, outer space, subduction zones, and ice sheets (Great Britain. DEFRA 2001: 17). Although there is no certain way of determining which is the best method to choose for the management of nuclear waste, some methods have been forbidden. For example, since 1983, the dumping of radioactive waste at sea has been banned by the London Dumping Convention. The remaining methods are discussed below.

2.5.2.1 Pre-disposal

Predisposal comprises all activities prior to waste disposal. There are six steps or stages of predisposal: pre-treatment, treatment, conditioning, immobilisation, transportation, and storage (Ojovan and Lee 2005: 126). During the pre-treatment stage, there are four activities: collection, segregation, chemical adjustment, and decontamination (Ojovan and Lee 2005: 130). First, wastes are collected and are stored for an interim period of time. Second, this interim period provides an opportunity to segregate radioactive waste according to radiological, chemical and physical properties. Third, chemical adjustment facilitates interim storage, transportation and treatment. Fourth, decontamination reduces a significant volume of the waste that requires further treatment. At the treatment stage, the objectives are to reduce the volume of waste, remove radionuclides from the waste, and change the waste's physical and chemical composition. At the conditioning stage, the aim is to transform radioactive waste into a form which is suitable for handling, transportation, storage, and disposal. The aim of immobilisation is to convert waste into a waste form by solidification, embedding, or encapsulation. A common immobilisation method is to solidify low and intermediate level of liquid radioactive waste in cement, bitumen, or glass, and to vitrify high level liquid waste in a glass matrix or embed it into a metal matrix (Ojovan and Lee 2005: 130). These methods include packaging the solidified radioactive waste into steel drums or into highly engineered thick-walled containers. Over-packing is also necessary for secondary or outer containers for subsequent handling, transportation, storage, or disposal of the waste. Transportation of conditioned radioactive waste would additionally use special containers or vehicles to journey to the final disposal repositories. Finally, at the storage stage, radioactive waste would be maintained in a condition suitable for isolation, environmental protection and monitoring. Storage of HLW requires a cooling period to alleviate some of the radiogenic heating before geological disposal (Ojovan and Lee

2005: 130, 270, and 271)³.

2.5.2.2. Disposal

Disposal is the final step in the management of radioactive waste. Disposal of radioactive waste means placing radioactive waste in a repository to prevent the escape of any waste material for hundreds, thousands or millions of years. This requires a system of multiple barriers comprising the natural geological barrier provided by the host rock of the site; an engineer barrier system such as the waste matrix; a container; an over-pack; a buffer or backfill; and a repository wall and wall linings. These various barriers act together to limit the radionuclide release into the environment (Ojovan and Lee 2005). The usual practice is that the short-lived LLW and ILW receive shallow disposal (near- surface disposal), while HLW, long- lived LLW and, ILW, receive deep disposal. Near-surface disposal in shallow trenches or engineered structures is for waste which will decay to a harmless level over a period of 200- 300 years (Bayliss and Langley 2003: 8). The design of these facilities should provide an adequate multiple barrier system to prevent the waste returning to its radioactivity over the timeframe (Bayliss and Langley 2003: 8). The design would also allow the monitoring of any activity in the local area to give advance warning of any action that needed to be taken. The near- surface disposal might be located on the surface or from a few metres to tens of metres depth in rocks and boreholes (Ojovan and Lee 2005: 273). Examples of these shallow disposal sites for short-lived LLW and ILW can be found in Drigg (West Cumbria) in the UK, Centre de'Aube and Centre de la Manche in France,

³ There is often confusion between 'storage' and 'disposal'. The distinction between them is that storage means that the waste must be retrievable, whereas disposal is intended to be a permanent measure. However, the term 'repository' is often used loosely to imply a place of temporary storage but one that might become permanent because the government and the public have not yet reached agreement on the final disposal site of radioactive waste.

Rokkasho-Mura in Japan, and El Cabril in Spain (Bayliss and Langley 2003: 8). Facilities to a depth of 100- 500 metres in hard rock or underground salt domes to host LLW and short-lived ILW can be found in Olliluoto and Loiviisa in Finland, Forsmark in Sweden, Morseleben in Germany, Himdalen in Norway, and Wellenburg in Switzerland (Bayliss and Langley 2003: 8).

Deeper disposal of long-lived waste is intended to reduce the risk of any return of radionuclides to the environment. It is possible for the radioactive material to be discharged via groundwater pathways, so it is essential to choose the site in a place where the water movement is very low and where natural and engineered barriers can help to prevent the discharge. Examples of very deep waste disposal sites (i.e., below 500 metres) include the Waste Isolation Pilot Plant (WIPP) in New Mexico, Yucca Mountain in Nevada in USA, and Gorleben in Germany (Bayliss and Langley 2003: 8). However, as the decay of some of the radioactive material could continue for hundreds or thousands of years or even longer, containment is difficult, nor is it easy to gain public confidence in containment policy. In some countries, underground research laboratories have been constructed to test the robustness of containment policies, and such facilities are found in Bure in France, Onkalo in Finland, Gorleben in Germany, Grimsel, Mont Terri, and Wellenburg in Switzerland, Mol in Belgium, Aspo in Sweden, Sellafield in the UK (though these facilities were abandoned after the public enquiry in 1986), and Tono and Honorobe in Japan (Bayliss and Langley 2003: 8).

The most obvious danger lies in the leaking of nuclear waste drums. Most countries using nuclear energy infuse nuclear waste in steel barrels. But after several decades, these drums became rusty and some of them leak radioactive substance into the surrounding environment, making repair work urgent. However, no scientist can guarantee that such repair work would prevent leaking forever: all that scientists can do

is to keep monitoring and repairing facilities for generation after generation until a solution is found.

2.5.3 Ethical aspects of nuclear waste management

The disposal of radioactive waste often imposes the cost on local communities while other part of the country benefit from the clean electricity production without bearing any cost. This unequal distribution of radioactive waste raises three ethical issues: interregional equity; intergenerational equity; and equitable compensation.

2.5.3.1 Interregional equity

Interregional equity is about local communities near nuclear waste repositories for nuclear waste facilities suffering from long-term exposure of radiation and health risks while other communities – indeed, the rest of the nation - benefit from the electricity produced by nuclear power without being exposed to these risks. This is an unfair concentration of health risks in local communities which host nuclear waste. For example, as we shall see in later chapters, the Taiwan government has since 1982 disposed of its nuclear waste in an indigenous people's island 65 kilometres from Taiwan Main Island. These indigenous people suffer from inequality of treatment because they are exposed to much more radiation than other people in Taiwan. However, inter-regional equality is not only within a country but also between countries. Some international agreements have allowed countries to dump nuclear waste in other countries. Invariably, the host countries are economically poorer than the producer countries, and they obtain money to fund their poverty-reduction programs by providing facilities for producer countries to dump their nuclear waste. Producer countries gain from such deals because they lack their own repositories for nuclear waste due to strong

opposition within their countries. But the result is an unequal distribution of hazards: the host countries carry the burden of health risk and environmental risks while the producer countries benefit from dumping their nuclear waste outside their borders. Also, within the host countries, the outcome is an unequal imposition of risks on the local communities which are located near the dump sites, because they suffer from exposure to radiation while other communities in the host countries benefit from the financial aid which flows from the producer countries without being exposed to the radiation.

2.5.3.2. Intergenerational inequality

Another ethical dimension of nuclear waste management is intergenerational inequality. Nuclear waste is a long-term problem: nuclear energy provides power supplies not only for the present generation but also for future generations, and in so doing, it generates large volumes of nuclear waste. This nuclear waste will not vanish until its radioactivity decays to a safe level, which may take thousands of years, during which time the costs of managing nuclear waste, which includes monitoring, repairing, and carrying out detailed safety measures, falls not only on the present generation but also on future generations. Similarly, radiation from nuclear waste causes health risks not only to the present generation but also to future generations. These two considerations – cost and health risk - raise the difficult ethical issue of how to ensure their fair distribution over time. It seems almost impossible for politicians to redress intergenerational inequality hundreds of years into the future.

2.5.3.3. Compensation

One way of redressing an inequitable concentration of radioactive waste in some local communities is by compensation. At any rate compensation could be the answer to

tackle interregional inequality, taking the form of investments by governments or the nuclear industries to provide public infrastructure for local communities, employment of local citizens, grants, or tax rebates (Openshaw et al. 1989: 9). Such compensation would also serve as an incentive for local communities to accept the proposal of dumping nuclear waste in their area. Of course, compensation would not reduce any risks caused by dumping nuclear waste – negative health effects on local communities would not vanish because of any compensation. Moreover, some people regard compensation as merely a way to bribe or buy off opposition to nuclear waste dumping in local communities.

As for compensation for intergenerational inequality, although this would be very difficult far into the future, many countries have established funds to benefit at least the next two or three generations. For example, the government-owned nuclear industry, Taiwan Power Company, contributes NT\$ 0.17 (approximately £0.34 pence) per unit of electricity to such a fund, which since 1986 has topped NT\$ 9.97 billions (approximately £199.4 billion) (Taipower 2009). This fund is exclusively earmarked for the final disposal of nuclear waste and the decommissioning of nuclear power plants, and its large size has attracted several local communities and foreign countries to compete for contracts for nuclear waste dumpsites.

2.5.4. Political aspects of radioactive waste

There is a lot of politics surrounding the nuclear waste disposal issue. This is mainly because the issue is highly controversial, causing considerable conflict between different groups of people, especially government, officials, nuclear industries, NGOs, and local communities. One means of resolving such conflicts is often held to be public participation – i.e. for those who are directly concerned to have a formal opportunity to

express their opinion. The 1972 Stockholm Declaration, the 1975 Helsinki Final Act of the Conferences on Security and Co-operation in Europe, and the Global Nature Charter of the United Nations General Assembly of 1982, all state an obligation on governments to inform the public, and to make it possible for every person to have the opportunity to participate, individually or with others, in decisions concerning their environment (IAEA 1998: 48). In France and Hungary, the authorities have established local information or safety committees to directly monitor the safety, operation and emergency planning at nuclear facilities (IAEA 1998: 48). In Sweden, municipal councils, which have power to veto industries they do not want, have established local nuclear safety committees composed of municipal politicians to review nuclear emergency plans and keep the public directly informed of all safety related matters (IAEA 1998: 48).

To achieve public participation on the issue of radioactive waste, first, the type of information provided to the general public is very important: it needs to be accessible and easy to understand. Second, an independent expert s group or local liaison committees should be established to provide this information to people. Third, there should be a mechanism to allow members of local communities to express their opinions about nuclear waste. Fourth, there must be a mechanism to enable local people to have to right to veto the decision by central government. Fifth and most importantly, decision makers must recognise local economic, political, and cultural considerations, in order to avoid making prejudiced decisions.

2.6 International comparisons of nuclear waste management practice

Different nuclear energy-producing countries have adopted different waste disposal policies. We can gain a deeper understanding of Taiwan's policy by studying the three

phases that six of the world's most important nuclear energy-producing countries have all undergone during the last 50 years: (1) little public awareness of the problem (1960-1980); (2) growing public anxiety (1980-2000); and (3) public involvement in decision-making. In all the cases, governments had to deal with major opposition to proposed sites for nuclear waste disposal. The six countries are USA, Canada, UK, Germany, France, and Sweden.

2.6.1. USA

In the USA before the 1980s, issues about nuclear waste did not attract much public attention. In 1962, civil nuclear waste began to be disposed of in commercial shallow-land facilities in 1962. By 1980, the accumulation of waste from nuclear power stations stirred up growing environmental and safety concern, and state governors began to use their political power to influence the decision-making for siting the repositories for LLW and HLW. Then Congress stepped in and produced two laws that were intended to provide the basis for a national policy for radioactive waste management. These two acts were the 'Low Level Radioactive Waste Policy of 1980', which stipulated that state governments had responsibility for ensuring the safety of LLW disposal, and the 'Nuclear Waste Policy Act (NWPA) of 1982', which stipulated that the federal government had responsibility for ensuring the safety of ILW and HLW disposal.

With regard to LLW, many states in the USA entered into negotiations to form regional compacts to share facilities for LLW disposal. For example, the three states with their own LLW disposal facilities - Nevada, South Carolina, and Washington - were quickly joined by nearby states to form the Rocky Mountains Low-Level Waste Management Compact, the Southeast Interstate Low-Level Waste Management Compact, and the

Northwest Interstates Low-Level Waste Management Compact (Committee to Review New York State's Siting and Methodology Selection for Low-Level Radioactive Waste Disposal 1996: 25). Some states, including several populous states with large volumes of LLW, opted not to join a compact but to develop their own facilities (Committee to Review New York State's Siting and Methodology Selection for Low-Level Radioactive Waste Disposal 1996: 27). By early 1985, it was clear that no new disposal capacity would be available by 1 January 1986, the deadline specified in the 1980 Act when compacts with existing facilities could exclude out-of-region wastes. In recognition of this problem, the U.S. Congress passed the Low-Level Radioactive Waste Policy Amendments Act of 1985 (P.L.99-240) to enable the three states with existing disposal facilities to open them to the rest of the nation for an additional seven years (from 1986-1992) in return for which these states were given authorisation to impose a surcharge on waste received from generators outside their compacts (Committee to Review New York State's Siting and Methodology Selection for Low-Level Radioactive Waste Disposal 1996: 27). But even in 2001, twenty years after the enactment of the Low Level Radioactive Waste Policy 1980, only fourteen states had assured access to LLW disposal facilities. Only the eleven states of the Northwest and Rocky Mountain Compacts (which used Richland, Washington state's disposal facility) and the three states of the Atlantic Compact (which used Barnwell, South Carolina disposal facility) have assured long-term access to LLW disposal facilities. The other thirty-six states rely on temporary access to the Barnwell and Utah disposal facilities.

With regard to ILL and HLW, before 1982 there was no major US legislation addressing the need for a temporary or permanent high-level waste repository location. By late 1982, a national dialogue had begun that would provide a legal framework for making decisions about the United States' high-level waste management program. In 1987, Congress selected Yucca Mountain in Nevada as the sole candidate site for spent fuel

and high level waste. In 2002, Energy Secretary Spencer Abraham recommended Yucca Mountain as a suitable site to President George W. Bush who approved it. Despite Nevada Governor Kenny Guinn exercising his state's right to veto the Yucca Mountain project (Eureka County Yucca Mountain Information Office), the project was debated and passed first in the House of Representatives and then in the Senate. President Bush signed the joint resolution into law, officially designating Yucca Mountain as the nation's nuclear waste repository site, and the Department of Energy (DOE) began work on its application for a license to build and run the repository. However, after a long investigation process, in 2009 the Obama administration stopped the funding for the project and the US Energy Secretary announced in the Senate that the Yucca Mountain site was no longer viewed as an option for storing reactor waste (Hebert 2009). The reasons for this volte face are threefold: first, the Yucca Mountain site is a geologically complex location with unsuitable rocks and recent volcano movement; second, the US EPA upgraded its performance standard from 10,000 years to 1,000,000 years. Third, the US government had earlier neglected strong local opposition to the site. After the Yucca Mountain site was abandoned, the new US strategy was to seek alternatives site selections with substantial public involvement in an open and transparent decision-making process.

With regard to ILW, HLW, and Spent Fuel, DOE's Office of Civilian Radioactive Management is responsible for site selection, site operation and oversight through the Nuclear Waste Review Board, the Nuclear Regulatory Commission, and the National Academy of Scientific Research.

2.6.2. Canada

Until the late 1980s, Canada's nuclear industry regularly dismissed public opposition to

its policies. Between 1966 and 1992, the focus was on the expansion of nuclear power (22 reactors were built), and the industry claimed during this period of time that no disposal policy should delay Canada's nuclear power program (Durant 2009), claiming that public approval of permanent disposal policy was both slow and unnecessary. The industry decided that deep geological repositories were the most suitable option for storing nuclear waste, and the government was happy to agree to whatever the industry proposed. In 1983, two sites were selected, despite strong opposition from local people. However, both these sites were eventually abandoned because local people gained the support of local government to oppose them. At this point, the nuclear industry in Canada realised that they had to gain public approval in order to find a solution for nuclear waste. In 1989, a full public inquiry on the concept of disposal of nuclear waste was designed by the Atomic Energy Canada Ltd (AECL), a federal -owned company promoter and developer of nuclear power (Durant 2009). This enquiry was carried out between 1996 and 1997, and had three phases: phase 1 was to conduct a broad discussion of ethical-political positions on nuclear waste issues; phase 2 was to focus on technical assessments of nuclear waste disposal techniques; and phase 3 was to allow local communities to address issue about nuclear waste direct to AECL through visits to the affected communities (Durant 2009). However, this public enquiry did not work well because AECL gave people the impression that only technically issue were important, and that support for waste disposal meant support for more nuclear reactors.

To get to grips with this problem of site selection for storage of nuclear waste, the Nuclear Waste Management Organization (NWMO) was established in 2002 by Ontario Power Generation Inc., Hydro-Québec and New Brunswick Power Corporation in accordance with the Nuclear Fuel Waste Act (NFWA). NWMO was given responsibility for the long-term management of Canada's used nuclear fuel (Durant 2009), and it was

mandated to conduct investigations, carry out public consultations, submit to the Minister of Natural Resources its suggested approaches for the management of nuclear waste overseen by the Canadian Environmental Assessment Agency, and make recommendations to parliament about waste management options. The NWMO undertook a consultation program between 2002 and 2005, involving conversations, workshops and dialogue among groups that were already involved in nuclear issues. NWMO emphasised the openness of the consultation process and the importance of the input of citizens. It asked the public which questions they would like to have answered, and how they understood the choices that were available for waste management policies. However, NWMO attracted criticism for controlling the issues to be discussed and for avoiding questions about the future. Nevertheless, NWMO released its proposed Adaptive Phased Management (APM) plan in November 2005 which was approved by the government in June 2007 (Durant 2009). The APM involves disposing of, or storing, used nuclear fuel in geological formations; flexible implementation of nuclear waste management strategies in which voluntary schemes would be considered; and public consultation to be taken into account in formal political decisions to move the process forward. Because site selection is expected within the next 30 years, site assessment processes are now underway.

2.6.3 The U.K.

In the UK, principles on nuclear waste management were established in the late 1960s, creating a licence system to allow dealing with radioactive waste on a safe basis. But the nuclear waste issue did not become politically contentious until the mid-1970s when the Sixth Report of the Royal Commission on Environmental Pollution (RCEP), the Flowers Report, was published in 1976. Before then, the UK government was uncontroversially focusing on developing nuclear technology in order to compete

militarily with other countries and to establish a leading status on civil nuclear technology. Nuclear waste was sent to Drigg for near-surface burial or dumped in the Atlantic or stored as high level waste (HLW) above ground at Sellafield. In the Flowers Report, the RCEP urged the government to take a more strategic approach to the increasing volume of radioactive waste, and suggested that waste management objectives should be clearly identified at the outset of a nuclear programme rather than at a later stage when important options might be foreclosed. During the 1980s and 1990s, the siting of a radioactive waste repository in the UK became a major issue attracting a great deal of public attention, both at home and abroad. Several sites were named by the Nuclear Industry Radioactive Waste Executive (NIREX⁴), but all were abandoned because of strong local opposition. In September 2001, the government published a consultation paper 'Managing Radioactive Waste Safely' (MRWS) to launch an open and transparent process of managing nuclear waste in the UK.

Following the MRWS, the government decided in 2003 to establish a new independent body (DEFRA 2002), the Committee on Radioactive Waste Management (CoRWM), to review the options for managing the UK's solid radioactive waste, and to make recommendations for the long-term managerial options to DEFRA. CoRWM is also responsible for public consultation on the issue of nuclear waste management, while another body, the Nuclear Decommissioning Agency (NDA), is responsible for implementing LLW management policy. In its recommendations to the government,

⁴ NIREX was created with government approval in 1982 by the four main bodies of Britain's nuclear industry: UKAEA (UK Atomic Energy Authority); CEGB (Central Electricity Generating Board); SSEB (South of Scotland Electricity Board) and BNFL (British Nuclear Fuels Limited), so all the staff in NIREX were from the nuclear industry mentioned above. The aim of NIREX as stated by the government was mainly to construct and operate new land disposal facilities for LLW and ILW. Ownership of Nirex was transferred to the UK government's Department of Environment, Food and Rural Affairs (DEFRA) and Department of Trade and Industry (DTI) in 2005 and integrated into the Nuclear Decommissioning Authority in 2006.

CoRWM stated that ecological disposal is the best available approach for the long-term management of all the material categorized; that public involvement is vitally important to long-term nuclear waste management policy; and that the government should organise a private sector scheme for the siting of the nuclear waste repository. At present, CoRWM is holding a public consultation on how this voluntary scheme would work.

However, despite CoRWM's achievements, it has faced criticism for being remote from the public. For one thing, its work is still too close to experts - for example, some terms and concepts that it uses are not easy for lay people to understand. For another thing, it seems to operate in a top-down rather than a bottom-up manner – for example, the agenda and setting of the consultation is still dominated by CoRWM members. These shortcomings could weaken its effectiveness in implementing its policy at local level, because its decision-making process would not satisfy local people.

2.6.4. Germany

During the period 1960s-1980s, the debate in Germany about nuclear waste management was focused on which kind of rock formation is most suitable for storing nuclear waste. The experts on nuclear energy favoured salt formations as a final host for nuclear waste, but this idea was challenged after a site in Gorleben was identified, and people who were opposed to the Gorleben site suggested that other rock formations should be considered, as a result of which, clay and granite were included in the debate over hosting nuclear waste. This incident typifies the early history of siting nuclear waste repositories in Germany when transparent procedures were absent; the involvement of civil society actors was limited to consultation; and there was no obligation on the government to take the results of consultation into consideration in its

decision-making. However, since the 1990s, the AkEnd (Arbeitskreis Auswahlverfahren Endlagersuche Committee) group, which was established to develop a site selection process which included public participation, recognised that without transparency, all efforts to make progress would fail. But Akend faced considerable difficulties, including the lack of a participatory or deliberative discourse; the absence of interdisciplinary research that could bridge the gap between scientific/technical issues and social issues; and the hostility expressed by experts who were impatient with long consultative processes and showed little enthusiasm for conducting reviews on any new sites. As a result, Akend was unable to find a solution to the issue of a nuclear waste repository site.

Administrative complexity compounded these difficulties. In the German political system, responsibility for nuclear waste disposal is shared between several authorities: the Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety is the central regulator and supervisory authority; the Federal Office for Radiation Protection operates nuclear waste repositories; state governments are licensing authorities acting on behalf of the federal government; and energy suppliers are responsible for the storage of spent fuel. Moreover, the planning procedure is complex and hard to understand. Under the German Atomic Energy Act, the construction, operation, and closure of a repository must be licensed within the scope of a complicated permitting (i.e., licensing) procedure, and this procedure involves an environmental impact assessment; a public hearing; and zoning permits issued by the local communities (Hocke and Renn 2009). Some discussion about simplifying this system has taken place, but proposed reforms were not accepted by the federal government.

2.6.5. France

In France, the management of nuclear waste in France is regarded as a technical problem rather than a social problem, and since the 1950s, the nuclear waste issue has been discussed mainly in technical language. The issues of nuclear waste management were analysed by groups of researchers holding the view that as long as the relevant scientific research continued to be funded, all problems surrounding nuclear waste management were technically solvable. During the 1960s-1980s, French scientists asserted that geological storage was the most suitable solution for nuclear waste. The director of the Agence Nationale pour la Gestion des Déchets Radioactifs (ANDRA) – an agency created in 1979, originally as a department of the Commissariat à l’Energie Atomique (CEA) – felt that it was time to move into action without any public consultation. However, when the French government selected four geologically favourable sites and launched preliminary work to create an underground storage centre, they faced strong local opposition, and began to realise that public acceptance was needed to make the technical solution work. Indeed, the government now acknowledged that nuclear waste disposal was more of a political problem than a technical problem. Accordingly, the French government started to implement an educational policy targeted at ‘laypersons’, ‘allies’ and opponents of nuclear waste and nuclear energy. This policy included organising a rational debate to influence people’s perception and reduce their fears about nuclear waste. Michel Rocard, the prime minister, suspended research on storage and instead launched a more open process in nuclear waste siting. Although Rocard was accused of exploiting the nuclear waste issue to woo the fast-growing green electorate in the 1989 municipal and European elections (Barthe 2009 and Sainteny 1998)⁵, consultations were organised with all stakeholders rather than only scientists.

⁵ Quote from Barthe, Y. (2009) “Framing Nuclear Waste as a Political Issue in France”, *Journal of Risk Research*, 12: 7, 941 — 954. originally from Sainteny, G. (1998) “L’émergence d’un nouvel enjeu de politique publique: le pouvoir face à l’environnement”. *Politiques et Management Public* 16: 130–58.

In 1991, the government created a national evaluation commission (CNE) composed of independent experts, with the annual task of drawing up recommendations to steer research towards emergent problems and to maintain the political process open to public participation (Barthe 2009). Also, the national commission for public debate (Commission Nationale du Débat Public – CNDP), an independent administrative authority, was commissioned by the government to organize a broad national consultation process on the subject (Barthe 2009). The CNDP noted that geological storage is the preferred scientific solution and that this solution could be implemented by 2015. But as with many other countries, France is still unable to build a geological repository.

2.6.6. Sweden

As we have seen, many democratic countries have failed to secure agreement on the siting of nuclear waste repository. However, Sweden is different, in that she has managed to construct and operate facilities for low and intermediate level waste and interim storage of high level waste. This successful outcome is explained by three reasons. First, responsibility for all radioactive waste was given solely to the Swedish Nuclear Fuel and Waste Management Company (SKB) which was established, and is owned, by utility operators who handle LLW, ILW, and HLW. Second, strict legal conditions have been imposed on operators to guarantee the safe disposal of their nuclear waste. Third, extensive processes of public consultations were carried out in localities where sites were proposed.

Before the 1970s, nuclear waste was not considered as a problem in Sweden. But in 1970s, nuclear power became one of the most politically controversial issues in Swedish society. Indeed, in the 1976 parliamentary election, most of the constituents were

influenced by their attitude towards the nuclear industry. After that election, a coalition was formed between the anti-nuclear Centre Party and the Liberal and Conservative parties which favoured the Swedish nuclear power program (Lidskog and Sundqvist 2004). In order to solve the internal tension in the coalition government, the government proposed a law that became the Nuclear Power Stipulation Act which required that before building a nuclear power plant, it is the owner's obligation to show how and where the spent fuel would be finally stored with absolute safety (Lidskog and Sundqvist 2004). This Act forced SKB⁶ to conduct investigations into the bedrock in different locations in Sweden. During the early 1980s, SKB found that plutonic rock gabbros was the most suitable type of bedrock for storing nuclear waste, and selected two sites. However, because of strong local opposition further investigation into these sites was cancelled, and in 1986, SKB looked instead for sites with gneiss or granite where building a repository was more socially acceptable. So rather than choosing the best technical solution, SKB switched its search to find a site where the repository would be accepted by local people and to construct safety barriers at the site to make sure it was safe.

In 1992, SKB's new strategy was rolled out by sending an open and honest letter to all 286 municipalities in Sweden, saying that its purpose was to manage and dispose of nuclear waste and that if the representatives of the municipalities were interested in SKB's proposal, they should contact SKB. Following SKB's letter to the municipalities in Sweden, a few municipalities expressed an interest, though after some discussion, only two sites, Storuman and Malå, agreed to be part of a feasibility study (Lidskog and Sundqvist 2004). SKB concluded that these municipalities could offer good possibilities as potential sites for a final repository for nuclear waste. But in local referenda in

⁶ SKB (Swedish Nuclear Fuel and Waste Management Company) has the responsibility for finding a site for nuclear waste.

Storuman in 1995 and in Malå in 1997, the inhabitants decided to reject further investigations (Lidskog and Sundqvist 2004).

In spring 1995, SKB asked five municipalities which already hosted nuclear facilities about their willingness to allow SKB to conduct feasibility studies, and three of them (Östhammar, Oskarshamn, and Nyköping) agreed. The reason why SKB targeted those nuclear municipalities was that they were more familiar with nuclear issues and therefore more likely to be sympathetic to hosting further facilities. Feasibility studies were carried out in the three accepting municipalities, and later another three studies were conducted in neighbouring municipalities (Tierp, Älvkarleby and Hultsfred) (Lidskog and Sundqvist 2004). By December 2000, eight feasibility studies had been completed, and SKB decided that further site investigations would be carried out at three of them (Östhammar, Oskarshamn and Tierp). During 2001, the municipal councils in Oskarshamn and Östhammar agreed to further site investigations, but the council in Tierp rejected the SKB proposal (Lidskog and Sundqvist 2004). A five-year investigation involving an extended drilling program was carried out, and after a total of 20 years of effort, Östhammar was chosen in 2009 as a potential site for the final disposal of spent nuclear fuel. In 2010, SKB submitted an application to the Swedish Radiation Safety Authority (SSM) and to the Environmental Court to build the final repository in Östhammar. The SKB strategy has thus become a success story.

The Swedish experience shows that a successful strategy for obtaining sites for nuclear waste disposal lies in not insisting on using geological criteria alone. SKB's de-emphasis on finding the best rock for a repository made the focus on the siting selection more flexible, releasing it from the rigid assumption that only very few areas in Sweden can host nuclear waste. Instead, SKB's focus on local public acceptance together with the notion of a safety engineering barrier to prevent the leaking of nuclear

waste, resulted in allowing many municipalities in Sweden to host nuclear waste sites if they wanted to. Furthermore, by conducting a voluntary strategy, SKB interacted directly with local communities face-to-face in framing the issues around a nuclear waste repository. Indeed, SKB and local communities were partners, sharing a common interest rather than opposed as enemies to each other. In this respect, the SKB successfully created trust and social acceptance on the issue of nuclear waste.

2.7 Literature review on the politics of nuclear waste

2.7.1 Single case studies

A significant number of academic studies of the politics of nuclear waste have been conducted. Many of these studies are single-country studies. The most common approach for a single country study on the politics of nuclear waste management is a historical framework to analyse the evolution of nuclear waste disposal in the country. For example, Hocke and Renn looked into the decision-making process of nuclear waste management policy in Germany by analysing the policy development process in a historical content (Hocke and Renn 2009). Similarly, Solomon investigated the high-level radioactive waste in the USA by analysing the historical policy development in different period of time (Solomon 2009). Other single country studies on the politics of nuclear waste used non-historical approaches. For example, Morton, Airoidi, and Phillips' article used a decision analysis perspective in investigating the work of the UK's Committee on Radioactive Waste Management by interviewing its members (Morton et al). Durant (2009) studied the political economy of uncertainty of radioactive waste in Canada (Durant 2009), examining the Adaptive Phased Management (APM) strategy proposed by Canada's Nuclear Waste Management Organization (NWMO) in 2005 as an approach for managing used nuclear fuel. Durant

concluded that the APM was the cause of repeated failure of Canada's nuclear waste management since the 1980s because it merely underpinned NWMO's approach of supporting nuclear expansion and ignored inclusive participatory democracy. Hocke and Renn (2009) studied the decision-making process of nuclear waste in Germany by analysing the relations and attitudes of government agency, political parties, and environmental groups. They found that the discourse among experts was on the risk and benefit of different disposal options and locations whereas political debates focused on the question of nuclear power generation, so the main reason for the failure to find a permanent nuclear waste repository in Germany was the disjunction between technical, political and procedural discourses.

2.7.2 Comparative studies

There are also some studies which compare two or more countries' policies on nuclear waste management. For example, Kraft (2000) employed theories of policy design to compare the process of developing high level nuclear waste disposal policy in Canada with the experience of the United States. Durant (2007) comparatively analysed the national programs for nuclear waste disposal in the USA, UK, Sweden, and Canada using a historical developmental approach.

2.7.3 Studies of oppositional groups

There are many studies of oppositional groups in the literature – i.e. focusing on the actions and views of opponents of nuclear waste storage siting decisions. For example, Rajeev Gowda and Easterling (1998) studied the resentment among Native Americans caused by the siting of nuclear waste facilities, rehearsing the history and logic of US government processes which led to the involvement of Native America and the negative

reactions of some tribes to the nuclear waste options. Rajeev Gowda and Easterling (1998) found that Native America generally distrusted the government, did not experience procedural and distributive justice, and felt targeted in the siting process.

O'Hare's (2011) study on siting nuclear waste and local opposition looked into the Not In My Back Yard (nimby) syndrome of local communities opposed to nuclear waste. He suggested that to counter such opposition, scientific and engineering analysis must ensure that the risks of harm from nuclear waste repositories are low (if not zero); that continuous long-term monitoring must be carried out; and that reasonable levels of compensation should be offered in acknowledgement that the hosts of a repository are acting in the public interest. In other words, O'Hare suggested the government must be politically responsive and receptive, and be seen to serve the public interest rather than short-term advantage or expediency.

The flip side of studies of oppositional groups is the study of supportive groups. One such study was carried out by Sjöberg (2004), who investigated the factors determining local acceptance of a nuclear waste repository in Sweden. The article examined the attitudes and risk perceptions of people living in four municipalities in Sweden where a high-level nuclear waste siting proposal was being intensely discussed at the political level, in media, and among the members of public. Data showed that communities which already hosted nuclear facilities had relatively high levels of consensus on acceptability for further investigation of the sites. People in these areas also perceived lower risks for nuclear waste and were more in favour of hosting the proposed nuclear waste repository. Sjöberg (2004) concluded that those communities which are more in favour of nuclear energy would be good candidates for siting a nuclear waste repository.

2.7.4 Studies on environmental justice

There are also some academic studies of the politics of nuclear waste which focus on the ideas of fairness and justice, using the concept of environmental justice. These studies are particularly helpful to this thesis in developing a theoretical framework for the examination of the environmental justice of nuclear waste policy in Taiwan. For example, Schrader-Frechette (2002: 24) interpreted environmental justice in terms of the principles and practices of distributive and participative justice. She defined distributive justice as 'equal apportionment of social benefits and burdens'; and participative justice as 'equal rights to self-determination in societal decision making'; and she employed the principle of political equality because it includes components of both distributive and participative justice (Schrader-Frechette 2002: 24). Schrader-Frechette (2002: 95 and 117) studied the cases of siting nuclear waste facilities in Mescalero Apache and Yucca Mountain, arguing that both cases were environmentally unjust because the local economic disadvantage was not adequately compensated. Furthermore, because radioactive waste is a long-lived substance, members of future generations cannot consent on the issue of hosting nuclear waste (since they do not yet exist).

Blowers' studies on nuclear industry also recognised the importance of equality in a discussion of environmental justice. Blowers introduced the term 'nuclear oases' in the 1990s (Blowers et al 1991: xviii), referring to peripheral communities hosting existing nuclear facilities which are highly dependent on the nuclear industry in terms of employment and income and were the only places welcoming nuclear waste repositories. However, the dependency and lack of power of these communities meant that the unequal distribution of nuclear risks and health effects has become a moral problem. At the societal level, equality can be restored by means of compensation, which may involve a range of economic measures such as relief of taxation, regeneration, diversification and infrastructure provisions (Blowers 2003: 75). At the political level,

Blowers argued that equality entails a commitment to openness, the provision of information, participation in decision-making, and the provision for vetoing decisions affecting the community (Blowers 2003: 76). According to Blowers, therefore, nuclear oases are entitled to demand and receive compensation and their claims for political justice must be acknowledged by society.

Vari's study on public perceptions about equality and fairness in the siting of low level radioactive waste facilities in New York and Hungary also contributed to our understanding of fairness and equality in the siting of nuclear waste facilities. Vari investigated publicly-expressed responses to low and intermediate level of radioactive waste in the USA by analysing 100 letters of protest and petition by residents and environmental groups from candidate sites, while in Hungary she conducted 24 semi-structured interviews with residents, activists, and government officials of the potential sites (Vari 1996). From her analysis, Vari (1996) proposed the following criteria for fair site selection: technical efficiency (minimal overall risk: choose the technically safest site; minimal additional risk: choose an already contaminated site); local consent (preference for hosting by those who perceive that the facility results in a larger benefit than cost); criterion of distributive justice (contribution to the problem: those who generate the waste should host it); ecological vulnerability (those who have a disproportionate share of risks should not be targeted); and socio-economic vulnerability (those who are economically-socially disadvantaged should not be targeted). Vari also suggested that the main principles and criteria for fair siting process should be explored and discussed before the planning process begins in order to achieve a mutually accepted outcome (Vari 1996).

Ishiyama's study on environmental justice and Indian tribal sovereignty provided a different perspective on environmental justice and nuclear waste. Ishiyama examined

American-Indian tribal sovereignty in the context of environmental justice through an analysis of a land-use dispute over the decision to host high level radioactive waste on the Skull Valley Band of Goshute Indians' reservation in Utah. Based on archival research and interviews with local people, she argued that the Skull Valley Goshute Indian Reservation has suffered the consequences of unequal distribution of toxic hazards and environmental racism over the years. As a consequence of the unequal distribution of toxic hazards and environmental racism, the Skull Valley Goshute Indian Reserve has been surrounded by chemical deposits, waste incinerators, and low level nuclear waste dump sites, making Skull Valley the 'nation's greatest concentration of hyperhazardous and ultradeadly materials' (Ishiyama 2003). This prolonged process of environmental racism has produced a landscape of injustice in which local people have suffered both procedural and distributive injustice. Conflicts over the definition and practice of sovereignty also revealed the social, historical, and political-economic complexities of environmental justice. Ishiyama (2003) suggested that rather than seeking equality in distribution of hazards, environmental justice requires the participation of communities in various decision-making processes. In the case of Indian country, environmental justice depends on the tribes' sovereign capacity to pursue politically, economically, and ecologically options for substitutable development. Therefore the reinforcement of the political and economic sovereignty of tribes will lead to the long-term accomplishment of environmental justice (Ishiyama 2003). Hoffman (2001) also studied the energy policy, environmental justice, and the politics of nuclear waste by analysing the case in Skull Valley Indian Reservation in Utah, focusing on the federal government and local government's attitude towards siting a high-level radioactive waste, and the relations between federal government, state government, and Indian leaders.

2.7.5. Studies of environmental justice in Taiwan

In the past, most researchers on nuclear waste in Taiwan were concerned with the technical aspects of the problem. However, some studies of environmental justice in Taiwan briefly mentioned the case of Orchid Island (also known as Lan Yu/ Lanyu) where the government had dumped nuclear waste from 1982 to 1996 without local people's consent. For example, Chi (1997) referred to Orchid Island (Lan Yu) as a case of environmental colonialism in his article about environmental colonialism. Huang (2003) was the first to discuss justice in relation to the case of Orchid Island (Lan Yu), but his discussion was restricted to how many times the concept of generational justice was mentioned in the meetings between people from Orchid Island (Lan Yu) and government officials. In 2006, Fan conducted a more thorough-going study of the concept of environmental justice in the nuclear waste issue in Taiwan in general and Orchid Island (Lan Yu) in particular, conducting focus groups in that community to examine local perceptions (Fan 2006a and 2006b), and her two articles on the subject are the most valuable studies in the literature for the present thesis. Orchid Island (Lan Yu) is 70 miles southeast from Taiwan Main Island where 90% of the local people are indigenous Yami people. The focus group data were analysed by Fan employing an environmental justice framework which made use of several themes, including the good life, duty, the right to life, utilitarianism, fairness and democratic procedures (Fan 2006a). On the issue of fairness, Fan's study suggested that Yami fishermen and housewife groups regarded it as bullying the ethnic minority to dump nuclear waste on Orchid Island (Lan Yu)(Fan 2006a and 2006b). Yami participants did not regard compensation as a means to achieve fairness or make the decision of dumping nuclear waste on Orchid Island (Lan Yu) legitimate (Fan 2006a). In order to achieve environmental justice in the nuclear waste management in Taiwan, Fan (2006a) suggested that environmental pragmatism could be employed to identify common goals and establish an alliance among different ethnic groups, defusing tension among groups of different ethnicities through dialogue processes.

2.8 Conclusion

Radioactive waste disposal is a unique problem, generated from every step of the nuclear fuel cycle, and potentially capable of causing immense damage to the health of humans, animals, and plants. Moreover, this potential damage could be inflicted for hundreds or even thousands of years. Attempts to guard against such risks have involved very elaborate strategies of containment, storage, and disposal. However, such strategies raise difficult questions about the ethics of siting policy, which in turn causes major political headaches about how to devise ways of dealing with them. A central assumption is that the public must participate in such decision-making, and as we saw in the comparative analysis of the six countries, the only country that has succeeded in establishing a nuclear waste repository - Sweden – is the only country to focus more on winning over public opinion in local areas rather than on enforcing the optimum technical solution. The lesson that Sweden teaches us - to respect public opinion – is one of the elements of environmental justice that we explore in more detail in the next chapter. In this chapter, we have also carried out a literature review on topics central to this thesis – case studies and comparative of the politics of nuclear waste disposal; studies of oppositional groups; studies on environmental justice; and studies of environmental justice in Taiwan. Many of these studies – especially in the last category – have been helpful to me in clarifying the issues of my thesis, and I am grateful to acknowledge that I have built on their insights. However, none of them has examined the issue of environmental justice in the politics of nuclear waste facility siting in Taiwan as comprehensively and deeply as I do in this thesis.

Chapter 3. Storing Nuclear Waste- An Environmental Justice Perspective

3.1 Introduction

In this chapter, the discussion moves from technical considerations of nuclear waste disposal to normative considerations. Its focus is on the concept of environmental justice and its application to the issues of siting nuclear waste repositories. The chapter begins by explaining the origin of the concept in the environmental justice movement in the USA and (briefly) its place in Taiwan; then discusses at length its meaning in its two forms - distributive and procedural justice.

3.2 The origin of environmental justice in the USA

The concept of environmental justice is derived from the environmental justice movement which emerged in the US in late 1970s and early 1980s. It originated in the concern felt by groups of people whose environment and health were affected by the dumping of toxic wastes in their neighbourhoods. Dobson states that 2 August 1978 could be marked as the starting point of environmental justice movement, because that was the day when the CBS and ABS TV networks first carried the news of the effect of toxic waste on the health of people who lived in a place called Love Canal (Dobson 1998: 17).

3.2.1 Love Canal

Between 1942 and 1952, the Hooker Chemical Company used Love Canal (a blue-collar housing development in Buffalo, New York) as a site for waste disposal.

They disposed of more than 21,000 tons of various chemical wastes at the site in a depth of twenty or twenty-five feet (Levine 1982: 10). Many of the substance were known to be dangerous, including chloroform, benzene, toluene and tricoloroethylene (Maples 2003: 215). In 1953, the Hooker Chemical Company covered over the dumpsite and in 1953 the site was sold to the Niagara Falls Boards of Education. Despite warnings from Hooker Chemicals, the surrounding land was developed into a residential area in which a school and many homes were built (Maples 2003: 214).

In providing affordable housing for low-to middle-income families, the Love Canal area was one of many lower-middle class communities, populated with the families of first-generation homeowners employed in the paint, chemical, pesticide, and related industries that gave them an opportunity to achieve the American Dream (Maples 2003: 218). However, trouble began in 1978 when children started telling their mothers that their feet burned when they played barefoot on the lawn. At the same time, many people in the area complained to the City of Buffalo about the leaking of black ooze in their basements, skin irritations, and some people even said that rocks which were dug up in the neighbourhood exploded when dropped on a hard surface. The city officials ignored the complaints by covering up the fact that the area had been built on a landfill operated by the Hooker Chemical Company (Dowie 1995: 128).

Residents began to take action after the three-year-old son of Love Canal resident Lois Maris Gibbs developed a serious respiratory problem, and many people discovered their children had the same or another medical problem. Lois Maris Gibbs started the Love Canal Houseowners' Association and complained to the state government which sent epidemiologists to visit Love Canal, who discovered abnormally high rates of birth defects, miscarriages, epilepsy, liver abnormality, rectal bleeding, and headaches (Dowie 1995: 128). In August 1978, the New York State Health Commissioner

announced that the landfill 'constitutes a public nuisance and an extremely serious threat and danger to the health, safety, and welfare of residents' (Dowie 1995: 128). In August 1980, when federal government inspectors from the Environmental Protection Agency (EPA) arrived at Love Canal, Gibbs and other residents held them for several hours demanding a commitment to take remedial action. Two days later, President Jimmy Carter arrived and declared Love Canal a national disaster area. He agreed that the federal government would purchase all homes in the contaminated area and relocate the residents to a safer neighbourhood (Dowie 1995: 128).

Love Canal is a significant event because it transformed the environmental movement in the USA in four ways. First, whilst environmentalism previously focused on preserving nature, wildlife, and natural habitats, Love Canal was focused on human health affected by toxic waste. Second, while previous US environmental campaigners had been predominantly middle class, the Love Canal campaign was run mainly by working class people. Third, while previous US environmental campaigns focused on environmental health, the Love Canal campaign widened the debate to focus on issues of justice, drawing attention to the fact that the people who suffered from the health effect of toxic waste were generally those who are poor and less advantaged. Fourth, unlike mainstream environmental groups, the Love Canal group did not create large, Washington-based, bureaucratic organisations. In contrast, they developed networks, made connections, and created solidarity out of understanding and a respect for both similarities and differences, and worked from a variety of places with a wide array of tactics (Schlosberg 1999: 108). For many people, Love Canal originated the environmental justice movement. However, there was a fifth element in its development that was initiated in another area - Warren County – the anti-racial element that made it into a full-scale civil rights movement.

3.2.2 Warren County

In 1978, three men from the Ward Transfer Company driving liquid tanker trucks which contained polychlorinated biphenyl (PCB) along state roads in North Carolina, drained 30,000 gallons of PCB contaminated oil into the roadside (Bullard 2002: 177 and Maples 2003: 234). The state had to clean up the oil spill and find a place to dump the toxic soil. A bankrupt farmer in Afton, Warren County agreed to sell his land to the state government which proposed to use the land as landfill (McGurty 2000 and Maples 2003: 234). At that time Afton Community was more than 84 percent African American; one of the poorest counties in North Carolina; and had an employment rate of 13.4 per cent and a median income of \$6,983 in 1982 compared with \$9,283 for the rest of the state (Bullard 2000: 30 c.f. Maples 2003: 237) Local residents contested the landfill proposal on grounds that the site was geographically unfit, but in 1982 state workers began to prepare the site for dumping. To prevent dumping, a coalition of local landowners and civil rights activists mounted a campaign of civil disobedience, organising marches, demonstrations, and roadblocks to deny access to the trucks transporting the toxic soil into the site, and in September 1982, over four hundred protesters were arrested (Maples 2003: 235). Although the protest failed and the landfill site was established, it is the first significant national environmental protest by African Americans (Edwards 1995: 36). Also, the events in Warren County marked the beginning of a coalition of civil right activists, environmentalists, churches and local residents. Edwards (1995) commented that 'almost overnight environmentalism became accessible to wide segments of the African American communities, churches, and civil rights organisations. In the process, African Americans redefined environmentalism and provided a powerful and overarching narrative capable of unifying a range of life quality grievances in communities of colour'. As Sandweiss remarked, it galvanised a nationwide grassroots social movement demanding environmental justice (Sandweiss 1998: 31).

3.2.3 Consolidation of the environmental justice movement in the USA

The cases of Love Canal and Warren County together marked the beginning of the environmental justice movement. However, these two are not the only cases, and with more and more examples cases coming to light, the environmental justice movement was consolidated. Its main assertion is that poorer people are the victims of environmental injustice. As Szasz put it, 'Why don't I see a toxic waste dump in Beverly Hill or next to the Governor's house?' (Szasz 1994: 152). The protestors from Love Canal and Warren County believed that their situation was due to the uneven distribution of environmental hazards, and numerous studies have confirmed that people who live close to noxious facilities are disproportionately people of low income and dark skins (Shrader-Frechette 2002: 5). Szasz observed that 'Toxic victims are, typically, poor or working people of modest means. Their environmental problems are inseparable from their economic condition. People are more likely to live near polluted industrial sites if they live in financially strapped communities' (Szasz 1994: 151; c.f. Dobson 1998: 19). Evidence indicates that minorities who are disadvantaged in terms of education, income and occupation not only bear a disproportionate share of environmental risk and health but also have less power to protect themselves (Shrader-Frechette 2002: 5). Studies consistently show that socio-economically deprived groups are more likely than affluent groups to live near polluting facilities, eat contaminated fish, and work in risky occupations (Shrader-Frechette 2002: 7). Research also confirms that they are less able to prevent and to remedy such inequalities (Shrader-Frechette 2002: 3). Some social scientists have found that race is a factor, linked together with socio-economic status, in predicting the distribution of air pollution, municipal landfills and incinerators, toxics waste dumps, and lead poisoning in children (Hofrichter 1993: 5). Member of communities facing such threat typically are too poor to move elsewhere.

The uneven distribution of resources and development that characterizes US society finds a strong parallel in the distribution of ecological hazards, particularly among underrepresented, disenfranchised populations such as African Americans, Asian Americans, Latino Americans, Native Americans, the poor, and women (Hofrichter 1993: 8). A 1983 report by the U.S General Accounting Office documented the socio-economic and racial characteristics of communities where hazards-waste landfills are sites (Shrader-Frechette 2002: 23)⁷, and concluded that three-quarters are poor, African Americans, and Latino Americans. These populations typically receive inadequate public health and social service facilities, and live in economically undeveloped areas with high rates of unemployment (Hofrichter 1993: 10). Often the sources of environmental injustice are the corporations and governments who site questionable facilities among those least able to be informed about, or able to stop, them.

From this account of environmental justice in the USA we can see a strong call for more thorough and participatory local input into, and control over, environmental decisions. Members of the environmental justice groups do not want mainstream environmental NGOs to represent them: they wish to be consulted from the start, speak for themselves, and work with other agencies to form partnerships in decision-making (Schlosberg 2003: 2003: 78). Moreover, rather than creating large, Washington-based bureaucratic organisations, they use social networks to make connections, creating solidarity out of understanding and mutual respect, and work from a variety of places with a wide array of tactics. By using strategies from the civil-rights, anti-war, anti-nuclear movements, as well as from other movements for social justice, these communities where people live and work are taking a leadership role in redefining the scope of the environmental

⁷ Quote from Shrader-Frechette, K. (2002) Environmental Justice: Creating Equality and Reclaiming Democracy, Oxford: Oxford University Press.

movement to include social conditions that people experience in everyday life (Hofrichter 1993: 25). Furthermore, beyond fighting against environmental hazards, they are uncovering connections between undemocratic production and investment decisions, energy policies, international trade, and lending policies, environmental effects of nuclear radiation and military power, and the inequalities of race and class that affect the quality of their lives and the world in which they live (Hofrichter 1993: 21). Whereas mainstream environmental groups are predominantly white, middle-class, and male, environmental justice groups are generally formed on a grassroots basis with most members from low-income or ethnic minority communities, and women and people of colour often take on the leading roles. While mainstream environmental NGOs protect natural environment, wildlife, and natural resources, the movement for environmental justice wants to reframe the policy debate over hazardous waste and shift the public agenda away from its current preoccupation with waste disposal towards reducing waste production at the sources (Edwards 1995: 36). Furthermore, they fight not only for the environment but also for justice because environmental injustice comes from an unequal distribution of environmental hazards. Therefore, environmental justice campaigns seek change in the social order to bring about more meaningful participation in environmental decision-making. They also want industry to shoulder the full social, health, and ecological costs of their products, including waste products, because that would create a strong economic incentive for non-toxic alternatives (Edwards 1995: 36).

So the grassroots movement has succeeded in raising the stakes, making it more difficult and expensive for irresponsible industries to pass the costs of chemical contamination on to those who live further down the waste stream. In the first 10 years in the USA, they did so without any new legislation, by engaging in the legal and scientific debates over regulatory policies, and by entering electoral politics (Edwards 1995: 36). But in 1991, the broad agenda, which included the input of Native Americans,

Asians Americans, Hispanics, and other people of colour, was formalised in the statement of purpose and call to action drafted by delegates to the People of Colour Environmental Leadership Summit. The draft is called the Principles of Environmental Justice, and contains 17 principles covering a range of ecological, social, political, cultural, and strategy issues. These principles have become part of governmental practice in that the National Environmental Justice Advisory Council to the U.S. Environmental Protection Agency (USA-EPA) includes a subcommittee on Public Participation, which in 1996 produced a Model Plan for Participation and Environmental Justice containing a participation checklist for government agencies to follow. The Model Plan indicates that policymaking procedures must encourage active community participation, institutionalise public participation, recognise community knowledge, and utilise cross-cultural formats and exchange to enable the participation of as many diverse groups as exist in a community (Schlosberg 2003: 95).

3.3. Environmental Justice in Taiwan

In Taiwan, the idea of environmental justice is connected to the anti-pollution movement and the anti-nuclear movement. Taiwan has not developed an environment movement such as in the US or even in the UK, but an idea of how environmental justice has spread in Taiwan can be seen in the 2001 research paper by Hsiao et al. entitled 'Taiwan Environmental Consciousness: Indicators of Collective Mind toward Sustainable Development' which reports on a survey of the knowledge and attitudes of Taiwan adults. The researchers listed nine statements about environmental justice, and respondents were asked whether they disagreed or agreed with each of them (Hsiao et al. 2001). The results which are set out in Table 3.1, show that the questions which got the most support were those which endorsed the general principles of environment justice. These are question numbers 6 and 8, the answers to which confirmed that most people

(96.9% and 81.8% respectively) supported the notion of environmental justice.

Also, only a minority of respondents (32.5% and 28.5% respectively) were in favour of the siting of nuclear waste repositories (question 1) or waste incinerators (question 9) if local residents were given compensation, and only a minority (33.1%) were in favour of siting industrial developments near aboriginal settlements (question 3). However, on other issues, there was little support for environmental justice. For example, on question 4, a large majority (75.7%) of respondents approved the government's right to build a reservoir to solve a water shortage many miles away from the site where local residents strongly objected to the project. Similarly, only 25.8% were in favour of aboriginal rights to make use of national park resources (question 2), while 55.5% supported the shipping of nuclear waste from Taiwan to other countries (question 7), and 44.9% were willing to sacrifice some people's living environments for the sake of economic development (question 5).

So the picture of environmental justice in Taiwan is patchy: general support for the principle of environmental justice, but lack of support on some issues where many respondents were prepared to accept environmental injustice as the price for economic development. However, although Taiwan might not like the UK and the U.S.A, have developed a radical and complete environmental movement, the people in Taiwan are aware of the importance of the environment generally, and in some respects Taiwan is more environmentally successful than the UK and the USA: for example, it started a recycling programme in every school and household in the early 1990s and banned the use of plastic bags in 1999.

Table 3.1 Results of Taiwan Environmental Consciousness Survey 2001

| Positive or Negative | Question number | Question | % |
|----------------------|-----------------|--|-------|
| Negative | 1. | Government has the right to store nuclear wastes in an area if local residents are given financial compensation. | 32.5% |
| Positive | 2 | Aborigines living in national parks are entitled to use park resources (e.g. hunting, living in tribal habitats). | 25.8% |
| Negative | 3 | It is acceptable for the government to permit cement and quarrying industrial zone near aboriginal residential areas. | 33.1% |
| Negative | 4 | Though Mei-Nong's residents strongly disagree, the government has the right to build a reservoir to solve the water shortage problem in the south of Taiwan. | 75.7% |
| Negative | 5 | For the sake of economic development in Taiwan, some people's living environment might have to be sacrificed. | 44.9% |
| Positive | 6 | People have a basic right to enjoy clean air and water. | 96.9% |
| Negative | 7 | It might be a good idea to ship and store Taiwan's nuclear waste in other countries, such as North Korea or mainland China. | 55.5% |
| Positive | 8 | It is not fair to locate incinerators and landfills disproportionately in poor | 81.8% |

| | | | |
|----------|---|---|-------|
| | | communities. | |
| Negative | 9 | So long as financial compensation is given to residents, it is acceptable to locate waste incinerators in poor communities. | 28.5% |

Source: Hsiao et al. 2001

3.4 The meaning of environmental justice

The US Environmental Protection Agency (USEPA) office of environmental justice has provided the following definition of environmental justice:

‘to ensure that all people, regardless of race, national origin or income, are protected from disproportionate impact of environmental hazards. To be classified as an environmental justice community, residents must be a minority and / or low income group; excluded from the environmental policy setting and /or decision-making process; subject to a disproportionate impact from one or more environmental hazards; and experience a disparate implementation of environmental regulation, requirements, practices and activities in their communities’ (USEPA 2000).

Within this definition we can discern two distinct elements of justice: distributive and procedural. Distributive justice is related to issues of unequal distribution of environmental ‘bads’ and ‘goods’. Procedural justice is related to issues of access to decision-making processes which give rise to these unequal distributions of environmental bad and goods. In the case of nuclear waste, it is argued that local communities suffered disproportionate health risks from hosting disposal sites in their

areas because they lacked power in the decision-making process. It is worth noting that these two kinds of environmental injustice are situated within three more general senses of injustice: (1) economic injustice (inequality of economic resources between the rich and the poor); (2) political injustice (inequality of political power between the elite and the mass); and (3) cultural injustice (inequality of social respect between favoured and unfavoured ethnic communities). As we shall see, each of these broader senses of injustice is touched on by the principles of distributive and procedural environmental justice.

3.4.1 Concept of Risk

As I stated in the previous chapters, people's fear of radioactive waste is because of the risk from radiation. But the concept of risk is problematic. As Fischhoff (1990) has suggested, people respond to risks depending on how they perceive those risks, and especially their perception regarding how large those risks are, how painful their realisation would be, what opportunity exist for controlling them, and how costly the control would be. People's perception of risks could be affected by their own experiences, how the information of risks has been communicated, and the psychological mechanisms for processing uncertainty. (Renn 2004).

As for environmental risks, these issues sometimes can be very technical therefore uncertain and unfamiliar for people. In this respect, people rely on experts to inform them and to make decisions regarding the likelihood of risks. But people also perceive risk according to their psychological make-up and social-economic circumstances (Henwood et al. 2008). What people choose to fear and how to fear depends on their personalities and relationships, leading them to downplay or overplay certain risks (Douglas and Wildavsky 1982). Therefore, while the experts' perceived risks are based

on scientific evidence, members of the general public could have different views on the same risks. This conflict between subjective and objective perceptions of risk has often arisen over environmental hazards.

3.5. Distributive environmental justice

3.5.1. Who are the recipients of environmental justice?

The first issue to be considered is the scope of the discussion on distributive environmental justice: how far do we extend the notion? We have to determine who are the recipients of environmental justice. As we have seen, the environmental justice movement began at a local level in the USA when local communities stood up to fight against the pollution in their area condoned by state authorities, so the original recipients of distributive environmental injustice were the members of local communities. However, during the last decades, with more and more environmental injustice cases occurring between communities and between countries (such as the Chernobyl nuclear accident), the range of recipients of distributive environmental injustice has widened considerably. Dobson has suggested that the communities of environmental justice should include present and future generations, all sentient beings, and the ‘agent- affected’⁸ (Dobson 1998: 63). However, for the purpose of this thesis, the recipients of environmental justice will be confined to the present generation and the next generation of the population in Taiwan.

3.5.2. What should be distributed?

⁸ ‘Agent-affected’ means anyone or thing affected by environmental conditions caused by the actions of another.

The second issue to be clarified is what should be distributed? There are two candidate categories: (1) the distribution of environmental 'bads' or burdens; and (2) the distribution of environmental 'goods' or benefits. The early campaigns for environmental justice were mainly preoccupied by the first category. As we have seen, the environmental justice movement first started in the USA because environmental hazard, toxic or pollution was disproportionately distributed to low-income or ethnic minority communities. These are the cases where an unequal distribution of environmental 'bads' led ethnic minorities or low income communities to suffer from a disproportionate burden of health threats. A 1983 report by the US General Accounting Office documented concluded that three-quarters of the landfill sites in the USA were in communities of low-middle income, African Americans, or Latino Americans, and that these populations typically received inadequate public health and social services and lived in economically undeveloped areas with high rates of unemployment (Hofrichter 1993: 6). Similarly, research in the UK found that 66 per cent of carcinogen emissions in England were in the most deprived 10% of wards (Friends of the Earth 2001 and Bell 2002).

One solution to this problem would be to redistribute the environmental bads equally across the whole population, requiring everyone to share the same amount of environmental hazards. But such a fair distribution of environmental bads may be impracticable in that some environmental hazards (including nuclear waste hazards) cannot be evenly located throughout communities.

More recently, the idea of distribution has embraced not only environmental bads or burdens but also environmental goods or benefits. For example, Wenz claimed that environmental justice is about the distribution of benefits and burdens among all those affected by environmentally-related decisions and actions (Wenz 1998:4 and Warren

1999). Miller has defined environmental goods as ‘any aspect of the environment to which a positive value may be attached’ (Miller 1999: 152). Hartley has claimed that environmental justice is the fair distribution of environmental quality (Hartley 1995: 287 and Warren 1999). Environmental justice is thus seen as not only about stopping ‘bads’ but also about promoting ‘goods’ such as being able to experience quality environments and environmental quality (Agyeman 2002). So while a fairer distribution of environmental hazards is the first aim of distributive environmental justice, every person is also entitled to have a fair share of environmental goods. The next section discusses principles of distribution to understand how to achieve a fairer distribution of both environmental hazards and environmental goods.

3.5.3. Principles of distribution

3.5.3.1 Equality

The most obvious distributive principle of environmental justice is equality – that everyone should experience the same amount of environmental bads, and receive the same amount of environmental goods. Shrader-Frechette (2002: 24) wrote that ‘presumably the principles ought to require that, all things being equal, rich and poor, coloured and white, educated and non-educated, be treated equally in the distribution of society’s environmental benefit and burdens’, and enunciated the ‘principle of Prima Facie Political Equality’ (PPFPE) which comprised the following four propositions:

1. The comparison class is all humans, and all humans have the same capacity for a happy life.
2. Free, informed, rational people would agree to a principle of political equality
3. This principle provides the basic justification for all schemes involving justice,

fairness, rights, and autonomy

4. It presupposes equality of treatment for persons similarly situated (Shrader-Frechette 2002: 26).

Shrader-Frechette explained that she “presumes that equality is defensible and that only different or unequal treatment requires justification”, and so the goals of PPFPE are to ‘help to ensure equal distribution of environmental impacts and to place the burden of proof on those attempting to justify unequal distributions’ (Shrader-Frechette 2002: 28).

Bell (2004) stated that the advocates of environmental justice have employed three principles of distribution: (1) equality; (2) equality plus a guaranteed standard; and (3) a guaranteed minimum with variation above that minimum according to personal income and spending choices. Bell started from the point that the environmental justice movement drew attention to the unequal distribution of pollution – i.e. that those who suffer a disproportionate burden of environment bads do so because they are economically poorer or ethnic minorities. Therefore, the first principle of environmental justice is equality, or more specifically, ‘to be polluted equally’. This argument echoes Shrader-Frechette’s last two PPFPEs. Then as the idea of distribution is extended from environmental bads or burdens to include environmental benefit or goods, Bell added the second and third principles of distribution to not only require an equal distribution of environmental bad but also to require that people have a guaranteed standard of environmental quality both to survive and to have an opportunity to lead their lives in accordance with their preferences. The latter requirement echoes Shrader-Frechette’s first principle of PPFPE.

Equality is thus a central principle of distributive environmental justice. Applying this principle to the issue of nuclear waste, dumping nuclear waste in certain area(s) of a

nation creates an unequal distribution of health risks to the members of communities which host nuclear waste. While people in the society all benefit from the electricity which is generated from nuclear power plants, people who live in the communities which host nuclear wastes are the only ones to suffer from the risk of radioactive material. In the USA, according to Easterling and Kunreuther (1995: 35)⁹, nuclear waste repositories are usually located in Western States despite the fact that Eastern States have a greater population and a greater use of electricity (Easterling and Kunreuther 1995: 36 and Marshall 2005). Likewise in Canada, according to Lois Wilson, the south produces nuclear waste while the north is more often the location of repositories for nuclear waste (Wilson 2000 and Marshall 2005). Similarly in Taiwan, over 80% of nuclear waste is stored in an indigenous people's island situated 75 km from the main island (Oon 2001: 262), while in the UK, most nuclear waste is stored in Sellafield in northwest England and Dounreay in the north of Scotland (Institution of Engineers and Technology 2005: 6-9) - both of which are communities in disadvantaged areas. This inequality also produces identifiable health problems. In the previous chapter, evidences have shown the higher possibilities of leukaemia for people who live near nuclear waste facilities in the U.K, France, and Germany.

In relation to nuclear waste, the risk is strongly associated with distributive environmental injustice. The risk here means the health risk which could affect the members of local communities, since evidence has shown a higher incidence of negative health effects for people living near nuclear facilities. If nuclear waste is sited near a community, a health risk is unequally distributed to the members of that

⁹ Easterling, D., and Kunreuther, H. (1995) The Dilemma of Siting a High-Level Nuclear Waste Repository, Boston: Kluwer. pp35. See also Marshall, A. (2005) "The Social and Ethical Aspect of Nuclear Waste," Electronical Green Journal, 21. <http://egj.lib.uidaho.edu/egj21/marshall1.html>, 17 May 2008.

community, thereby creating distributive injustice. However, this risk is often downplayed by some experts who claim that engineered barriers such as deep disposal facilities could prevent the potential health risks. This is a good example of the fact that local people have different perceptions regarding nuclear waste risks to the experts. This dispute could be solved by procedural means such as providing accurate information and participation in order to build up trust between experts and local people in the siting processes.

For a utilitarian, such distributive injustice in particular communities might be justified because of the greater good experienced by the rest of society. But for an egalitarian, it is a different matter: egalitarians hold that ‘it is in itself bad if some people are worse off than others’ (Temkin 2003: 62 and Parfit 1998: 3) In other words, egalitarians see equality as an intrinsic value. In the case of nuclear waste, communities which host nuclear waste would be worse off than communities far away from radioactive waste, but egalitarians would not accept that this inequality can be offset by a greater benefit to the whole of the country.

However, egalitarians have to face up to the so-called ‘levelling down problem’, which arises if we choose to level down the position of one of the better-off groups to make the position of all the groups equal. In order to achieve fairer distribution, can we really distribute nuclear waste equally to every person by requiring every community to host the same amount of nuclear waste? Not only is this technologically impossible because managing nuclear waste needs very specific technology, but it would encounter the normative problem that it would inflict harm on the majority without materially benefiting the minority.

3.5.3.2. Priority

One way of dealing with the levelling-down criticism is Parfit's 'priority view' (Parfit 1998: 3). According to Parfit, the priority view is that the well-being of worse-off people is more important than the well-being of better-off people. Prioritarians are not concerned about the relative positions of people in society, but hold that it is simply wrong if people are very badly off – i.e. at a low absolute level of well-being. Prioritarians argue that helping such people is the highest priority for the society. In the case of radioactive waste, those who suffer from hosting radioactive waste are very badly off, therefore, to improve their condition is a high priority for the society.

3.5.3.3 Sufficiency

Another way to escape from the egalitarian's levelling-down problem is to make use of the principle of sufficiency. Harry Frankfurt argued that 'what is important from the point of view of morality is not that everyone should have the same but that everyone should have enough' (Frankfurt 1988: 134; c.f. Rosenberg 1995: 56). For Frankfurt, the idea of sufficiency requires a certain level of well-being, and once this level of well-being has been reached, no further action needs to be taken. So if people are below the threshold of sufficiency, then it is the sole distributive duty of society to bring these people up to the level of sufficiency. The central concern for the sufficiencyarians, therefore, is that people have enough rather than the same. As long as all have at least a sufficiency, any inequality between them can be tolerated. The idea of sufficiency not only provides a basic level of well-being to enable everyone to survive, but it also an opportunity for people to compete for further resources in order to fulfil their personal preferences. This idea echoes Bell's second and third principle of distribution which is equality plus a guaranteed standard; and a guaranteed minimum with variation above that minimum according to personal income and spending choices. In the case of nuclear waste, those who suffered an unequal distribution of health risk from nuclear

waste would thereby experience well-being below the sufficiency level – in some extreme cases lacking the minimum standard of health necessary for survival. Therefore, action would be needed to bring up their well-being to the sufficiency level (i.e. not only to survive, but to fulfil their preferences). This raises the question of how and what we should give to these severely disadvantaged people in order to raise them to the sufficiency threshold – i.e. what compensation they should receive.

3.5.3.4. Compensation

Both prioritarrians and suffiencirians demand measures to compensate people who are either very badly off or below the sufficiency threshold, because of the siting of nuclear waste repositories in their communities. In order to meet the principle of either priority or sufficiency, therefore, it has been deemed necessary to compensate people who host radioactive waste by offering them such benefits as money (including grants or tax rebates), employment, or investment in public infrastructure (Openshaw et al: 11). In many countries, governments and nuclear industries have provided financial compensation to local communities which host nuclear waste. Although estimating levels of compensation for future generations is next to impossible, many countries have established funds for expenditure on nuclear waste management in the future. In our case study country of Taiwan, the government-owned nuclear industry, Taiwan Power Company, as discussed at section 2.5.3.3, has provided fund which to be used only for the final disposal of nuclear waste and decommissioning of nuclear power plants. Because the amount of money accumulated is quite high, it has attracted considerable interest among local communities and other countries to compete for the contract for a nuclear waste repository.

3.6. Procedural environmental justice

Turning to the second aspect of environmental justice – procedural justice – we focus on the process of decision-making rather than the outcome of those processes (which is the subject of distributive justice). Procedural environmental justice is as important as distributive environmental justice. Indeed, at times, activists in the environmental justice movement seem to be more exercised by procedural issues than by distributive issues. This may be because they hold that procedural injustice is the cause of much distributive injustice. For example, the reason why people suffer from a disproportionately high level of health risk from nuclear waste is often believed to be because those people lack the power to participation in the decision-making process, which, as we shall see, is a form of procedural injustice. There are five elements in procedural environmental justice: non-discrimination; participation; information; local knowledge; and trust.

3.6.1 Non-discrimination

The first element in procedural environmental justice is non-discrimination. Bullard describes this element as ‘the extent to which governing rules and regulations, evolution criteria, and enforcement are applied in a non-discriminatory manner. Unequal protection result from non-scientific and undemocratic decisions, such as exclusionary practices, conflicts of interest, or public hearings held in remote locations and at inconvenient times’ (Bullard 2000: 10).

3.6.2. Participation

The second element in procedural environmental justice is political participation. Schlosberg states that ‘without a doubt, the demand for political participation in decisions governing communities is central to the environmental justice movement’

(Schlosberg 2003: 92). In Freudenberg and Steinsapir's study of the environmental justice movement, it is suggested that the first and major shared perspective among the grassroots is the 'right of citizens to participate in making environmental decisions - emphasis on process as well as content of decision making' (Schlosberg 2003: 92)¹⁰. Participation is certainly an essential principle of procedural justice. Environmental justice groups not only seek particular and incremental policy changes but also fundamental change in the processes of environmental and economic decisions that affect their communities. They call for a more thorough participatory local input into, and control over, environmental decisions, demanding 'participation in assessment, planning, and implementation' so decisions on environmental issues are properly discussed before decisions are made. For example, in the USA, the Southwest Organizing Project's 'Community Environmental Bill for Right' stated 'We have the right to participate as equals in all negotiations and decisions affecting our lives, children, home and jobs. We have the right of access without cost to information and assistance that will make our participation meaningful, and have our needs and concerns as the major factor in all policy decisions. Government agencies at all levels should be responsive to our needs, provide us with necessary data and include us in all negotiations with polluters. We have the right to sit at the negotiation table' (Intel Corporation, SouthWest Organizing Project, and Electronics Industry Good Neighbor Campaign 1995: 20).

This emphasis on public participation reflects the frustration of environmental justice

¹⁰ Quote from Schlosberg, D. (2003) "The Justice of Environmental Justice: Reconciling, Equality, Recognition, and Participation in a Political Movement" in Light, A. and De-Shalit, (eds) Moral and Political Reasoning in Environmental Practice, Cambridge, MA: MIT Press, 77-106. Original in Freudenberg, N., and Steinsapir, C. (1992) "Not in My Back Yard: the Grassroots Environmental Movement" in Dunlap, R., and Mertig, A. (eds) American Environmentalism: The U.S. Environmental Movement, 1970-1990, New York: Taylor & Francis.

groups with the traditional governmental practice of undertaking public consultation after decisions have been made. This practice has been dubbed the Decide-Announce-Defend approach (Hunt 2001: 223; Marshall 2005). The government decides in advance which of the alternative policies its officials and experts think is appropriate, and then they announce their decision in parliament to allow debate and inform the public. As a result of the debate in parliament and the reaction from the public, the government adjusts its policy and finalises its decision. This approach has attracted heavy criticism by environmental justice groups, because people from local communities can only express their opinion on the decision through their MPs in parliament during a debate when they are facing a decision that has largely been taken. In some cases, the local communities are not even informed before the government announces their decision. The most notorious example of this practice in relation to nuclear waste in Taiwan occurred in the 1980s when the government took the decision to build a repository in an indigenous people's island. The local people did not realize that a nuclear waste was to be built on their land until the nuclear waste repositories began to operate.

3.6.3 Information

The third element in procedural environmental justice is access to information, without which environmental justice groups would be hamstrung in their campaigns. In the case of nuclear waste, access to information not only means obtaining information, but getting that information disseminated in local communities in order to keep people informed about latest developments, and extending public discourse to everyone affected by decisions. It also means ensuring that people understand the information, because nuclear issues are very complex and technical, and even when information does get into local communities, local people might not be able to grasp its significance or

implications for them. Scientists and local people may use very different terminology when they describe the same nuclear phenomena. The UK government has produced many documents about radioactive waste management which contain technical terms which are hard for lay people to follow. Such technical communication gaps need to be filled by regular visits from government agencies and industry representatives to local communities to explain the meaning of such documents, and by the establishment of an environmental information centre.

However, in some instances, misunderstandings are cultural rather than technical, as Schlosberg points out in the case of Cora Tucker, an African-American activist, who, at a town board meeting, when white women were addressed as Mrs. So and so, she was addressed as Cora (Schlosberg 2003: 89). Also When Lois Gibbs one of the leading environmental justice campaigner told her stories about Love Canal, the representatives appeared not to have listened to her testimony (Schlosberg 2003: 89). In other cases, misunderstandings may have been deliberately fostered, as when the Taiwan government appeared to have duplicitly gained the consent of the people of Orchid Island (Lan Yu) to store radioactive waste in their area, because Orchid Island (Lan Yu) local communities claimed that they were told that the government was going to build a fish canning factory.

3.6.4 Local knowledge

The fourth element in procedural environmental justice is local knowledge. Most environmental justice movement activists come from communities that have suffered a disproportionate burden of environmental hazards, and their knowledge of the problems arises out of their own experiences, by contrast to the knowledge of the problems possessed by the scientists, which arises out of their site investigations, laboratory

analyses, and computer simulations. Such contrasts are common in environmental controversies, often resulting in opposing views about the seriousness of the problem, with scientists claiming that the environmental impact is less significant to human health but local people claiming the environmental impact is very serious. An example of such a conflict in Taiwan concerned the rusty barrels of radioactive waste stored at Orchid Island (Lan Yu) which the scientists at the government-owned nuclear power company Taipower claimed did not leak or constitute a danger, but the local people suspected discharged radioactive material.

One way to resolve such an impasse, typically urged by environmental groups, is to ask the various parties to visit the site to help people from outside to understand the nature of the environmental injustice which members of local communities were suffering. Another way of resolving the deadlock is for the community's knowledge to be included in the assessment of environmental impact. As Schlosberg explains, 'this participatory research or popular epidemiologist approach uses community members to help to understand and explain several environmental illnesses' (Schlosberg 1999: 164, Brown 1992, Brown and Tandon 1983, Bryant 1995, and Gaventa 1991). Such local knowledge could be institutionalised by establishing an environmental justice centre in a nearby university to encourage respect for community knowledge. These centres could conduct participatory research as well as educate local people on environmental justice issues.

3.6.5 Trust

The fifth element in procedural environmental justice is trust. Trust is an essential pre-requisite of a fair process for resolving nuclear waste management controversies, and many of the other elements of procedural environmental justice such as participation and information depend upon it. Trust in scientific experts in the nuclear

waste issue is particularly important, as nowadays they are rarely seen as neutral: local communities often discount experts' evidence because of whom the experts work for, especially when, as in many countries, nuclear industries are state-owned. Indeed, whenever local communities are not in favour of the decision which government has made on nuclear waste management, they invariably do not believe the evidence presented by industry experts. Significantly, the Eurobarometer opinion poll found that 29% of European citizens were very worried about the way that nuclear waste is handled in their own countries and only 10% trusted the information provided by nuclear industries (European Commission 2002 and Marshall 2005).

Lack of trust increases public anxiety over the health risks of nuclear waste siting. In decision making of nuclear waste siting, Slovic et al. 1991 claimed that the lack of a trustworthy process for siting, developing, and operating a nuclear waste repository in the US nuclear waste management had created a 'crisis of confidence'. This crisis of confidence refers to the breakdown of trust in scientific governmental and industrial managers of nuclear technology. A restoration of trust by a transparent policy process, dissemination of information, and thorough public participation would improve people's perception of environmental risks, and thereby help to achieve public acceptance of equitable proposals for hazardous waste siting.

3.7. Economic injustice

In the previous section, the most common elements of environmental justice were presented. However, when we look into the case study of politics of nuclear waste, procedural injustice and distributive injustice are often situated within more general injustices issues. This section presents these more general injustices which are economic injustice, political injustice, and cultural injustice.

Economic injustices exist in most societies. Many studies have suggested that poorer people and ethnic minorities tend to live near waste facilities and bear a disproportionate share of health risks from exposures to toxins. Taylor (2000) discovered that deprived and minority communities were more likely to be exposed to environmental hazard, more likely to suffer the disproportionate impact of environmental process, and more likely to be targeted for siting noxious facilities (Walker et al 2003: 25)¹¹. In the UK, Friends of the Earth (1999) was the first to examine the relation between income and pollution facilities. They found that 662 of pollution sites including waste facilities in England and Wales were located in areas where the annual household incomes were less than £15,000. By contrast, there were only 5 pollution sites located in areas where the annual household incomes were £30,000 or more (Walker et al 2003:25)¹². Following the study in 1999, Friends of the Earth (2001) study confirmed that 66 percent of the total carcinogenic emissions in England in 1999 were in the 10 percent most-deprived electoral wards and only 8 percent of emissions were in the least-deprived 50 percent of the wards (Walker et al 2003: 25)¹³. In 2004, Friends of the Earth (2004) also discovered that 8 out of 16

¹¹ Quote from Walker, G., Fairburn, J., and Smith G. (2007) Addressing Environmental Inequalities: Waste Management, Bristol: Environmental Agency.
<http://publications.environment-agency.gov.uk/PDF/SCHO0507BMRV-E-E.pdf> (Accessed: 31 August 2011). Originally from

Taylor, D (2000) "The Rise of the Environmental Justice Paradigm," the American Behavioral Scientists, 43(4), 508-580.

¹² Quote from Walker, G., Fairburn, J., and Smith G. (2007) Addressing Environmental Inequalities: Waste Management, Bristol: Environmental Agency.
<http://publications.environment-agency.gov.uk/PDF/SCHO0507BMRV-E-E.pdf> (Accessed: 31 August, 2011). Originally from

Friends of the Earth (1999) Pollution Injustice and the Geographic Relation between Household Income and Polluting Factories, London: Friends of the Earth.
http://www.foe.co.uk/resource/reports/income_pollution.html (Accessed: 31 August 2011).

¹³ Quote from Walker, G., Fairburn, J., and Smith G. (2003) Addressing Environmental Inequalities: Waste Management, Bristol: Environment Agency.

municipal incinerations in England were located in the 10 percent most-deprived electoral wards (Walker et al 2003: 25)¹⁴. So people who are poorer or lack resources would be more likely to live in the areas where there are more shares of environmental bads. Similarly, environmental risks are more likely to be imposed on economically-disadvantaged communities as we can see from the evidence in the previous section. Environmental risk factors are integrally linked to these economic injustices. Although environmental risks do not necessarily cause economic injustices in the first place, environmental injustices occur because such risks are imposed on economically disadvantage people and areas. And because the environmental risks have been distributed unequally, they make disadvantaged people and areas even become more economically disadvantaged. For example, in Lan Yu, Taiwan, it was one of the poorest places in Taiwan before nuclear waste was dumped there, and over the years people's living standard in Lan Yu has not improved (as promised by Taipower) but deteriorated. If it is true that economically-disadvantaged people would be likely to trade off the health risks of nuclear waste siting in their areas for better living standards, in Lan-Yu they were exposed to the health risks but cheated of the economic benefits.

In the case of nuclear waste siting, deprived areas might have been targeted by the policy makers because they have fewer resources to use for resistance. Furthermore,

<http://publications.environment-agency.gov.uk/PDF/SCHO0507BMRV-E-E.pdf>, (Accessed: 31 August 2011). Originally from

Friends of the Earth (2001) Pollution and Poverty: Breaking the Link, London: Friends of the Earth. http://www.foe.co.uk/resource/briefings/pollution_and_poverty.pdf, (Accessed: 31 August 2011).

¹⁴ Quote from Walker, G., Fairburn, J., and Smith G. (2003) Addressing Environmental Inequalities: Waste Management, Bristol: Environment Agency.

<http://publications.environment-agency.gov.uk/PDF/SCHO0507BMRV-E-E.pdf>, (Accessed: 31 August 2011). Originally from

Friends of the Earth (2004) Incinerators and Deprivation. Brief, London: Friends of the Earth. http://www.foe.co.uk/resource/briefings/incineration_deprivation.pdf, (Accessed: 31 August 2011).

economic inequalities increase the vulnerability for local people to host nuclear waste, and weaken their power to obtain compensation to improve their living standards. In chapter six, the economic situations in the two case study communities will be presented, and how the economic inequalities affected their decisions on hosting nuclear waste will be examined in the interviews with residents.

3.8. Political injustice

A political injustice is another more general injustice which leads to environmental injustice. Political injustice is linked with lack of public participation, and in most democratic countries, to participate in elections, and enjoy freedom of assembly, freedom of expression, and freedom of speech are regarded as universal human rights. However, even in democratic countries, because of the unequal political power and influence people suffer from, the burden of environmental risks is likely to be shared unequally. Similar to economic justice, environmental risks are more likely to be imposed on communities where political injustice exists, because politically powerless people cannot fight back.

Political inequality can be present in various forms in terms of nuclear waste siting. First, information provided by nuclear industries could be misleading. Second, there could be failure to thoroughly inform local communities about the option to host nuclear waste. Third, lack of thorough discussion inside or outside local communities increases the likelihood of unfairness in the siting of nuclear waste repositories. Fourth, those communities which suffer from political inequality often are deprived and minority communities, and their voices are often neglected by decision makers. Fifth, when the powerful nuclear industry uses its vast economic resources to exercise its power in order to obtain the acceptance of its proposals for hosting nuclear waste, members of local

communities can hardly compete with them even in a democracy. Deprived and minority communities are often targeted for hazard waste siting because they have less power to influence the decision makers. Even though many countries require referendums for local people on decisions over hosting nuclear waste, unequal political power can mislead local people in referendums. The next two chapters will explore how opponents of nuclear waste from local communities suffered political inequality in the decision-making process of choosing nuclear waste storage sites, and how they struggled to articulate their opposition in such an unequal political situation.

3.9. Cultural injustice

Culture environmental justice is another aspect of the injustice issue which this research would like to point out in the discussion of dumping nuclear waste or other environmental hazard in indigenous people's areas.

Cultural injustice is often linked with recognition. The concept of recognition means sensitivity to differences, especially cultural differences, between groups of people. Misrecognition can easily lead to an unequal distribution of environmental risk. As Iris Young has argued in 'Justice and political differences', 'where social group differences exist and some groups are privileged while others are oppressed, social justice requires explicitly acknowledging and attending to those group differences in order to undermine oppression'(Young 1990: 81; c.f. Schlosberg 2004). According to Schlosberg, lack of recognition, which 'could be demonstrated by various forms of insults, degradation, and devaluation at both the individual and cultural level, inflicts damage to both oppressed communities and the image of those communities in the larger cultural and political realms' (Schlosberg 2004). Honneth (1995: 190) connects recognition and participation, stating that 'citizens are subject to a form of personal disrespect when they are

structurally excluded from the possession of certain rights within a given society...The experience of being denied rights is typically coupled with a loss of self-respect, of the ability to relate to oneself as a partner, and to interact in possession of equal rights on a par with all other individuals' (Honneth 1995: 190; c.f. Schlosberg 2003: 84). But recognition is also an independent element of procedural environmental justice in that, for example, even where there is full public participation, there could still be lack of respect for an aboriginal or indigenous group by a failure to pay sufficient attention to their cultural identity. Moreover, for such groups, lack of recognition is not only an environmental issue: it is a matter of cultural survival. Lance Hughes, director of Native Americans for a Clean Environment has stated that 'we are not an environmental organisation, and this is not an environmental issue. This is about our survival' (Schlosberg 2003: 84). In terms of nuclear waste siting, failure to recognise cultural differences of local communities would result in cultural inequality. This often reflects decision makers' attitude towards local people especially ethnic minorities. The case study of Da-Ren in Taitung County, has over 90% indigenous Paiwan people. How they suffer from cultural injustice will be explored through interviews in order to understand the opposition to nuclear waste in Taiwan. Here it is important to note the distinctive nature of cultural environmental injustice and its relationship to risk.

Environmental risks which disproportionately affect ethnic minorities not only cause damage to local people as individuals but also damage their collective culture. As people's perceptions of risk are based on their experiences and social-economic perspectives, environmental risks imposed on individuals and members of ethnic minorities have different effects. For example, O'Neill showed how contaminated fish in the Puget Sound and Columbia River brought different impacts to two local communities. As Puget Sound is Native American land, whereas the Columbia River is not; and Native Americans in the Puget Sound area consume more fish than do residents

in the Columbia River area , the impact of contaminated fish is much greater for them (O'Neill 2000; Yamamoto and Lyman 2001). Environmental risks imposed on ethnic minorities, therefore, is not only an issue of political and economic disadvantage but also an issue of cultural and ethnic survival. This is why, in the case of Lan Yu, the local Yami people see their fight against nuclear waste as an existential fight for their cultural future.

Environmental risks which are disproportionately allocated to different ethnic areas cause not only procedural, but also distributive injustice. And this distributive injustice goes beyond environmental injustice to exemplify a deeper form of injustice – cultural injustice. In fact, environmental injustice is both cause and effect of cultural injustice: cause, since environmental injustice inflicted on an ethnic minority reinforces cultural discrimination; effect, since cultural maltreatment makes an ethnic minority vulnerable to environmental discrimination.

So there are three more fundamental justice issues which may lie behind the environmental justice - economic, political and cultural injustice. Economic injustice and political injustice explain how disadvantaged people often lack time, resources and power to participate in decision making, making them easily targeted for hazardous waste siting. However, cultural injustice has a different order of magnitude in that not only does it render a community vulnerable to nuclear waste siting and consequent loss of economic well-being and political autonomy, but it exposes a community to existential annihilation.

3.10 Understanding the opposition: using an environmental justice framework

In order to understand the opposition to a nuclear waste repository, this section will

provide a picture about how should we approach the idea of opposition in the siting process. Not in my back yard (NIMBY) is the term which is often used to describe opposition to local unwanted development, ranging from waste sites to wind farms (Devine-Wright 2008 and Burningham et al 2007)¹⁵. Many commentators have suggested that a person holding a NIMBY position is self-interested and opportunist. This is because Nimbys would not allow a development which did not suit their self-interest even if it is for the public good. However, there are scholars who suggest that Nimbys have their own principles, usually attached to their land and identity. Nevertheless, Nimbyism can help us to understand the opposition of nuclear waste in terms of how the opposition has been conceptualised and developed.

By conducting interviews with opponents of nuclear waste in the local communities, we can determine whether the opposition is based on Nimbyism or not. Of course, opponents might start from a Nimby position and then switch to demanding environmental justice in the process. Therefore, listening to the opponents of nuclear waste repository is important. The interviews were carried in two communities in Taiwan, and the evidence will be analysed in chapter seven.

3.11. Conclusion

This chapter has examined the concept of environmental justice in some detail to establish a framework for its application to the case of Taiwan. This examination has traced the origin and development of the concept, showing how it has evolved from a

¹⁵ Devine-Wright, P. (2008) "Rethinking Nimbyism: The Role of Place Attachment and place Identity in Explaining Place-protective Action", *Journal of Community and Applied Social phylogeny*, 19, 426-441.
Burningham, K., Barnett, J., and Thrush, D. (2007) The Limitation of the NIMBY Concept for Understanding Public Engagement with Renewable Energy Technology: A literature Review, Manchester: Manchester Architecture Research Centre, University of Manchester.

realisation that previous environmental groups were more concerned with the conservation of nature than the inequitable distribution of risks to human health. By contrast, environmental justice groups demanded a more egalitarian approach to environmental policy in order to protect vulnerable communities of low-income and disadvantaged ethnicity. The important distinction between distributive and procedural environmental justice is explained, focusing especially on the distributive principles of equality and sufficiency, and the procedural principles of participation, trust and recognition. Also, the wider forms of injustice that often lie behind instances of environmental justice, as both causes and effects – economic, political, and cultural injustice – have been explored and their implications discussed.

In chapter seven, these principles will be applied to the case of Taiwan. The next chapter (four) begins the analysis of the Taiwan nuclear waste case by explaining its geo-political context.

Chapter 4. Taiwan – The Geo-Political Context

4.1 Introduction

The aim of this chapter is to understand Taiwan in its geo-political context. The chapter has five parts: (1) the geography and demography of Taiwan; (2) the political history of the country; (3) its path of economic development; (4) its foreign policy; and (5) its civil society.

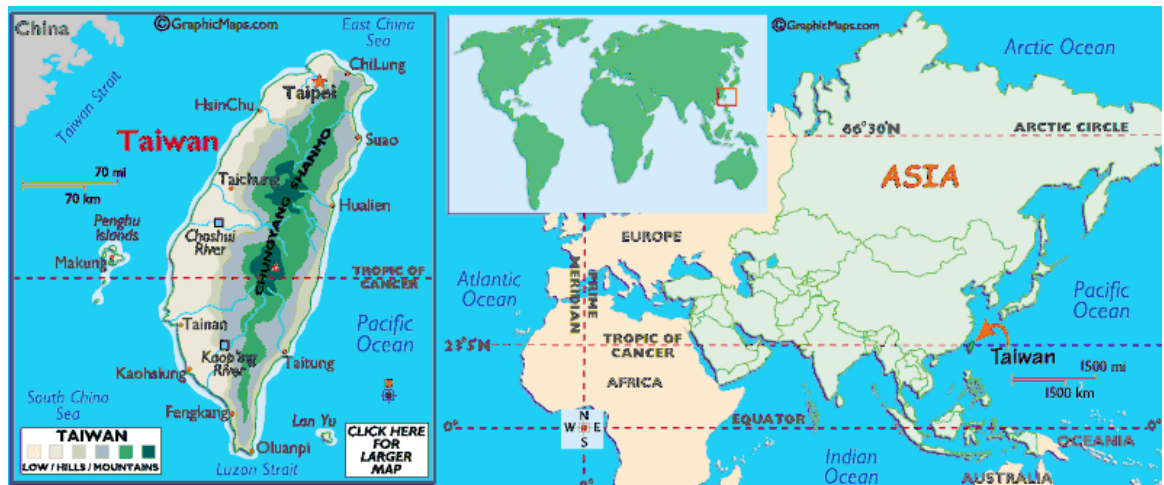
4.2 The geography and demography of Taiwan

4.2.1 Geography

Taiwan is an island located in the Western Pacific, 160 kilometres (96 miles) from China across the Taiwan Strait to the west, with Ryukyu Islands (Japan's most southerly island) to the north, and the Luzon islands of the Philippines to the south. Taiwan comprises 86 islands, including Taiwan main island, Penghu(澎湖) (Pescadore), Kinmen (金門), Matzu (馬祖), Green Island (綠島), and Orchid Island(蘭嶼) (Lanyu/Lan Yu). The total land area is approximately 36,000 square kilometres (13,900 square miles) – approximately the same size as Holland. Taiwan Main Island is about 400 kilometres (230 miles) long and 145 kilometres (85 miles) from east to west at its widest (Government Information Office 2009). It is situated between 22° 45' and 22° 50' north latitude. Mountains occupy nearly two-thirds of Taiwan with more than two hundred peaks rising higher than 3,000 metres above sea level, including the highest peak of East Asia, Jade Mountain (玉山) at 3,952 metres (13,114 feet) (Government Information Office 2009). The mountain ranges lie in the middle and towards the east of Taiwan. The west coast is made up of basins and plains, which are the most productive

farming (mainly rice) areas (Copper 1999: 4). The climate of Taiwan is subtropical, with hot, humid weather from June to September, which is also the typhoon season. Sitting on the boundary of the Eurasian and Philippine plates, Taiwan is also prone to earthquakes.

Table 4.1: Maps of Taiwan



Source: World Atlas .com <http://www.worldatlas.com/webimage/countrys/asia/tw.htm>

4.2.2 Demography

In 2010, the population of Taiwan was 23,165,878 (Directorate General of Budget, Accounting and Statistics). With two thirds of the land area covered by mountains, the distribution of the population in Taiwan is very uneven. Thirty-one per cent of the total population lives in 2.9% of the total land area, mostly in big cities on the west coast plains. In 2009, the population density was 640.09 people per square kilometre, making Taiwan the fifteenth most densely populated country in the world. Taiwan's population has two main ethnic groups: over 95 per cent of the population are Han Chinese and around 2 per cent (503,259 in 2009) are aborigines, belonging to the Austronesian language group (Department of Household Registration Affairs). The Han(漢) Chinese

population includes Holo(河洛), Hakka (客家), and Mainland Chinese groups(外省), of which the Holo (or Fukienese 福建人) are the largest subgroup (about 70 per cent of the population) with significant economic power (Government Information Office 2011). From the 14th to the 17th century, the Holo migrated to Taiwan in large numbers and pushed many Hakka inland to the hills who in turn pushed the aborigines into the mountains or east plains. The Hakka, who came to Taiwan from southern Fukien or Canton province in China and make up 19.6 per cent of the population, (Council of Hakka Affairs 2009) were a persecuted minority in China, driven from northern China about 1500 years ago (Copper 1999: 11). By AD 1000, there were significant numbers of Hakka in southern Taiwan and the last large-scale Hakka migration to Taiwan was in the 1860s (Copper 1999: 11). The Mainland Chinese came to Taiwan with Chiang Kai-Shek (蔣介石) when the Nationalist government was defeated by the Communist Party in October 1949. Today, they are about 8.9 per cent (Council of Hakka Affairs 2009) of the population, and they dominated Taiwan politics and culture between 1945 and 1980s, holding key positions, including senior posts in the government, military, and bureaucracy.

The aboriginal population is even more divided: the Taiwan government recognises 14 aboriginal tribes, most of whom live in the central mountains or on the east coast plains. The main exception is the Yami people (雅美族), who live on Orchid island (Lan Yu), which is about 73 km off Taiwan's southeast coast. There has been a history of conflict between aboriginal communities and settlers, with aborigines forced from the western coastal plains (Government Information Office 2011). Most aborigines are engaged in agriculture, fisheries and, more recently, tourism. Generally, they are isolated from the main social, political and economic institutions in Taiwan.

4.3 Political history of Taiwan

We turn now to the second part of Taiwan's geo-political context – its political history. This section is divided into six timeframes: pre-1945; 1945-75; 1975-88; 1988-2000; 2000-08; and 2008-to present.

4.3.1 Pre-1945

The first people who settled in Taiwan were those of Malay-Polynesian descent about 12,000 to 15,000 years ago. Historical evidence suggests that the interaction between Taiwan and the rest of the world was infrequent before the 7th century A.D. Taiwan was successively under the rule of Mongols, the Dutch, the Spanish, and the Chinese until 1894. However, China lost the Sino-Japanese War in 1894 and, in the Treaty of Shimonoseki, ceded sovereignty of Taiwan and Pescadores to Japan. Under Japanese colonial rule, which lasted until the end of World War II, Taiwan's agricultural productivity increased, its infrastructure was improved, and modern banking and Japanese currency were introduced (Brown 2004: 61). From 1899 to 1942, the railway network was extended from 30 miles to more than 300 miles, and the highways system was extended from 4,184 miles to 10,816 miles (Brown 2004: 31 and Copper 1999: 31). Japan also introduced compulsory primary education in Taiwan. By 1944, there were 944 primary schools in Taiwan with total enrolment rates of over 70 per cent (Brown 2004: 31). However, the Japanese exploited Taiwan's natural resources and, by the 1930s, much of the rice and sugar production in Taiwan was exported to Japan (Copper 1999: 25) . In the late 1930s, Japan promoted industrialization in Taiwan to support its preparations for war with new machinery, shipbuilding, petrochemical, textiles, and cement industries being developed in Taiwan (Brown 2004: 66). When Japan lost the war in 1945, Taiwan was returned to the Republic of China.

4.3.2 1945-1975: Chiang Kai-Shek

The Republic of China (ROC) was founded in 1912 after the fall of the Imperial Ching Dynasty. At this time, Taiwan was under Japanese colonial rule, but after World War II, the Cairo Declaration stated that 'all the territories Japan has stolen from the Chinese, such as Manchuria, Formosa (Taiwan), and the Pescadores, shall be restored to the Republic of China' (National Diet Library of Japan). In October 1945, Chiang Kai-Shek sent Nationalist Chinese officials and troops to Taiwan. There was considerable tension between the Taiwanese people and the mainland Chinese troops (Copper 1999: 35). This tension exploded on 27 February 1947, when a Taiwanese woman was beaten by a Mainlander policeman with his pistol on suspicion of selling smuggled cigarettes. This incident aroused the ill-feeling of the surrounding Taiwanese crowds towards the mainland troops, and the Taiwanese people protested against the government and police authority but the government did not respond. On the next day, Chinese troops were called in and fired on unarmed protestors. As the situation intensified, Chinese troops targeted those opposed to the Nationalist government, and between February and May 1947 at least 6,000 people died in clashes between troops and the anti-government movement, while 10,000 were executed for joining the anti- government movement (Lee 1998: 35). This violent episode had a very significant influence on Taiwanese domestic politics, providing a historical focus for ethnic tensions in Taiwan for most of the second half of the twentieth century.

In October 1949, the Nationalist government relocated from the mainland to Taiwan after Chiang Kai-Shek's Nationalist force had been defeated by the Chinese Communist Party forces in China. The Chinese Nationalist Party (Kuomintang 國民黨 KMT) had been founded by Sun Yat-Sen (孫逸仙) in 1894 as a revolutionary organisation. In October 1911, Sun and his followers successfully defeated the Imperial forces of the Ching Dynasty and subsequently established the Republic of China (ROC) in 1st January 1912. Sun died in 1925, and Chiang Kai-Shek, a military general and an ally of

Sun, succeeded as the leader of KMT, and Taiwan was under KMT rule until 2000.

The KMT regime introduced martial law in order to deal with the national security threat from Communist China. The members of the Legislative Yuan and National Assembly¹⁶ who had been elected in mainland China before 1949 became life-long members and remained in parliament until December 1991. The military and intelligence agencies dominated politics and anti-government (pro-socialist, pro-communist and pro-independence) movements were prohibited. The KMT government controlled the trade unions and the media; rights to freedom of speech, assembly and association were curtailed; and there were no genuine civil society organisations. During Chiang Kai-Shek's rule in Taiwan (1949-1975), approximately 140,000 people in Taiwan were imprisoned or executed for their real or perceived opposition to the KMT government, according to a report of Executive Yuan of Taiwan (Wei 1997: 47). However, the KMT government allowed limited political participation to people in Taiwan, and in March 1966, the government decided to replace the deceased members of Legislative Yuan and National Assembly with popularly elected members, and supplementary elections were duly held for both bodies in 1969, 1972, and 1975. In 1969, there were 11 seats for supplementary election for the Legislative Yuan and 15 seats for the National Assembly. As a result, non-KMT member captured 3 out of 11 seats in the Legislative Yuan election but KMT won all the 15 seats in the National Assembly election. In 1972, the eligible seats for supplementary election to Legislative Yuan and National Assembly increased to 51 and 53 seats, respectively. Non-KMT members won 9 out of the 51 seats in the Legislative Yuan election and 10 out of the 53 seats in the National Assembly. In 1975, non-KMT members gained 9 out

¹⁶ The Legislative Yuan is the highest legislative organ of the country, and the main function of the National Assembly was to elect the President and Vice President. However, constitutional amendments in 1992 established the direct popular elections for the President and Vice President. The constitutional amendments in 2005 abolished the National Assembly and its other responsibilities have been transferred to Legislative Yuan.

of 52 seats. Although the newly elected members of Legislative Yuan and National Assembly comprised less than 10 percent of each body, the elections gave the Taiwanese people at least some degree of political participation.

4.3.3 1975-88: Chiang Ching-Kuo (蔣經國) and the end of martial law

After Chiang Kai-Shek's death on 5 April 1975, his Vice President Yen Chia-Kan (嚴家淦) succeeded as President until his term ended in 1978. However, Chiang Kai-Shek's son Chiang Ching-Kuo, who succeeded Chiang Kai-Shek as KMT's chairman after Chiang Kai-Shek's death, became President after Yen's term ended in 1978. Chiang Ching-Kuo abandoned his father's dream of returning to power in China. Instead, he focussed on economic development and modernising public infrastructure and, in his final years in power, he started the process of democratisation in Taiwan. He launched an anti-corruption campaign, which led to some government officials being jailed. He also increased the number of supplementary elections for members of the Legislative Yuan from 97 seats in 1980 to 129 seats in 1989.

In the 1970s, an opposition movement for democratisation developed in Taiwan despite the continuation of martial law. By the late 1970s, although illegal, the Formosa Magazine was the most popular opposition publication in Taiwan, a rallying point for opposition Legislators and other opposition politicians who played key roles in the opposition movement. Their attempts to hold a public meeting to demand democratic reform on International Human Rights Day, 10 December 1979, led to the 'Kaohsiung Incident' (高雄事件) when many opposition leaders were arrested and received long prison sentences. However, the opposition movement continued to develop in the early 1980s, and Chiang Ching-Kuo began a slow process of political democratisation in

response to both internal and international pressure¹⁷, seeing democratisation as Taiwan's best strategy for resisting China's demand for re-unification. In 1984, Chiang Ching-Kuo appointed Lee Teng-Hui (李登輝), a Taiwanese loyal to KMT, as vice president – a symbolic move indicating Chiang's intention to transfer political power from the mainland Chinese to the Taiwanese. In 1986, the KMT allowed the establishment of the first official opposition party, the Democratic Progressive Party (DPP)(民進黨), which took part in national elections for the first time in 1986, when it won 12 seats out of 100 seats in the supplementary Legislative Yuan ballot - which matched the achievements of the pre-DPP opposition movement in 1980 (Cheng 1989). In 1987, Chiang Ching-Kuo ordered the end of martial law with effect from 15 July 1987, and allowed Taiwanese residents to visit mainland China for the first time since 1949. Finally, just before his death in 13 January 1988, he significantly increased the freedom of the press by ending state control of the media and allowing new TV stations and newspaper to be created.

4.3.4 1988-2000: Lee Teng-Hui and Democratisation

After Chiang Ching-Kuo's death in January 1988, Vice President Lee Teng-Hui succeeded as President of ROC – the first Holo (Taiwanese) to become President of Taiwan. Lee worked with the opposition DPP and began a process of constitutional reform in 1989. The so-called 'elder parliamentarians', who had been elected in Mainland China before 1949, were retired and the first genuine general elections for the National Assembly and the Legislative Yuan took place in 1991 and 1992 respectively, with all seats contested. In the 1991 National Assembly elections, the KMT received 71 percent of the vote and 254 seats while the DPP received 24 percent and 66 seats

¹⁷ Taiwan lost its seat at the United Nations in October 1971, by which time it had lost its official diplomatic ties with most major countries such as USA, the UK, Japan, France, and Germany.

(Rubinstein 2007b: 455). In the 1992 Legislative Yuan elections, the KMT did less well but still managed to gain a majority of both votes (53%) and seats (95 out of 161) with the DPP winning 31.7 per cent of the vote and 51 seats (Copper 1999: 143).

Table 4.2: Vote Shares of Major Political Parties in Legislative Yuan Elections, 1992-2008 (%)

| Year | KMT Seats Percentage of vote | DPP Seats % | NP Seats % | PFP Seats % | TSU Seats % | Non ¹⁸ Seats % | Total seats |
|-----------|---------------------------------------|-------------------|------------------|-------------------|-------------------|---------------------------------|----------------|
| 1992 | 95 53.02% | 51 31.03% | | | | 15 15.95% | 161 |
| 1995 | 85 46.1% | 54 33.2% | 21 13% | | | 4 7.7% | 164 |
| 1998 | 123 46.4% | 70 29.6% | 11 7.1% | | | 21 | 225 |
| 2001 | 68 28.6% | 87 33.4% | 1 2.6% | 46 18.4% | 13 7.8% | 10 | 225 |
| 2004 | 79 32.83% | 89 35.72% | 1 0.12% | 34 13.9% | 12 7.79% | 10 5.94% | 225 |
| 2008 | 61 53.48% | 13 38.65 | 0 | 1 0.3% | 0 0.96 | 4 6.18% | 79 |
| Districts | | | | | | | |
| 2008 | 20 | 14 | | | | | 34 |

¹⁸ This column includes small party and non-party candidates

| | | | | | | | |
|----|--------|--------|-------|--|-------|--|-----------|
| PR | 51.23% | 31.53% | 3.95% | | 3.53% | | total 113 |
|----|--------|--------|-------|--|-------|--|-----------|

Sources: Central Election Commission.

In May 1992, Lee significantly increased the freedom of the press and expression by promulgating a revision of Article 100 of the Criminal Code, which provides for imprisonment of people convicted of anti-state activities (Amnesty International 1992), and had been used by the KMT government to control the society for over 45 years. Since 1992, any expression of opinion regarding the independence of Taiwan is considered to be legal, so long as it is not violent. While Lee was in office, constitutional amendments in 1992 and 1994 made provision for the direct election of the President and city mayors in Taipei City and Kaohsiung City. This weakened the National Assembly because its most important function was to elect the President and the Vice President and to propose and ratify constitutional amendments.

However, the speed of democratisation and the apparent abandonment of the possibility of re-unification of the Republic of China led to divisions in the KMT. In 1993, some Mainland Chinese members of the KMT left to establish the New China Party (NP), and in the 1995 Legislative Yuan election, the NP gained 21 seats with 13 per cent of the votes and the KMT were reduced to 85 seats (46.1% of the vote). The DPP slightly increased both its share of the votes (33.2%) and its number of seats (54).

In 1996, Taiwan held its first direct presidential election, before which China conducted military exercises over the Taiwan Strait in what was widely seen as an attempt to influence its outcome. In response, the USA sent an aircraft carrier battle group to the region. Despite the threat from China, Lee Teng-Hui secured 54 per cent of the popular vote for the KMT to become the first directly elected President of the Republic of

China.

Table 4.3: Results of the 1996 Presidential Election in Taiwan.

Voter turnout: 76%

| President candidate | Vice Presidential Candidate | Political Affiliation | Votes % |
|---------------------------|-----------------------------|-----------------------|--------------------|
| Lee Teng-Hui (李登輝) | Lien Chan (連戰) | KMT | 5,813,699 54% |
| Peng Ming-Min (彭明敏) | Frank Hsieh (謝長廷) | DPP | 2,274,586 21.1% |
| Lin Yang-Kang (林洋港) | Hau Pei-Tsun (郝柏村) | Independent | 1,603,790 14.9% |
| Chen Lu-An (陳履安) | Wang Ching-Feng (王清峰) | Independent | 1,074,044 9.9% |
| Invalid votes/blank votes | | | 117,160 |

Sources: Central Election Commission.

However, the DPP did win 12 out of 23 local county/city mayoral elections in 1997, which put it in the position of running local government, giving it jurisdiction over 70 percent of the total population in Taiwan. By contrast, the DPP did not perform well in

the 1998 Legislative Yuan election, because of the outbreak of the Asian financial crisis. Although Taiwan was not directly affected by the crisis, voters were convinced that the KMT could do better than the DPP in bringing economic stability. Therefore, the DPP lost nearly 4 percent of the total vote and managed to win only 70 out of 225 seats while the KMT retained its share of the vote by winning 46.4 per cent of the total vote and capturing 123 out of 225 seats.

In the run-up to the 2000 Presidential election, the KMT suffered further internal divisions, with competition for the Presidential nomination between Vice President Lien Chan(連戰) (a Taiwanese Holo) and James Soong(宋楚瑜) (a mainlander Chinese). Lee supported his Vice President for the nomination and Soong decided to run as an independent in the 2000 Presidential election. The result was a significant split in the KMT vote and the DPP candidate, Chen Shui-Bian (陳水扁), was elected President. Chen received 39.3 per cent of the total votes, just 2.5 per cent more than Soong. Chen's victory marked the first democratic transition of power in Taiwan and ended the half-century of KMT rule in Taiwan.

Table 4.4: Results of the 2000 Presidential Election in Taiwan

Voters' turnout rate: 82.69%

| President Candidate | Vice President Candidate | Political Affiliation | Votes % |
|-------------------------|--------------------------|-----------------------|--------------------|
| Chen Shui-Bian (陳水扁) | Annette Lu (呂秀蓮) | DPP | 4,977,737 39.3% |

| | | | |
|------------------------------|-------------------------------|-------------|---------------------|
| James Soong (宋楚瑜) | Chang Chau-Hsiung (張昭雄) | Independent | 4,664,932 36.8 % |
| Lien Chan (連戰) | Vincent Siew (蕭萬長) | KMT | 2,925,513 23.1% |
| Hsu Hsin-Liang (許信良) | Josephine Chu (朱惠良) | Independent | 79,429 0.63% |
| Li Ao (李敖) | Elmer Fung (馮滬祥) | Independent | 16,782 0.13% |
| Invalid votes/blank votes | | | 122,278 |

Sources: Central Election Commission.

4.3.5 2000-2008: Chen Shui-Bian and the DPP Government

After the 2000 Presidential election, the DPP President Chen had to work with a KMT majority in the Legislative Yuan (115 of 225 seats). The 1997 constitutional amendment had introduced a French style semi-presidential system in Taiwan. The government is headed by a Prime Minister appointed by the President without the need for the consent of the Legislative Yuan. The Prime Minister is responsible to the Legislative Yuan and the legislators can cast a vote of no confidence in the government, but the President has the power to dissolve the Legislative Yuan should a vote of no confidence be passed (Wu 2001). In 2000, conflict between the DPP President Chen and the KMT-led

Legislative Yuan created political gridlock. This gridlock manifested itself in the nuclear debate when President Chen Shui-Bian sought to stop the construction of the 4th Nuclear Power Station¹⁹ in order to fulfill his campaign promises. Prime Minister Tang Fei (唐飛) did not agree with Chen's decision and resigned after only four months in office. Chen appointed his political ally Chang Chun-Hsiung (張俊雄) as Prime Minister, and announced an end to the construction of the 4th Nuclear Power Station – a decision which negatively affected the economy, because the stock market lost 47.7 percent of its value over fears of an energy shortage that would slow down economic development (Lin 2001). The DPP government had lost support in the business community, and foreign companies began to question Taiwan's ability to honour its long-term contracts. In January 2001, the Council of Grand Justices intervened and declared that it was the legislature and not the cabinet that had the power to decide on the issue, and the next month Prime Minister Chang allowed the construction of the 4th Nuclear Power Station to continue. However, this volte face undermined the relationship between DPP and environmental groups which were allies when DPP was in opposition, but felt that the DPP government had betrayed them for failing to deliver their anti-nuclear promises after they won the election.

The result of the presidential election in 2000 also brought changes to party politics in Taiwan. After the election, the former Taiwan Governor, James Soong, established the People First Party (PFP), attracting several KMT members and legislators who did not like Lee Teng-Hui's approach to democratisation. Angry supporters of KMT gathered outside KMT headquarters demanding that Lee Teng-Hui step down as party chairman – he duly obliged, but only to found the Taiwan Solidarity Union (TSU) recruiting the Taiwanese Holo people who had worked closely in KMT with Lee, to fight the Legislative Yuan election campaign in 2001. In that election, KMT lost its majority in

¹⁹ The construction of 4th Nuclear Power Station began in 1997

the Legislative Yuan, only winning 68 out of 225 seats, and DPP became the biggest party in the parliament with 87 out 225 seats. Both the PFP and TSU performed well in their first-ever elections - PFP captured 46 out of 225 seats in the Legislative Yuan with 18.4 per cent of the total vote, while TSU captured 13 seats with 7.8 per cent of the votes.

After the 2001 election, the KMT, NP and PFP worked together in the Legislative Yuan to form the 'Pan Blue Camp' - an anti-DPP opposition coalition which adopted a pro-unification platform. For their part, the DPP and TSU also worked together in the Legislative Yuan in order to support the DPP's independence platform, and were dubbed the 'Pan Green Camp'. Taiwan party politics had come to the stage in which two broad coalitions lined up against each other in the Legislative Yuan as well as in elections in Taiwan. As the Pan Green Camp held 100 out of 225 seats, the DPP government faced less opposition in the Legislative Yuan, and President Chen Shui-Bian focused on economic development, talks with China, and his campaign for a second term in office. When Taiwan was rejected by the World Health Organisation (WHO) for observer status and not allowed to participate in the WHO summit in 2003, Chen decided to initiate a referendum in the expectation that such a referendum would help to mobilise the DPP party base and excite Taiwanese patriotism and so win the election in 2004 (Rigger 2004).

The 2004 presidential election brought a major shock to Taiwan: just one day before the poll on 19th March, President Chen Shui-Bian was shot in the stomach while campaigning in southern Taiwan. Although Chen was only lightly injured and left the hospital in less than a day, he won the presidency (by a margin of 0.22 per cent of the total votes) despite the fact that the referendums were invalid because the turnout rates were lower than 50 per cent. The Pan Blue Camp candidates Lien Chan and James

Soong demanded a recount, accusing the DPP of engineering the shooting incident to influence the results. For their part, the Pan Green supporters saw the assassination as a China-led conspiracy to damage Taiwan's democracy. Despite the turmoil, Chen and his running mate, Annette Lu, duly took office in May 2004 (Chan 2005).

Table 4.5: Results of 2004 Presidential Election in Taiwan.

Voters turnout rate: 80.28%

| President candidate | Vice President Candidate | Political Affiliation | Votes % |
|---------------------------|--------------------------|-----------------------|---------------------|
| Chen Shui-Bian | Annette Lu | DPP | 6,471,970 50.11% |
| Lien Chan | James Soong | KMT-PFP | 6,442,452 49.89% |
| Invalid votes/Blank Votes | | | 337,297 |

Sources: Central Election Commission.

However, in December 2004, the result of the Legislative Yuan election brought a setback to Chen and his DPP government. Although DPP won 89 out of 225 seats and was still the largest single party in Legislative Yuan, the Pan Blue Camp won 114 seats, which was 10 more than the Pan Green Camp won. In 2005, the DPP also suffered a major loss in the county/city mayor election when KMT won 17 out of 23 county/city mayor elections. With government bills often rejected in the Legislative Yuan, and the

loss of local control, the DPP government was in a very difficult situation. Moreover, since late 2005, a series of corruption accusations were launched against Chen, his wife, and his family, including charges of insider trading, money laundering, and improper use of government funds. Chen denied any wrongdoing, and to minimize the impact of these allegations, he raised the issue of Taiwan's independence, speaking publicly about abolishing the National Unification Guidelines and the National Unification Council. In fact, the National Unification Council had not been functioning for years, and Chen's strategy backfired – by May 2006 his approval rating had dropped to 5.8 per cent (Li 2006), and in September, nearly 90,000 demonstrators gathered outside the Presidential Palace in Taiwan demanding that he step down. In response, Chen continued to deny any wrongdoing, and insisted that he would not step down until his second term of office ended.

In 2007, the unpopular President planned a referendum on Taiwan's membership in the United Nations (U.N.) in order to boost Pan Green's support in the 2008 presidential and Legislative Yuan elections. Despite objections from the USA and China, Chen insisted that the referendum on Taiwan's joining the U.N. must go ahead. As a counterweight, the KMT initiated its own referendum to return Taiwan to the U.N. under the name of either Taiwan or the ROC. The two referendums were held on the same day as the presidential election in March 2008, but both were declared invalid because their turnout rates were lower than 50 percent.

In January 2008, the number of seats in the Legislative Yuan were reduced from 224 to 113 under a constitutional amendment in 2005 in order to have a more efficient legislative process. Taiwan politics turned a new page when the KMT captured an overwhelming victory in the Legislative Yuan election with 81 out of 113 seats. By holding two-third of the seats in Legislative Yuan, KMT would be able to impeach the

president by its own votes. In March 2008, KMT's Ma Ying-Jeou (馬英九) defeated DPP's Frank Hsieh (謝長廷) in the presidential election by 58 per cent to 41 per cent. The scale of KMT's victory showed DPP's inability to handle the economic downturn, cross-strait relations, and corruption allegations, during the previous eight years, and Taiwan experienced a democratic power transfer for the second time.

Table 4.6 Results of 2008 Presidential Election in Taiwan

Voters turnout rate: 76.33%

| President candidate | Vice Presidential Candidate | Political Affiliation | Votes % |
|------------------------------|-----------------------------|-----------------------|---------------------|
| Ma Ying-Jeou | Vincent Siew | KMT | 7,659,014 58.45% |
| Frank Hsieh | Su Tseng-Chang (蘇貞昌) | DPP | 5,444,949 41.55% |
| Invalid votes/Blank Votes | | | 117,646 |

Sources: Taiwan. Central Election Commission.

4.3.6 Ma Ying-Jeou (馬英九) 2008-

When the newly-elected President Ma Ying-Jeou took office in May 2008, he ended the

government gridlock of 2000-2008. Since KMT held two-thirds of the seats in Legislative Yuan, it would be easier for Ma to push through his agenda. Ma believed that to improve the Taiwan economy, it was necessary first to improve relations between Taiwan and China, and he made clear to Chinese leaders that the two sides should resume talks under the '1992 Consensus'²⁰. China welcomed Ma's gesture, and the talks between Taiwan and China restarted, while direct flights, shipping, and trade with China were established in December 2008.

However, Ma faced strong challenges from the Pan Green Camp, and in October 2008, many people organised by DPP held demonstrations against China's representative Chen Yun-Lin's (陳雲林) visit to Taiwan. In November 2008, the Taiwan government ordered the police to tighten security, and the subsequent police conduct became violent. Several journalists reported that the police broke the national flags held by peaceful protesters, hitting the journalists and protesters in the face, breaking into private hotel rooms and taking away private property, shutting down local stores by force or threats, and arresting large numbers of innocent demonstrators. Taiwan police's violent behaviour drew strong criticism at home and abroad, and college students launched a peaceful sit-out demonstration demanding an end to the police violence and a more reasonable law guaranteeing the right of assembly. Freedom House, an international NGO which conducts research and advocacy on democracy, political freedom, and human rights, issued a statement calling for an inquiry into the incident, which badly damaged the image of Taiwan's democracy (Freedom House 2008).

In 2009, Ma faced further criticism after the worst typhoon in 50 years - typhoon

²⁰ In 1992, the meeting between Taiwan and China representatives in Hong Kong reached agreement to recognise the 'One China principle', under which both sides recognise there is only one China – in that both mainland China and Taiwan belong to the same China - but that both sides agree to interpret the meaning of that one China according to their own individual definitions.

Morakot - hit Taiwan on 8 August. Ma was criticised by both the Pan Blue Camp and the Pan Green Camp for not responding to the disaster quickly and effectively. Ma's KMT government failed to mobilise the military to join the rescue team, and this failure was held to have resulted in the loss of more than 200 lives. Ma was forced to apologise publicly for his government's failure and bad management. Finally, Ma was also criticised for lack of success in his flagship economic policy of closer relations with China: Taiwan's economy suffered another downturn in 2009 with minus 1.93 per cent of growth, the worst in 50 years. With the unemployment rate still high at 5.85 per cent in 2009, Ma did not achieve his election promise to improve the economy in Taiwan.

4.4 Political Economy

This leads us to the third part of Taiwan's geo-political context – its political economy.

4.4.1 Taiwan's economy 1945-1988

The KMT government initiated the economic development of Taiwan in the 1950s with the help of the USA, beginning with land reform and an import-substitution strategy in 1953 (Rubinstein 2007a: 367). As a result, agricultural productivity improved, and food products were successfully exported, bringing in half of the nation's foreign exchange during the 1950s and early 1960s (Cooper 1999: 132). Much of this foreign currency was used to import industrial machinery in order to develop the industrial sector. During the 1960s, the government placed emphasis on labour-intensive export industries, basic services, financial reform and energy development in order to fit Taiwan into the world's economy. The government established export-processing zones near major ports in Taiwan which enabled foreign companies to import materials and use the cheap and

capable labour force to assemble their products then to export the finish products to the rest of the world. Foreign investment into Taiwan increased dramatically this period from US\$ 20 million between 1952 and 1959 to more than US\$ 950 million between 1966 and 1973. The Taiwanese began to set up small businesses producing toys, shoes, textiles, and sports equipments, and these became the suppliers for transnational or foreign retailing companies. As a result, Taiwan's GDP grew nearly four times from US\$ 1,783 millions in 1961 to US\$ 6,662 millions in 1971, and GDP per capita increased 272 per cent, from US\$164 per capita in 1961 to US\$447 per capita in 1971.

However, because Taiwan had no natural resources to draw upon to supply sufficient energy for its economic development, the government initiated the project of building a nuclear power plant in 1971. On this and other major projects such as steel mills, shipyards, petrochemical refineries, motorways, railroads, airports, and harbours (Copper 1999: 135), the Taiwan government invested US\$ 92 billion to modernise Taiwan's infrastructure under the command of Prime Minister Chiang Ching-Kuo (who later became President in 1978).

The oil crises in the 1970s led the government to promote industries which were low-energy consumption, high technology, and high value-added. As a result, the economy of Taiwan was gradually transformed from labour-intensive industries to capital-intensive industries, which contributed to spectacular economic growth during the 1970s and 1980s. For example, between 1984 and 1988, the value of made-in-Taiwan computer hardware products rose from US\$ 1 billion to 5.15 billion (Rubinstein 2007: 375), and from 1971 to 1988, GDP per capita increased more than seven times, while the nation's income per capita grew from US\$ 419 to US\$ 5,948. This impressive economic performance was dubbed the 'Taiwan Miracle' and radically improved living standard in Taiwan.

4.4.2 1988-2000

During the 90s, Taiwan maintained its high rate of economic growth supported by government policies. However, evidence of the negative consequences of environmental degradation began to surface, and after the government lifted the ban on trade relations with China in 1987, labour-intensive industries in Taiwan began to invest in China and South East Asia. Nevertheless, even during the Asian Financial Crisis in 1997-1998, Taiwan's economy still enjoyed considerable growth in production, exports, and trade surpluses, largely because of its technology-based industries. In 1986, the technology-intensive industries had occupied 59.96 percent of the total value of manufacturing output, while in 1999 technology-intensive industries accounted for 76.1 percent of the total value of manufacturing output and 76.1 percent of the total export value (Government Information Office).

In short, during the period 1988-2000, Taiwan's economy under President Lee Teng-Hui was spectacularly successful, with an annual average economic growth rate of 6.24 per cent, and an increase in GNP of 57 per cent, raising GNP per capita from US\$ 6,318 to US\$ 14,909 (Government Information Office).

4.4.3 2000-2008

However, in 2000, Taiwan experienced the beginnings of an economic downturn: the restructuring of the economy and the relocation of businesses led to a rise in unemployment, while political instability led to a fall in investment. As a result, Taiwan's economy performed poorly in 2001: the economic growth rate was minus 1.65 (the first negative figure for post-war Taiwan); exports dropped 17.2 per cent (Government Information Office); and the unemployment rate rose to 4.57 (the highest

for four decades). In addition, the gap between the rich and poor in Taiwan widened: the ratio of the income share of the highest 20 per cent household to that of the lowest 20 percent reached its highest point (6.39 times) since the 1960s.

In order to rescue the failing economy, the DPP introduced a series of measures including the continuation of the fourth nuclear power station; a relaxation of the upper limit on investment in China; and permission for direct investment (Rigger 2003). However, although these and other measures helped the economy to recover, and Taiwan enjoyed 5.26 per cent economic growth in 2002, small businesses continued to leave the country because of lack of confidence in the DPP government and concern over the political situation in Taiwan. As a result, in Chen's second term, Taiwan's economic growth rate was lower than that in Singapore, Hong Kong, and South Korea. Moreover, between 2000 and 2007, the growth of wages was 7.1 per cent while the rate of inflation increased by 8.9 per cent, so the real level of wages declined. With businesses complaining about the restriction on cross-strait trade and people's real wage levels falling, the DPP government's eight years in power did not have the desired effect of maintaining the strength of Taiwan's economy.

4.4.4 2008-to present

One of the reasons why the KMT won the presidential and legislative elections in 2008 was that the public believed that the KMT had more experience than the DPP of dealing with economic issues. However, the KMT government has not performed well in economic terms since 2008 despite the ever-closer economic relations between China and Taiwan. President Ma Ying-Jeou expected that signing the Economic Cooperation Framework Agreement (ECFA) with China would improve Taiwan's exports and bring economic growth, but Taiwan's economy suffered another reverse, with economic

growth down to the worst level in 50 years (minus 1.93 per cent) and the highest-ever unemployment rate at 5.85 per cent in 2009.

So after a long period of highly successful growth, Taiwan has entered the second decade of the 21st century with an economy in difficulty. The following tables track this decline in detail, and compare Taiwan's performance with other competitor countries.

Table 4.7. Main economic indicators for Taiwan 1951-2009

| Year | Economic Growth Rate (%) | GNP Millions USD\$ | GNP per capital (USD\$) | National Income per capita USD\$ | Unemployment rate % |
|------|-----------------------------------|--------------------------|----------------------------|---|------------------------|
| 1951 | 11.85 | 1,227 | 158 | 154 | 4.52 |
| 1961 | 6.32 | 1,783 | 162 | 153 | 4.10 |
| 1971 | 12.45 | 6,662 | 447 | 419 | 1.66 |
| 1981 | 3.97 | 48,958 | 2,715 | 2,455 | 1.36 |
| 1988 | 5.57 | 125,338 | 6,318 | 5,948 | 1.69 |
| 1991 | 7.88 | 189,924 | 9,263 | 8,473 | 1.51 |
| 2000 | 5.80 | 330,674 | 14,909 | 13,299 | 2.99 |
| 2001 | -1.65 | 299,391 | 13,401 | 11,821 | 4.57 |
| 2002 | 5.26 | 308,101 | 13,716 | 12,077 | 5.17 |
| 2003 | 3.67 | 320,312 | 14,197 | 12,549 | 4.99 |
| 2004 | 6.19 | 351,104 | 15,503 | 13,602 | 4.44 |
| 2005 | 4.70 | 373,870 | 16,449 | 11,412 | 4.13 |
| 2006 | 5.44 | 385,957 | 16,911 | 14,724 | 3.91 |

| | | | | | |
|------|-------|---------|--------|--------|------|
| 2007 | 5.98 | 403,207 | 17,596 | 15,192 | 3.91 |
| 2008 | 0.73 | 410,108 | 17,833 | 15,194 | 4.40 |
| 2009 | -1.93 | 389,921 | 16,895 | 14,271 | 5.85 |

Sources: The World Bank. World Development Indicators (WDI) and Global Development Finance (GDF).

Table 4.8. GDP per capita in Taiwan and other countries since 1961
US\$

| Year | Taiwan | China | Hong Kong | Singapore | South Korea | Japan | Euro Zone | USA | UK |
|------|--------|-------|-----------|-----------|-------------|-------|-----------|-------|-------|
| 1961 | 164 | 77 | 483 | 438 | 92 | 564 | 1036 | 1452 | 976 |
| 1971 | 447 | 117 | 1102 | 1061 | 302 | 2201 | 2519 | 5360 | 2524 |
| 1975 | 978 | 176 | 2251 | 2506 | 608 | 4514 | 5082 | 7517 | 4205 |
| 1981 | 2730 | 195 | 5979 | 5489 | 1846 | 10062 | 8469 | 13526 | 9142 |
| 1988 | 6146 | 281 | 10591 | 8932 | 4466 | 24230 | 14845 | 20698 | 14951 |
| 1991 | 9016 | 330 | 15444 | 13768 | 7123 | 28121 | 19484 | 23493 | 18387 |
| 2000 | 14704 | 949 | 25374 | 23019 | 11347 | 36789 | 20099 | 35081 | 25089 |
| 2001 | 13147 | 1041 | 24812 | 20700 | 10655 | 32210 | 20297 | 35898 | 24885 |
| 2002 | 13404 | 1135 | 24285 | 21152 | 12093 | 30745 | 21976 | 36797 | 27172 |
| 2003 | 13773 | 1274 | 23559 | 22651 | 13451 | 33113 | 26977 | 38196 | 31238 |
| 2004 | 15012 | 1490 | 24454 | 26319 | 15028 | 36051 | 30704 | 40309 | 36782 |
| 2005 | 16051 | 1731 | 26092 | 29401 | 17751 | 35627 | 31709 | 42534 | 37859 |
| 2006 | 16491 | 2069 | 27699 | 32960 | 19707 | 34178 | 33408 | 44663 | 40251 |
| 2007 | 17154 | 2651 | 29898 | 38523 | 21653 | 34264 | 38134 | 46627 | 45901 |
| 2008 | 17399 | 3413 | 30833 | 39950 | 19162 | 38268 | 41648 | 47209 | 43361 |
| 2009 | 16353 | 3744 | 30065 | 36537 | 17078 | 39738 | 38084 | 45989 | 35165 |

Sources: The World Bank. World Development Indicators (WDI) and Globe Development Finance (GDF).

Table 4.9. Unemployment rates in Taiwan and other countries 1981-2009

Units: USD\$

| Year | Taiwan | China | Hong Kong | Singapore | South Korea | Japan | Euro Zone | USA | UK |
|------|--------|-------|-----------|-----------|-------------|-------|-----------|------|------|
| 1981 | 1.36 | 3.80 | 3.55 | 2.90 | 4.51 | 2.28 | n/a | 7.61 | n/a |
| 1988 | 1.69 | 2.00 | 1.36 | 3.61 | 2.52 | 2.53 | 11.13 | 5.51 | 8.80 |
| 1991 | 1.51 | 2.3 | 1.81 | 1.95 | 2.40 | 2.06 | 8.47 | 6.83 | 8.38 |
| 2000 | 2.99 | 3.1 | 4.92 | 5.96 | 4.42 | 4.77 | 9.20 | 3.99 | 5.48 |
| 2001 | 4.57 | 3.60 | 5.09 | 2.92 | 4.00 | 5.03 | 8.20 | 4.73 | 4.74 |
| 2002 | 5.17 | 4.00 | 7.28 | 4.43 | 3.28 | 5.38 | 8.58 | 5.78 | 5.07 |
| 2003 | 4.99 | 4.30 | 7.86 | 4.70 | 3.56 | 5.22 | 8.81 | 5.99 | 4.84 |
| 2004 | 4.44 | 4.20 | 6.74 | 5.80 | 3.67 | 4.68 | 9.12 | 5.53 | 4.63 |
| 2005 | 4.13 | 4.20 | 5.58 | 5.60 | 3.73 | 4.41 | 9.01 | 5.08 | 4.60 |
| 2006 | 3.91 | 4.10 | 4.77 | 4.48 | 3.44 | 4.10 | 8.35 | 4.62 | 5.35 |
| 2007 | 3.91 | 4.00 | 4.00 | 3.90 | 3.23 | 3.88 | 7.46 | 4.62 | 5.64 |
| 2008 | 4.14 | n/a | 3.56 | 3.95 | 3.17 | 3.99 | 7.49 | 5.78 | 5.28 |
| 2009 | 5.85 | 4.3 | 5.22 | 5.86 | 3.65 | 5.03 | 9.42 | 9.26 | 7.71 |

Sources: The World Bank. World Development Indicators (WDI) and Globe Development Finance (GDF).

Table 4.10 Average disposable income per household by disposable income quintile in Taiwan from 1964-2009 (Units: NT\$)

| Year | Average disposable income per household | Average disposable income per household of each fifth | | | | | Ratio of income share of highest 20% to that of lowest 20% |
|------|---|---|-------------------|------------------|------------------|--------------------|--|
| | | lowest 20 percent | Second 20 percent | Third 20 percent | Forth 20 percent | Highest 20 percent | |
| 1964 | 28,591 | 11,022 | 17,969 | 23,759 | 32,493 | 58,712 | 5.33 |
| 1976 | 92,813 | 41,048 | 62,589 | 78,886 | 102,268 | 179,295 | 4.18 |
| 1988 | 410,483 | 161,874 | 275,655 | 360,257 | 469,525 | 785,101 | 4.85 |
| 2000 | 891,445 | 315,172 | 571,355 | 778,556 | 1,043,508 | 1,748,633 | 5.55 |
| 2001 | 868,651 | 279,404 | 524,766 | 740,054 | 1,013,478 | 1,785,550 | 6.39 |
| 2002 | 875,919 | 292,113 | 538,584 | 743,888 | 1,005,274 | 1,799,733 | 6.16 |
| 2003 | 881,662 | 296,297 | 545,465 | 745,231 | 1,021,325 | 1,799,992 | 6.07 |
| 2004 | 891,249 | 297,305 | 555,452 | 775,719 | 1,035,972 | 1,791,796 | 6.03 |
| 2005 | 895,574 | 297,694 | 556,117 | 779,044 | 1,043,131 | 1,796,884 | 6.04 |
| 2006 | 913,092 | 304,274 | 564,865 | 795,427 | 1,073,507 | 1,827,387 | 6.01 |
| 2007 | 923,874 | 312,145 | 571,128 | 799,418 | 1,069,885 | 1,866,791 | 5.98 |

| | | | | | | | |
|------|---------|---------|---------|---------|-----------|-----------|------|
| 2008 | 913,687 | 303,517 | 564,893 | 796,225 | 1068,804 | 1835,994 | 6.05 |
| 2009 | 887,605 | 282,260 | 544,531 | 771,571 | 1,049,242 | 1,790,418 | 6.34 |

Sources: Directorate-General of Budget, Accounting and Statistics 2010.

4.5 Civil Society and Social Movement in Taiwan

We turn, finally, to the fifth part of Taiwan’s geo-political context – civil society and social movements. In this part, the Presbyterian Church, the women’s movement, the labour movement, aboriginal movements and the anti-nuclear movement will be discussed.

4.5.1. Presbyterian Church

The Presbyterian Church plays a very important role in the democratisation in Taiwan. It was established in Taiwan in the 19th century by the Presbyterian Church in England and the Presbyterian Church in Canada. The missionary work of the Presbyterian Church was carried out not only in the cities but also in rural areas and aboriginal villages. The uniqueness of the Presbyterian Church in Taiwan is to preach and operate in local dialects; indeed, missionaries from the Presbyterian Church translated Bibles into Hokkien dialects and other aboriginal languages, and as a result, the Presbyterian Church is very popular among aboriginals. However, the use of local dialects violated the KMT government’s mandarinisation policy during the martial law rule period. The Presbyterian Church’s support for humanitarianism and human rights also caused unease in the KMT government, as did its issuing in the 1970s, of a series of documents claiming that Taiwan’s fate should be decided by Taiwanese rather than outsiders (such as the KMT government) (Fell 2011: 176). Under the martial law rule in Taiwan at that time, these documents were seen as very radical and not welcomed by the KMT

government. Thus, the Presbyterian Church was strongly associated with opposition to the KMT government and was very important in the democratisation in Taiwan. Unsurprisingly, therefore, the Presbyterian Church played an important role in the Lan Yu anti-nuclear waste movement and the anti-nuclear waste movement in Daren Taitung.

4.5.2. Women's movement

Together with democratisation in Taiwan, civil society also emerged. Many scholars noted that the lifting of martial law in 1987 opened the gate for large scale development of social movements in Taiwan. The transition to democracy in Taiwan began in the 1980s, and with it social movements became very vibrant.

In Taiwan, politics were traditionally dominated by men: women were excluded from key decision-making institutions of the government and inside the KMT before 1980s (Fell 2011: 178). During the early 1980s, a women's movement in Taiwan emerged, led by groups of middle- and upper- class women who formed several volunteer organisations to promote women's right such as gender equality legislation (Fan 2004: 178). Despite lacking political experience, women's groups such as Awakening Foundation (婦女新知基金會) focused on legal lobbying and adopted a non-partisan strategy. For example, in 1984, women's groups demanded that the laws relating to legalised abortion be retained, despite originating in the early stage of the Eugenic Protection Act (Fan 2004: 179). During the 1980s, women's groups have initiated eight important bills, four of which were entirely new proposals. For instance, in 1987, members of Awakening Foundation began to drafting Equal Employment Act in order to improve the gender equality in employment. Despite strong opposition from the business sector, this act finally passed in 2001 - the first time in Taiwan that civil

associations had drafted a law themselves and submit it to the Legislative Yuan (Fan 2004: 179). Since the 1980s, the women's movement in Taiwan has helped to pass legislation against child prostitution, domestic violence, sexual harassment and rape within marriage, and legislation protecting women's property rights after divorce (Fell 2011: 179). So in terms of legal lobbying, the women's movement in Taiwan is a successful story.

Moreover, the women's movement together with the democratisation movement facilitated benefits for women during a period of rapid social and economic change in Taiwan. For example, the number of women joining the work force increased significantly: in 1961, 35.8 per cent of Taiwanese women held jobs outside the home, whereas there were 44.5 per cent in 2000 (Copper 2003: 89), and in 2012, there are more than 50 per cent, most of them working full time.

In politics, because of the pressure from women's groups that was exerted on the multi-party system since the 1990s, political parties employed more women in election campaigns in order to show their support for gender equality and to attract large number of female voters. DPP and KMT started to recruit women's movement leaders into executive or policy advisors when gained office in local government. In 2000, when the DPP first won the presidential election, Annette Lu, the vice president, assumed the highest position a woman ever had in Taiwan political history. Also, in the cabinet, 25 per cent of the members were women. In 2008, when KMT won the presidential election, there were also around 25 per cent of the cabinet members were women. Furthermore, when the DPP held power between 2000- 2008, the women's movement had much greater access to government ministers (Fell 2011: 180), which increased the opportunity that the leaders of women's movement had to promote gender issues.

Overall, therefore, the status of women in Taiwan has improved greatly since the 1960s, making Taiwan one of the most gender-equal societies in Asia, and much of the credit for this transformation must go to the Taiwan's women's movement. .

4.5.3. Labour movement

The labour movement in Taiwan emerged later than other social movements. This was mainly because, before the 1980s, KMT strongly controlled the labour sector, having created trade unions and industrial unions in the state-owned companies since the 1950s, in order to keep the workforce subservient to the state. KMT dominated the personnel of these unions, prescribing that only those persons who were loyal to the KMT could be the members of unions (Ho 2006a).

However, a free labour movement in Taiwan emerged in the late 1980s along with the lifting of the martial law and democratization. With a more and more industrialised economy, the labour movement in Taiwan focused on the 'bread –and butter' issues such as overtime and annual bonus (Ho 2006a). Activists established unions in the private sector, and tried to gain control over the pro-KMT unions in the public sector. The labour movement also sought to bring unions together and to link up with international workers' organizations to improve its effectiveness in campaigning. For example, in May 1988, the National Federation of Independent Trade Union was established and it became a member of the World Federation of Labour (Fell 2011: 182).

However, despite these efforts of labour activists, the KMT government was still very strong in its pro-business position, and in 1989, a strike in the Far Eastern Chemical Fibre Company was suppressed by the police (Ho 2006a). The KMT government

announced its intention to further restrict the legal protection of labour rights by amending the Labour Union Law, the Labour Dispute Law and the Labour Standard Law. As a consequence, compulsory union membership was removed, legalising parallel unionism in the same workplace so as to minimise the influence of the 'free' unions, banning unions from certain industries, imposing a higher threshold for industrial action, and importing foreign workers (Ho 2006a; Fell 2011: 189).

In order to face this situation, the labour movement had to change its focus from grassroots activism to opposition to proposed legislation, and to do so it had to ally itself with the opposition DPP. This strategy was effective, in that the labour movement, working together with the DPP, successfully blocked KMT's pro-business legislation policies. Although the labour organisations did not make any significant legal gains in the 1990 (Fell 2011: 183), in 2000, the DPP's victory brought a new momentum to the labour cause (not unexpectedly, since traditionally, the DPP are much closer than the KMT to labour activists), which ended the KMT's control over the trade unions. In 2000, independent unions for the first time had the chance to establish a Taiwan Confederation of Trade Unions (TETU) and were recognised by the government. From 2000-2004, under the DPP regime, the labour movement achieved some legislative success, including the passing of the Equal Employment Law (with women's groups), the Protective Act for Mass Redundancy of Employees, the Protection for Workers Incurring Occupational Accident Act, and the Employment Insurance Act (Fell 2012: 183).

However, the labour movement suffered some setbacks during the period of DPP rule from 2000 to 2008. For instance, in the private sector, unions criticised the DPP for increasing the number of foreign workers. In the public sector, privatisation of state-owned companies such as the telecommunication company and banks by the DPP

government was criticised by unions for resulting in job losses and cutting wages. DPP's privatisation policy gave the impression to the unions that both governments - DPP as well as KMT - would focus on economic development rather than labour welfare. Moreover, with the return to power of KMT in 2008, the labour movement in Taiwan faced a strong challenge from the government's pro-business economic position.

4.5.4 Aboriginal movement

Aboriginals in Taiwan have been marginalised and de-rooted since the Japanese rule period from 1894-1945. During KMT's rule from 1945 until the 1980s, the government KMT centralised policy and promoted the national culture, discriminating against the indigenous culture in Taiwan.

As with other social movements, the 1980s was the era in which the Taiwan aboriginal movement began. . In December 1984, the Alliance of Taiwan Aborigines (ATA) was established with the help of the Presbyterian Church of Taiwan by groups of aboriginal political activists as the first aboriginal people's movement group under martial law (Tien 2010: 17). ATA campaigned about the problems which aboriginals in Taiwan had experienced for many years such as prostitution, economic disparity, land rights, and official discrimination in the form of forbidding the use of aboriginal tribal names (Faure 2001: 99).

In 1988, the ATA launched the first large-scale movement demanding the return of lands to the original inhabitants whom are the indigenous people in Taiwan. There were 1500 indigenous people from all different tribes who joined the demonstration in Taipei in August 1988 in their traditional costumes. This event marked the first emerging awareness of self identity and self consciousness among aboriginals in Taiwan. Since

then, many aboriginal groups have been launched, including the group formed to remove nuclear waste from Orchid Island.

The government responded to the demands of aboriginal people in Taiwan very slowly. For the KMT government until 2000, aboriginal issues were never a priority. However, in 1995, the KMT regime started to recognise the romanised spellings of aboriginal names in official documents - a process which was not completed until 2005 when the new identity cards were issued. In 1996, government established the Council of Indigenous Peoples, and in 1998, the official school curriculum in Taiwan has started to include more stories of aboriginals. KMT also relaxed its Mandarinised policy on aboriginals in the 1990s which helped the indigenous people in Taiwan to become prouder of their own identity.

Although in 2000, when DPP got into power, aboriginal policy was still not a priority, after aboriginal activists held many protests against economic development on their traditional ground, the government enacted the 'Indigenous People's Basic Law' in 2005 in which it stated that the survival of the tribes and their traditional ways of living would be protected by the government. However, the DPP government at that time did not pass the regulations required to implement the 'Indigenous People's Basic Law', and it left open the question of whether or not the 'Indigenous People's Basic Law' would take preference when it conflict with other law or regulations.

In short, although the aboriginal movement in Taiwan did not have a very large base of support, aboriginal rights did improve as result of its demands, and while the indigenous people are still fighting to improve their social status, they are more and more proud of their own identities and cultures.

4.5.5. Environmental movement

Since the 1950s, Taiwan has enjoyed rapid economic growth and industrialisation. This has resulted in serious environmental degradation in Taiwan that until the 1980s attracted little public attention in Taiwanese society. Widespread of environmental protests started in early 1980s despite martial law rule, and local residents organised themselves to protest against local pollution from factories and dumpsites. These protests were usually small scale and based on the Not In My Back Yard (NIMBY) principle. Often these disputes were resolved through compensation distributed by local politicians. (Fell 2011: 185)

Many scholars see the anti-Du Pont incident in 1986 as the turning point for the Taiwan environmental protection movement. Local leaders, local officials, and local resident in Lukang (鹿港), Changhua County (彰化縣) organised together to protest against the proposal of Du Pont's petrochemical plant to be built in their community (Tang and Tang 1997). At the time, Du Pont's proposal was the biggest single foreign investment ever made in Taiwan, and unsurprisingly, the central government supported it. Local anti-Du Pont groups held demonstration in Lukang and also in the capital city Taipei in 1986 and 1987 (Tang and Tang 1997). The demonstrations were supported by many opposition politicians and for the first time received extensive attention from the media (Fell 2011: 185). Despite the illegal nature of the demonstration under martial law, the central government was rather restrained (Tang and Tang 1997), and finally, Du Pont withdrew its plan voluntarily. After the Du Pont incident, the environmental protest movement became more and more active: between 1980 and 1987, there was an average of 13.75 environmental conflicts per year, but this number increased to 31.33 between 1988 and 1990 and to 258 in 1991 (Hsiao 1994).

As a result of the increasing number of environmental protests after the Du Pont incident, the relations between environmental groups and the DPP became closer,

because the environmental movement's protests were strongly targeted against the KMT. By supporting the environment movement, DPP member therefore gained publicity locally and nationwide. Conversely, environmental groups benefited from DPP's resources to help fund its organisation, manpower, and campaigning strategy. The establishment of the Taiwan Environmental Protection Union (TEPU) in 1987 was a good example of the ever closer relations between DPP and environmental groups: members of TEPU were also DPP members in some local branches and even shared the same offices (Ho 2005). TEPU played an important role in education, organising protests, lobbying the government, and conducting research. In the 1990s, therefore, it was common to see the DPP allied with environmental groups fighting against the pro-business KMT regime on various environmental issues such as nuclear power.

On the other hand, the KMT government made some responses to the challenge from environmental groups. For example, the Environmental Protection Agency (EPA) was established at cabinet level in 1987 by elevating the Environmental Protection Bureau from its local government level. The EPA drafted the 'Law to Settle Public Nuisance Disputes' and established the notion of environmental impact assessment (EIA) in Taiwan. Furthermore, the KMT regime introduced more stringent pollution control regulations and tax incentives to encourage industries to invest in pollution control facilities. Upgrading the state-owned industries to decrease their pollution levels, and setting up longterm monitoring systems were also introduced by the KMT regime. Despite the pro-business posture of the KMT regime, KMT had realised the importance of environmental protection, while the increasing numbers of DPP legislators had weakening the KMT's dominance on all issues including environmental protection.

Year 2000 marked another big change for the environmental movement in Taiwan. When the DPP won the presidential election, environmental protests turned a new page,

because environmentalists had now gained procedural participation under the DPP government (Ho 2005). Firstly, Edgar Lin (林俊義) an anti nuclear and conservationist biology professor was appointed as EPA director. This was the first time that an environmental activist had occupied the highest government position in environmental regulation. Furthermore, environmentalists were recruited on to the EIA committee, including the National Advancement for Sustainable Development Committee, the top advisory organ of environmental policy in Taiwan, which incorporated eight environmentalists into its membership in 2002 (Ho 2005). However, the participation of these environmentalists in the government did not achieve any policy changes because the above institutions in the government were relatively powerless comparing with the pro-development and pro-business Ministry of Economic Affairs and the Council for Economic Planning and Development especially during the economic downturn in Taiwan since 2001.

A major illustration of the relative powerlessness of the environmental lobby was the reversal of the decision to cancel the building of the 4th nuclear power plant in Taiwan by the DPP. The DPP government announced its decision to stop the construction of the 4th nuclear power station in October 2000, but due to the strong opposition from the KMT, business sectors, and foreign companies, the DPP reversed this decision in 2001 favour of continuing the construction. Environmental groups criticised the DPP for betraying their election commitment to environmental groups, and relations between DPP and environmental groups have not been close ever since.

This policy reversal on the 4th nuclear power station by the DPP reflected a more general shift into a more pro-business position after 2000. DPP's President Chen promised the business community, in response to their complaints about the long process of EIA, to reduce obstacles to economic development, and in 2007, he

ordered the Vice Premier to intervene in the EIA process on the steel plant proposal from Formosa Plastic Groups (Fell 2012: 187). In 2007, several environmentalists on the EIA committee and the National Advancement for Sustainable Development Committee resigned to protest DPP's pro-business position.

When the KMT returned to power in 2008, environmental groups had fewer chances to be included in government institutions because of KMT's even-stronger pro-business position. Environmental groups tried to keep their distance from the government in order to retain support from members of the public. Nevertheless, despite these disappointing developments for the environmental movement in recently years, people in Taiwan are now more aware than before of environmental protection issues. This is the biggest transformation in Taiwan, because it means that politicians are at least pretending to be greener even though they may hold pro-development views.

4.5.6. Anti-nuclear movement

The anti-nuclear movement has been one of the most discussed among the environmental movements in Taiwan. The anti-nuclear movement in Taiwan can be traced back as early as 1979 when Professor Edgar Lin published an article criticising the KMT government's nuclear policy. At that time, the first nuclear power plant had begun operation and the second and the third ones were under construction. Professor Lin pointed to the government's lack of ecological considerations, and disregard of the problems of nuclear power and nuclear waste. The article faced strong opposition from Taipower nuclear engineers, thereby generating the first nuclear debate in Taiwan (Ho 2003). For ten years, the anti-nuclear movement in Taiwan was led by a group of American-trained academics, who because of martial law, focused on publishing articles which were very technical. Taipower nuclear engineers responded to these anti-nuclear

articles with counter articles that also contained lots of technical terms. So at this early stage of the anti-nuclear movement in Taiwan, the issues around nuclear energy were not easy for members of the public to understand, though at least the nuclear debate in Taiwan had started.

In the late 1980s, the anti-nuclear movement began to ally with the political opposition (which in 1987 became the DPP). As we saw earlier, the DPP needed to endorse the ideas of social movements in order to create a powerful opposition bloc against the KMT's authoritarian regime. In this concern, anti-nuclear movement served a purpose of antagonism to KMT's secrecy in its nuclear deals, hiding possible corruption. Since 1986, opposition magazines have published anti-nuclear articles in which criticism was made of wider aspects of government policy on nuclear policy making and nuclear weapons. This situation also made the anti-nuclear movement more politicised than other social movements (Ho 2003), adopting a strong partisan position. Even the KMT began to have reservations about the 4th nuclear power station, with some young KMT legislators opposing it, and in April 1985, 55 KMT legislators with 6 opposition legislators signed an appeal to suspend the construction of fourth nuclear power plant. The Prime Minister Yu Kuo-Hua (俞國華) later issued a statement noting that 'the fourth nuclear power plant was not in a hurry to build' (Ho 2003). As a result of the efforts of anti-nuclear activists, several large-scale public debates were held, as people in Taiwan were becoming aware of the issue of nuclear energy.

Moreover, because of democratisation in Taiwan, anti-nuclear scholars changed their strategy since anti-government protests became more acceptable. In October 1986, inspired by the Du Pont incident, anti-nuclear scholars with opposition legislators held the first anti-nuclear demonstration outside Taipower's headquarter (Ho 2003), signifying the increasing cooperation between anti-nuclear activities and the opposition.

With the support of DPP, local politicians and anti-nuclear scholars, the locally-led Yenliao, the Anti-Nuclear Self-Defence Association (YSDA) (鹽寮反核自救會), was established in 1988 in Gongliao (貢寮) which is the site for the fourth nuclear power plant. Anti-nuclear scholars and TEPU played a very important role in helping YSDA in its relations with local people. After YSDA was established, TEPU and YSDA together with DPP to organise a large-scale anti-nuclear demonstration in Taipei (Ho 2003). This marked the beginning of the annual anti-nuclear demonstrations in Taiwan in April or May each year ever since.

The KMT government responded to the anti-nuclear movement and other social movement with harsh measures. In May 1990, an ex-military officer Hao Po-Tsun (郝柏村) became prime minister, and he strongly associated the increasing influence of the anti-nuclear social movement with falling economic performance. Hao thought that building the fourth nuclear power station was the most important way re-establishing the government's authority and strengthening the investment environment (Ho 2003). This hardline position of the KMT government served to unite the anti-nuclear movement with DPP, TEPU and YSDA. In 1991, when the government passed the EIA on the fourth nuclear power station, local people staged the most serious protest in Gongliao. Local people claimed that the EIA excluded anti-nuclear EIA members, not even contacting them about its meeting. When the situation intensified, one policeman was killed and after the event 17 persons involved in the protest were sentenced, one of them accused of killing the policemen was given a life sentence. This was the so-called '1003 incident' recorded in the documentary 'Gongliao, How Are You?'

However, such governmental repression did not weaken the anti-nuclear movement. DPP started to flex its power by holding referendums in counties which they controlled despite the fact that at that time there was no legal basis for referendums in Taiwan.

Between 1994 and 1998, there were four referendums held in Gongliao, Taipei County, Taipei City, and I-lan County (宜蘭縣) respectively²¹. Over 70 per cent was opposed to the construction of fourth nuclear power station in Gongliao. Of course, the KMT would not recognise the result. While the DPP started to gain more seats in the parliament since the 1990s, TEPU also sought support in lobbying with young KMT legislators who were more aware of the environmental issues, and significantly, between 1992 and 1996, the budget bill on the fourth nuclear power station faced strong challenges each year. Outside the parliament, thousands of anti-nuclear protestors staged sit-in, hunger strikes, and a host of other activities (Ho 2003). However, the anti-nuclear movement now faced the problem that the DPP was not strong enough to persuade the majority to vote against nuclear power, not least because it was very difficult to attract non-DPP party members/voters to support the anti-nuclear movement.

Far worse for the anti-nuclear movement, since the later 1990s, the DPP started to switch its position on the 4th nuclear power station because they saw an opportunity to win the presidential election. They realised that they needed to abolish their anti-business image and be less radical to stand a chance of winning that election. Also in 1996, the DPP saw there was no way they could prevent a vote in parliament in favour of the construction of the fourth nuclear power plant. So the DPP abandoned its anti-nuclear position, and tacitly traded its new-found support for the nuclear bill in return for KMT's support within the parliament (Ho 2003). Although the DPP Presidential candidate Chen Shui-Bian continued to speak publicly in his election campaign of stopping the construction of the fourth nuclear power plant and signed a contract with the Lan Yu people promising to remove nuclear waste, anti--nuclear activists and scholars felt being betrayed by the DPP, and established a new Taiwan

²¹ Gongliao was the town located in Taipei County. Taipei City and I-lan County are the neighbouring county/city of Taipei County. At that time, all these 3 counties were controlled by DPP.

Green Party.

Indeed, the biggest disappointment for the anti-nuclear movement in Taiwan was the DPP's reverse of its decision on the construction of the fourth nuclear power station. When the DPP government announced to halt the construction, YADA, TEPU, and other social movement groups all thought they had accomplished the most difficult task. However, the reversal of the decision not only damaged the relationship between the DPP and anti-nuclear movements, but also the relation between the DPP and other social movement groups. But the fact is that the DPP never won the parliamentary majority to enable them to stop the nuclear build, and, the economic consequences of stopping the fourth nuclear power station were too huge for Taiwan especially in the economic downturn. The result was that the anti-nuclear movement thereafter kept its distance from both DPP and KMT governments, and since 2002, DPP have not been welcomed by the annual anti-nuclear protest held by TEPU and YSDA.

After 2008, since the KMT returned to power, the anti-nuclear movement has become relatively quiet. It seems that the public and the media have been exhausted by the political instability and the economic recession. However, after the Fukushima nuclear power plant discharged radioactive substance into the surrounding environments in Japan at the earth quake on 11 March 2011, anti-nuclear ideas have won much support among members of the public in Taiwan. In the 2012 presidential campaign, DPP presidential candidate Miss Tsai Ing-Wen (蔡英文) declared her support for ending nuclear power by 2025. The KMT also responded to the issue by saying it would reconsider the use of nuclear energy. So it seems that nuclear issue is not a priority for the present KMT government, but that public debates on nuclear issue are not going to disappear.

Along with the anti-nuclear movement, there is an anti-nuclear waste movement which also started in the late 1980s when people in Lan Yu held their first protest against the government for dumping nuclear waste on their land. The details of this movement will be discussed in chapter 5 and chapter 7.

Generally speaking from 1945 to 1987 during the first 45 years of this period, civil society was kept under tight control by the KMT regime. Indeed, before 1980, martial law prevailed, and there was no genuine civil society (Hsiao 2006) because the KMT regime monitored every aspect of social life. The only social groups that existed were those established by KMT or under very specific surveillance by the regime. Only after 1980 did social movements begin to emerge, when Taiwan began to experience the damaging effects of rapid industrialisation such as environmental degradation, labour exploitation, and increasing urban house prices. These social evils were compounded by inequalities between the sexes and discrimination against ethnic minorities such as aborigines.

In 1987, martial law was lifted, and the number of NGOs increased rapidly because the restrictions on freedom of association and expression had been removed. These NGOs included groups campaigning for consumer protection, labour and farmer rights, environmentalism and natural conservation, gender equality, human rights, urban housing, minority identity, and ethnic cultures. The anti-nuclear and anti nuclear waste movements were also born at this time, and they organised protests regularly since the late 1980s around Taiwan. Many of the NGOs allied themselves to the opposition DPP to demand social and political reforms. A series of strikes took place in Taiwan, organised by workers demanding fewer working hours and higher wages. Farmers also held demonstrations, asking for reform of the social insurance system, and environmentalists began to campaign against pollution. Moreover, middle class people

inspired by the DPP mobilized themselves to demand more political participation, including a popular vote for the entire Legislative Yuan and National Assembly, and a direct vote for the president. During, the late 1980s and 1990s, the power of these social movements was too strong to be ignored by the KMT government, and was the driving force behind reforms in all aspects of people's lives in Taiwan.

In 2000, the opposition DPP won the presidential election, marking the first transition of power to an opposition party in Taiwan history. This change in the ruling party made the relationship between the government and the NGOs even closer. During Chen's first term as President, many ideas which derived from social movements and NGOs were implemented by the government's policy. For example, the DPP government enacted several reformist laws despite its minority status, including the Protection for Workers Incurring Occupational Accident Act (in 2001), the Gender Equality in Employment Act (in 2002), the Employment Insurance Act (2002), the Protective Act for Mass Redundancy of Employees (2003) and the Basic Environmental Act (in 2002) (Ho 2010). Also, Chen's minority government established several institutions consonant with the agenda of the social movement in the mid-1990s, including the Council for Hakka Affairs, the Council of Indigenous People, the National Human Rights Commission, and the Committee for a Nuclear-Free Homeland (Ho 2010). In addition, the DPP government appointed veteran activists to become ministers in the Environmental Protection Administration, the Ministry of Education, the Council of Indigenous People, and the Council of Labour Affairs, and nominated members of NGOs for the Environmental Impact Assessment Committee, the Committee on Women's Right Promotion, and the National Council for Sustainable Development (Ho 2010).

However, the economic downturn forced the DPP to shift its focus to economic development, and this shift led many social movement activists to criticise the DPP,

among them labour and environmental NGOs who were the most disappointed by the DPP. Labour NGOs and labour activists claimed that the DPP failed to cut the working hours of workers as it promised in the election campaign, and it also failed to increase the allowances of elderly workers on the labour insurance pension scheme (Hsiao 2006). Environmental NGOs criticised the DPP government for failing to halt the construction of the 4th nuclear power plant²² despite its nuclear-free homeland policy. Environmental activities and NGOs could not believe that the DPP compromised on nuclear power. Moreover, the DPP government was criticised for approving many development projects in order to create jobs – a policy which led members of the Environmental Impact Assessment Committee to resign in protest against the DPP's pro- economic priorities.

However, despite these criticisms from activists and NGOs, the number of large-scale demonstrations decreased rapidly because many NGOs and activists became enmeshed into the DPP government, and their co-opted status weakened their capacity to mobilise and organise campaigns.

When the KMT recaptured the presidency in 2008, it might have heralded a setback for the NGOs and social activists, because the KMT is traditionally a party which is pro-economic and less caring for social welfare, labour, and environmental issues than is the DPP. However, paradoxically, it marked a re-birth for social movement activists, because it made them detach themselves from too close an association with government, and thereby regain their moral high ground of radical autonomy. In 2008, students protested against police brutality to people expressing their ideas about independence

²² When the DPP got into power in 2000, they announced an immediate end to the construction of the nuclear power plant. After the announcement, the stock market dropped rapidly. In the Legislative Yuan, the KMT (who held a majority) boycotted the government's annual budget; and many businesses lobbied to KMT. Faced with such pressure, the DPP withdrew its decision to stop the construction of nuclear power plant in order to restore economic and political instability.

for Taiwan when officials from China visited Taiwan. This protest marked the comeback of genuine social movements in Taiwan. In addition, in September 2009, a campaign against building a casino in Penghu successfully won the referendum against the pro-casino KMT politicians. During 2009 and 2010, social movements and NGOs have again actively played an important role in Taiwanese society on many issues, and they are now more organised and careful to keep their distance from political parties. The most obvious case of this distancing was the anti-nuclear demonstration in May 2011. After the Fukushima nuclear power plant discharged radioactive substance into the surrounding environments, the Taiwanese anti-nuclear movement and anti-nuclear waste movement organised a rally which they allowed politicians to join, but on condition that they did not show their flags and names.

4.6 Conclusion

This chapter has provided the geo-political context which will help us in the next chapters to better understand the way in which Taiwan has dealt with its nuclear waste disposal problem. Its geographical situation makes it clear why policy makers favoured an island location; its demographic composition shows why an ethnic minority was an easy target; its political history indicates how a long period of authoritarian rule bred a top-down approach to nuclear waste decision-making, but how the more recent politics of democracy heralded a much greater sensitivity to public opinion and the claims of local communities; its political economy demonstrates how the outstanding growth trajectory of the late 20th century led to environmental damage that rang alarm bells for unfettered economic development; and its experience of the growth of civil society explains how channels of social power have opened up that wield significant influence over governmental decision-making on nuclear waste issues.

Chapter 5. History of Nuclear Waste in Taiwan

5.1 Introduction

This chapter examines the historical development of nuclear waste policy in Taiwan and explores the issues of decision-making on the nuclear waste repository in Orchid Island (also called Lan Yu) and the proposed siting of the final repository for Taiwan's nuclear waste inside and outside Taiwan. The chapter draws on public opinion in the communities which host nuclear waste to probe the problem of public acceptance and involvement in the siting of repositories, and public attitudes to radioactive waste management in general. What follows in this section is a short synopsis of the chapter.

Taiwan has six reactors in three nuclear power stations located in the north and south of Taiwan. These three power plants generate 5,144MW electricity per year. In 2010, nuclear power accounted for 17.2 % of total electric power generation in Taiwan (Taiwan. Energy Bureau 2010: 36). Taiwan's nuclear power stations are owned and operated by the state-owned Taiwan Power Co. Ltd (Taipower). In 1982, the Taiwanese government started to ship radioactive waste to Orchid Island, which is 70 miles southeast from Taiwan Main Island and occupied by the indigenous Yami people. The Yami people did not know the government had built a national repository for radioactive waste on their island until an environmental NGO discovered that the government had stored radioactive waste on their land. Since then, the Yami people have protested and negotiated with the government for many years with little success. In 1999, the government claimed that the repository for radioactive waste on the island was only a temporary repository, and promised to remove it by 2002, and it has been searching ever since for replacement repositories for nuclear waste both domestically and internationally. Domestically, Taipower conducted a voluntary scheme which offered

money to any communities which were willing to host radioactive waste. Many communities initially agreed to host the radioactive waste, but later withdrew because of local opposition. Internationally, Taiwan signed agreements in 1997 and 1998 with North Korea, the Marshall Islands, and Russia to ship nuclear wastes to these countries, but because of strong opposition around the world, none of these agreements came to fruition. With no place willing to host radioactive waste within Taiwan, and the international agreements opposed by other countries, the Taiwan government has so far failed to keep its promise to the Yami people.

5.2 Regulatory framework

Taiwan's nuclear power stations are all administered by the state-owned company, Taiwan Power Co Ltd. (Taipower) that is under the management of the Ministry of Economic Affairs (MOEA). The first law associated with nuclear energy was the Atomic Energy Act, promulgated by President Chiang Kai-Shek (蔣介石) in 1968. Because tension between Taiwan and China led to the USA fearing that Taiwan would use nuclear energy as a means of producing nuclear weapons, the Act explicitly restricted the use of nuclear energy in Taiwan to peaceful purposes. Article 1 stated that 'The purpose of the act is to promote research, development, resource exploitation and peaceful use of the science and technology on atomic energy' (Taiwan. Atomic Energy Act 1968: Article 3). Another important aspect of this Act is that it is the first time that the Taiwanese government had assigned the responsibility for nuclear energy to a non-departmental body – the Atomic Energy Council (AEC). In Article 3 the Act stipulated that 'the complete authority over atomic energy is the Atomic Energy Council (AEC)' (Taiwan. Atomic Energy Act 1968: Article 3); and in Articles 21 and 22 it stipulated that 'the import, export, transit, carry, use, discard, and assign of nuclear source material and nuclear fuel shall be filed with and approved by AEC and AEC

might carry out the inspections' (Taiwan. Atomic Energy Act 1968: Article 21 and 22). Also the Act is significant because it is the first official governmental document to highlight the issue of radioactive waste in Taiwan (Taiwan. Atomic Energy Act 1968). Although the Atomic Energy Act 1968 referred to radioactive waste, at that time there was only a very small reactor in National Tsing-Hua University(國立清華大學) for research purpose, so hardly any radioactive waste existed in the country, and the Taiwanese government did not have any plans for its management.

The first attempt by the Taiwanese government to regulate the management of radioactive waste was when it set up a project unit on radioactive waste management under the AEC in 1971. The Director of Fuel Circle and Materials Administration (FCMA), Dr. Chin-Tien Yang(楊清田), said that 'AEC and Taiwan government had noticed the radioactive waste issues in a very early stage. The first nuclear power station began construction on November 1970²³. Five months later, there was a project unit about radioactive waste management formed in the AEC' (Oon 2001: 252). The establishment of this project unit was the first indication that the Taiwanese government was aware of the radioactive waste problem. In order to respond to the issues of radioactive waste more efficiently, this project unit was enlarged by the government and became the FCMA under AEC's command on 1st January 1981. The responsibilities of FCMA include planning, supervision, and control over the management of radioactive waste in general and the operation of the Orchid Island (Lan Yu) National Repository of Radioactive Waste in particular (Oon 2001: 116). Responsibility for controlling radioactive waste and enforcing policies is assigned to FCMA, while research into techniques of dealing with radioactive waste belongs to another AEC subsidiary, the Institute of Nuclear Research.

²³ Interview with the Director of FCMA on 30 December 2003.

During the mid-80s, many people in Taiwan became aware of the dangers of radiation and nuclear waste and anti-nuclear and anti-nuclear-waste movements were formed which pressed the government to act more positively. In its response, the government published several policy guidelines: for example, in 1988, FCMA's Radwaste Management Policy and Guidelines stipulated the following six strategies:

1. to ask the producer of radioactive waste to reduce the amount and volume;
2. to require the producer of radioactive waste to pay all the relevant expenses;
3. to control the management and transport of radioactive waste to ensure security.
4. to devise a plan for the final disposal of radioactive waste
5. to enforce a management system and create an information system.
6. to support research studies and provide education for the general public.(Oon 2001:116)

Following the publication of the FCMA's guidelines and strategies, the management of the Orchid Island (Lan Yu) National Repository of Radioactive Waste was transferred from AEC to Taipower in July 1990, and in October 1992, FCMA established an information system to monitor all the data of radioactive waste. Table 5.1 shows the amount of radioactive waste accumulated since Taiwan started nuclear energy production in the 1980s. In 1993, FCMA adopted a strategy to reduce the amount of radioactive waste in 1993 – a task which it has carried out spectacularly well since the total amount of radioactive was reduced from 11,814 barrels in 1983 to 234 barrels in 2010 (See Figure 5.1).

Table 5.1 Amount of radioactive waste 1983-2010

| Year | 1983 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|---------|--------|-------|-------|-------|-------|-------|-------|-------|------|------|
| Barrels | 11,814 | 4,756 | 3,363 | 2,231 | 1,716 | 1,603 | 1,346 | 1,081 | 963 | 819 |

| Year | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---------|------|------|------|------|------|------|------|------|
| Barrels | 765 | 664 | 601 | 337 | 259 | 253 | 251 | 234 |

Source: AEC 2003 and FCMA 2010

The guidelines were revised in September 1997, adding the requirements that radioactive waste management was designed to ensure the safety of everyone in the country, to safeguard the environment, and to prevent present and future generations suffering harm from radioactive waste (Taiwan. FCMA 2003: 13). The last requirement was the first time an official government document had mentioned the impact of radioactive waste on present and future generations, which was a big step for the Taiwanese government. However, the government's approach was top-down and bureaucratic, neglecting the role of public participation and thereby causing disputes with local people and groups which led to the emergence of the anti-nuclear and anti-nuclear waste movement.

5.3 Orchid Island (Lan Yu) national repository for radioactive waste

5.3.1 Decision options

Orchid Island (Lan Yu/ Lanyu) is located 65 kilometres off Taiwan's southeast coast (See Table 5.2). The island is the homeland of the Yami people (雅美族), one of the aboriginal tribes in Taiwan. The Yami people number around 4,000 of whom 3,390 people live in Orchid Island (Taiwan. Council for Indigenous People) supporting themselves with agriculture and fishing. They have no written language, but young people can communicate in Mandarin and some attain higher education on Taiwan Main Island. Many Yami are Christian, especially Presbyterian.

Table 5.2. Map of Taiwan



Source: Lonely Planet, Map of Taiwan.

According to AEC, after the Taiwanese government decided to build the first nuclear power station in November 1970, AEC invited its nuclear research centre, the Ocean Research Institute of National Taiwan University, the Atomic Science Institute of National Chin-Hwa University, and the Taiwan Power Company (Taipower), to study all the alternatives for radioactive waste management to recommend the best policy option and to identify the optimum radioactive waste storage site (Oon 2001: 251). In 1972, scholars from the Ocean Research Institute concluded that because, unlike countries such as the USA and Canada, Taiwan is a highly populated island where it is impossible to find a large area of land with no population, the following five other possible options had to be considered:

1. Store in a discarded mine;
2. Store in former underground military facilities built during Japanese rule;
3. Store in the high mountains;
4. Dump at sea;
5. Store on a remote island (Oon 2001: 251).

Among these five options, only the last one - storing on a remote island - was regarded as feasible. Storage in a discarded mine was considered to be too close to residential areas; the mines were not in very good condition; their atmospheres were very humid because they contained large amounts of underground water; and none of the mines had salt rocks (from experience in the USA, the best option is to store radioactive waste in salt rocks). For all these reasons, the project unit rejected the option of storing radioactive waste in discarded mines.

The second option - to store radioactive waste in former underground military facilities built during Japanese rule, was rejected by the project unit because the tunnels in the former military facilities were too narrow; they were only twenty metres below the surface; and they did not have sufficient space. The third option - storing in the high mountains - was rejected because access is very difficult; it would cost a considerable amount of money to build a new road; and if radioactive wastes leaked into the rivers originating in these high mountains, they would pose a serious threat to human health. The fourth option – dumping at sea – was rejected because internationally there were too many disputes over the environmental risks posed by sea dumping. On the fifth option – storage on a remote island - after conducting several surveys in Penghu islands and Orchid Island (Lan Yu), Taipower and AEC both suggested that this seemed the best option.

On 17 January 1974, AEC held a seminar on 'Management of Low Level Radioactive Waste' at which it presented its surveys of all the islets around Taiwan, and suggested that for the following reasons the Long Men area in Lan Yu (Orchid Island) was the most suitable site for a radioactive waste repository:

1. It is economically efficient, because the total area is bigger than one square kilometre, and so there would be more than 100 hectares to use, which is sufficient to store all solid radioactive waste from the peaceful use of nuclear energy and radioactive waste from the six reactors owned by Taipower,
2. There is no population within 5 kilometres of the repository: the nearest village is located more than 5 kilometres away;
3. The possibility of polluting the living environment is very low because the area faces the sea and mountain;
4. The route of transportation is by sea, in which the level of radiation is very low and so would not pollute the environment; and
5. It provides easy access for future sea dumping if the international condemnation of sea dumping is lifted (Oon 2001: 251).

Therefore in February 1974, AEC asked permission from Executive Yuan to reserve the land in the Long Men area for a solid radioactive waste repository, and the Orchid Island (Lan Yu) project was thereby officially started. However, the government hesitated because of worries about the negative impact of the site on tourism, so it asked for investigations to be carried out on other islands using the following (stricter) criteria of assessment:

1. The island should be sparsely populated or not populated at all, and the further its distance from Taiwan Main Island the better.
2. The island should be easy to reach for maintenance work in the repository to be

carried out especially after typhoons or earthquake hits, and there should be a natural barrier such as water, mountains, or rocks, making it easy to control the entrance and exit to the site, and prevent damage to people's health and the ocean by radiation.

3. In order to reduce the cost of transportation, there should be roads and a harbour already on the island.

4. The area should be large enough to store solid radioactive waste for one hundred years.

5. The location should have easy access for sea dumping in the future (Oon 2001: 252) .

There are lots of islands around Taiwan Main Island, but most of them were either developed, highly populated, or very near the main island, and no island met all the above conditions except Orchid Island (Lan Yu). On 4 March 1976, AEC together with other government officials including the Director of the Tourist Bureau, and the Director of the Traffic Research Institute came to Orchid Island and confirmed that the proposed repository would not affect tourist development on Orchid Island (Lan Yu). So on 24 Apr 1976, AEC decided to build a repository for LLW and ILW in the Long Men area of Orchid Island. The necessary surveys and investigations began immediately, and in September 1978, the Orchid Island (Lan Yu) National Repository of Radioactive Waste was under construction (Oon 2001: 252). The Orchid Island (Lan Yu) project was designed to build two repositories which could store nuclear waste for one hundred years. Repository I required six phases of construction works in order to build 98 ditches to host 338,040 barrels. Repository II required three phases in order to build 58 ditches to host 227,568 barrels. Construction works of the first phase of Repository I finished in 1982, and on 20 May 1982, the Orchid Island (Lan Yu) National Repository of Nuclear Waste began operation (Oon 2001: 264).

5.3.2 A fish canning factory or a radioactive waste repository?

The decision to build a radioactive waste repository on Orchid Island (Lan Yu) was controversial. Whether the government had the consent of the local communities is a matter of dispute. The government claimed that the signature of Orchid Island's District Commissioner proves that local people did understand the building of the radioactive waste repository. However, some reports showed that the people in Orchid Island did not know the government was building a repository for radioactive waste during the construction, but were led to believe that a fish canning factory was planned.

When the Yami people discovered the truth that the government had built a repository for nuclear waste in Orchid Island, a resident missionary, Reverend Dong Sen-Yun (董森永), together with other Yami missionaries and youngsters read numerous book and articles on nuclear energy and radioactive waste, and published articles in newspapers, church communiqués and magazines to express their anger about the threat of radioactive waste and the unfairness of siting the waste repository on Orchid Island (Lan Yu). In both Taiwan and Orchid Island, these activists educated the Yami people and elders to understand nuclear power and radioactive waste, thereby bringing the Yami community together to fight against the repository.

Although the Yami missionaries' efforts could not stop the construction and operation of the radioactive waste repository, by the mid 1980s, most Yami people understood the dangers they were exposed to (Lin, Lin, and Liu 1993: 1). Some elderly Yami leaders asked 'why did the government not dispose of radioactive wastes in Taiwan Main Island if it is as safe as the government claims? If the radioactive waste is harmless why not distribute each barrel to each household or store at the basement of the Presidential Building in the capital city Taipei?'(Kuan 1987) This kind of public reaction spread all over Orchid Island (Lan Yu).

Whether or not the people of Orchid Island (Lan Yu) were told that what was being built was a repository of radioactive waste or a fish canning factory, it is clear that local people feel that they were misled by the government (including AEC and Taipower). It is also clear that local people were not given the chance to participate in the decision-making about the repository for radioactive waste, and that AEC also did not consult local people. It is hardly surprising, therefore that since 1987 there have been many demonstrations held both in Taiwan and Orchid Island (Lan Yu) organised by people from Orchid Island against radioactive waste and demanding that the government remove the radioactive waste from Orchid Island.

5.3.2.1 Lack of trust in the government

This was not the only source of mistrust felt by the Taiwanese people toward the government and Taipower on radioactive contamination issues. The irradiated steel bars incident was another reason for the low level of trust in the government and Taipower. Irradiated steel bars used in apartment blocks in Taiwan were first discovered in 1983 (Bih and Kou 1999). In 1985, a dentist detected dangerous amount of radiation when he set up an x-ray machine at his clinic in northern Taiwan. These two cases were reported to the AEC, however, AEC covered it up and did not carry out any future investigation (Taipei Times 2003), and it was not until 1992 that the issue of irradiated steel bar for building apartment blocks drew serious public attention. A Taipower worker accidentally brought a radiation detector home and surprisingly discovered that the radiation level was higher than safety limits in 1992. Liberty Time revealed that Minsheng Villas (民生別墅) in Taipei contained irradiated bars in their buildings (Bih and Kou 1999). After the demand by local people, AEC started a complete investigation in 1992, and it was found that by October 1997, there were more than 100 public buildings including schools and kindergartens, and more than 1400 apartment units in

Taiwan contaminated by the irradiated steel bars (Bih and Kou 1999). However, no coordinated effort has been made to demolish the affected buildings and to rebuild them, and local residents blamed AEC and the government for managing the issue with secrecy and slowness to react. In 1993, three officials were censured for neglect of duty having learned in 1985 that Minsheng Villas was seriously contaminated by radiation, and in 1994, the Taipei District Court accepted lawsuits for state compensation from 65 residents of Minsheng Villas (Taipei Times 2001).

Moreover, AEC's attitudes towards this issue of irradiated steels bars created controversy. . From November 1995 to June 2000, a research team at National Yang Ming University (陽明大學) tracked more than 4,100 residents who once lived in buildings that had been constructed between 1982 and 1983 using irradiated steel bars. The researchers concluded that a high incidence of diverse cancers was evidenced among samples taken from this group of residents (*Taipei Times* 2001). However, the AEC did not agree with the results, and claimed that a low dose of radiation has been proved to be beneficial to humans (*Taipei Times* 2001).

To date, AEC still have not carried out an investigation into irradiated steel bars in every building in Taiwan, and some legislators believed that the amount of radiation contaminated buildings could be higher than expected. The response of AEC to the issue of irradiated steel bar reflected the secrecy on issues related to nuclear energy shown by government institutions. Also, it severely damaged the credibility of AEC, and contributed to the low level of trust among members of general public towards the government on the issue of nuclear waste.

5.3.3 Protest against nuclear waste

The Yami organised their first protest on Orchid Island on 7 December 1987 when 30 aboriginal Yami youth gathered at Orchid Island airport to protest against AEC's bribing aborigines and representatives of the local council with trips to Japan (Kao 2000). The Yami youth also accused people who went on such trips of ignoring public opinion in Orchid Island. The protest was effective in that 17 representatives of the local council cancelled their trip to Japan (Danafu 1989). Importantly, this was the first time that the people from Orchid Island (Lan Yu) had publicly expressed their anger about the deception and unfair treatment they had received from the government since the Orchid Island (Lan Yu) project started. The people who joined in this protest would become the leaders in subsequent protests and play an important role in the anti-nuclear waste movement in Orchid Island. Although this protest was small-scale, it had attracted the attention of many local people, and made more of them aware of the fact that Orchid Island (Lan Yu) had been hosting radioactive waste for many years, and encouraged them to join the campaign.

On 20 February 1988, six years after the repository began operation, about 350 Yami people held their first large-scale demonstration with the slogan 'Repel the Nuclear Evil', on the site of the repository in Orchid Island (Kao 2000). The Yami requested the government to stop plans for expansion of the site and set a timetable for removal of radioactive waste from Orchid Island. The news of this demonstration spread all over Taiwan and drew much attention from people in Taiwan making them aware of the radioactive waste issues in Orchid Island. Two months later (22 April 1988) at the annual anti-nuclear demonstration in the capital city Taipei, Yami youth leaders Chang Hai-Yu (張海嶼) and Kou Chien-Pin (郭建平) handed a petition from the Orchid Island people to the AEC and Taipower. However, the government did not change its attitude and did not respond to the Yami people. Instead, AEC offered compensation of \$30 million New Taiwan Dollars (NTD) (approximately £600, 000) to build a pipeline of tap

water and buy engines for fishing boats for the Yami people (Kao 2000). But the Yami elders reacted strongly against the compensation: Mr. Shaman, a Yami artist, recalled his memories in an interview conducted in 2003 on what elderly Yamis said about the compensation: ‘the government try to buy us with approximately NTD\$30 million. Building a pipeline of tap water and buying engines for fishing boat is not what we need. We are facing a survival challenge. We will return the money to AEC’.

Although the first large-scale demonstration did not change the government’s attitude, the people of Orchid Island (Lan Yu) did not give up. On 20 February 1991, Yamis led by Kou Chine-Pin conducted a similar demonstration in Orchid Island, during which about one hundred Yami people and representatives from environmental groups marched to the repository where they presented the petition again and made a declaration requesting the government to:

1. Immediately stop the expansion of the second phase of the storage site;
2. Immediately stop transporting radioactive waste to Lan Yu (Orchid Island); and
3. Set a timetable for removing nuclear waste from Lan Yu (Orchid Island) (Kuan 1991).

The declaration also called on Taipower to respond to their demands to the Yami people in written documents by 30 June 1991. If the government or Taipower ignored these demands, the Yami demonstrators threatened to conduct more radical action, such as blockading the repository and harbour until the radioactive waste is removed from Orchid Island (Kuan 1991).

5.3.4 A two-faced approach?

The United Nations Year of Indigenous People was 1993. Under the pressure of strong

local resistance, on 20 March 1993, the Chairman of AEC, Dr. Hu Chin-Piao (胡錦標) Hu, declared in the Legislative Yuan that ‘the radioactive waste stored in Orchid Island will start to be removed by 2001’ (Lin 1995). But Taipower had just sent plans to AEC to build another six ditches in Orchid Island to host another 100,000 barrels of radioactive waste. The Yami people asked Legislators (MPs) to oppose this expansion plan and put pressure on the government to stop it. On 26 Apr 1993, Dr. Hu insisted in the Legislative Yuan that ‘there will be no more expansion of the radioactive waste repository’ (Lin 1995). The vice-general manager of Taipower also spoke publicly on 12 May 1993 saying that ‘Taipower guaranteed we will negotiate with Taitung County Council beforehand and any works will not start without the approval of local people’ (Lin 1995). Yet at the same time (the beginning of May 1993), Taipower applied to the Executive Yuan for a ‘Significant Public Project’ permit (Lin 1995), because in Taiwanese Law, the central government can approve a ‘Significant Public Project’ without the consensus of local government, local council or local communities for the purpose of benefiting all people in the nation. This two-faced approach brought the people of Orchid Island (Lan Yu) to Taipei again on 20 May 1993, where a total of 20,000 people joined the demonstration. The demonstration opened with about twenty Yami elders dressed in their traditional clothes with bamboo helmet, loincloths and bamboo chest armour conducting an aboriginal dance in front of the Legislative Yuan. The event attracted much attention and made the whole nation aware of the radioactive waste issue on Orchid Island.

In May 1995, there were further protests in both Taipei and Orchid Island (Lan Yu) against radioactive waste. The Yami people put rocks into the ocean to try to block the harbour, and in Taipei, they asked the government to investigate the legality of Taipower’s enlargement plan. In response, at the end of 1995, Taipower suspended the enlargement plan and promised to reduce the six new ditches to two ditches, but local

opposition remained strong (Kao 2000). During the 10th anniversary of the Chernobyl accident on 24 April 1996, Taipower's freighter containing a shipment of 186 barrels of radioactive waste was blocked from entering the harbour of Orchid Island (Lan Yu) by Yami aborigines. Strong local opposition made it impossible for Taipower to build any more ditches in the repository in Orchid Island (Lan Yu) to host more nuclear waste, so the repository had effectively reached its maximum capacity (Kao 2000). Therefore, in July 1996, Taipower decided to stop sending any more radioactive waste to Orchid Island (Lan Yu). But this did not end the controversy, because the presence of the existing stock of radioactive waste in Orchid Island (Lan Yu) continued to cause acute controversy.

During the 14 years (1982-1996) that Taipower had sent radioactive waste to Orchid Island, there were 338 shipments totalling 97,671 barrels of radioactive waste transported from Taiwan to Orchid Island (FCMA 2002: 20). In 1998, AEC estimated that there were at least 4,000 barrels of radioactive in Orchid Island (Lan Yu) which were rusty and that the number was increasing. . The Director of FCMA said to *China Times* on 7 February 1998 that 'because the natural environment in Lan Yu (Orchid Island) has high temperature, high humidity and salt, the radioactive waste barrels will last only ten years but 1982 is more than fifteen years ago. We undoubtedly assume that the number of rusty barrels will increase day by day' (*China Times* 1998a: 9) . Rusty barrels may leak radioactive substances into the surrounding water and air and cause illness to people. AEC asked Taipower to re-fill the radioactive waste in new barrels, and in June 1998, Taipower launched a six-year plan to complete the re-fill work by re-filling the radioactive waste in new barrels. However, Taipower decided that the best way of doing so was to build another new ditch for the new re-filling work, but people in Orchid Island (Lan Yu) were strongly against building another ditch, and their opposition meant that no new ditch was built. On 17 November 2000, a Taipower ship

with several barrels arrived in Orchid Island (Lan Yu), and the Orchid Island people assumed there was radioactive waste on the ship and prepared for protest (China Times 2000b: 8), until a Taipower official explained that the barrels on the ship were empty barrels brought to replace the rusty barrels (*China Evening Times* 2000c: 5). The Yami people were not satisfied with the length of time taken to complete the refix work: by November 2002, 77% of the rusty barrels had been replaced (FCMA 2002: 22), and at the time of writing (August 2012), the refix work is still under way, despite the fact that Taipower scheduled to finish all the fixing work by October 2011 (Lu 2006, and Chen 2011: 6). People in Orchid Island (Lan Yu) claimed that Taipower deliberately delayed the fixing work, and they suspected that Taipower's shipments of empty barrels actually contained radioactive waste, so they often continued to blockade Taipower's ships.

At a visit to Orchid Island during his (successful) 1999 Presidential election campaign, Mr. Chen Shui-Bian (陳水扁) signed a 'New Partnership Relationship' with the people in Orchid Island (Lan Yu) committing the government to removing the radioactive waste from Orchid Island (Lan Yu) by 2002 (Chen 2002: 5). It was the first time that a high profile politician had signed a written agreement with aboriginal people in Taiwan. However, the radioactive waste issue was too complicated for the material to be removed easily – for one thing, Taipower had not found any other place in Taiwan or in other countries, which could host the radioactive waste immediately.

On 15 February 2001, Vice President Miss Lu (呂秀蓮) offered her apology for siting the radioactive waste during a visit to Orchid Island. She told the Yami people that Taipower had reported they had signed agreements with other countries to deal with the radioactive waste by 2002, and she stated that 'though I cannot say which countries are going to receive the waste, the government never forgets the demands of people in Lan Yu (Orchid Island)' (Shin 2001: 8). But ironically, on the following day, Taipower's

general manager reported to the Vice President that it was nearly impossible to remove all radioactive wastes from Orchid Island by 2002 (Shin 2001: 8).

On 2 May 2002, the largest protest in Orchid Island was launched, and nearly 2,000 residents joined the protest. Yami children, women, and elders together with Yami youths in their traditional dress marched around the island to express their anger, calling on the government to keep their promise to remove the radioactive waste from Orchid Island (Lan Yu). The Minister of Economic Affairs, Mr. Lin Yi-Fu (林義夫), replied to the Yami people by fax confirming that the government's policy was to gradually stop the use of nuclear energy and to achieve a nuclear-free homeland in Taiwan, and that Wuciou (烏坵鄉) had been designated as the final disposal site and work had already started on its environmental impact assessment (Chen 2002: 5). But the Yami people were not satisfied with the reply faxed by the Minister of Economic Affairs, and they threatened that if the government could not give them a more concrete reply, they would burn the repository. The Minister of Economic Affairs and the Chairman of Taipower went to Orchid Island on 4 May 2002 and the former apologised for failure to remove radioactive waste from Orchid Island by 2002 (BBC NEWS 2002), and signed an agreement with the people in Orchid Island which stated that:

1. The Minister of Economic Affairs, Mr. Lin Yi-Fu, as a representative of the government sent his apology for years of failure to remove radioactive waste stored in Lan Yu (Orchid Island). The Minister of Economic Affairs also sent his apology for disrespect for the human rights and environmental rights of all people in Lan Yu (Orchid Island);
2. The government would legislate to protect Yami people's rights in Lan Yu (Orchid Island);
3. The government would set up a committee to oversee the removal of radioactive waste stored in Lan Yu (Orchid Island). The Committee members would include

anti-nuclear waste leaders from Lan Yu (Orchid Island), members of environmental groups, experts, representatives from the Ministry of Economic Affairs, representatives from the AEC, representatives from Taipower, Yami representatives from the Council for Indigenous People, and aboriginals MPs. This Committee would set a timetable to remove radioactive waste as soon as possible.

4. The government would set up a committee within a month to improve the health care, living conditions, and education in Lan Yu (Orchid Island), and after removal of the waste, to clean up all the radioactive materials and restore the natural landscape of the site.
5. If the government does not comply with this agreement, the government will have to face further demonstrations held by the Yami people.
6. This agreement will be recorded in the Legislative Yuan (Shin 2002: 8).

The Yami signed this agreement with the Minister of Economic Affairs, though Taipower stated that the Yami people would have to wait at least seven years for removal of all of the radioactive waste from Orchid Island. In November 2002, the Committee for the Lan Yu (Orchid Island) Repository Removal (CLYRR) was established by Executive Yuan to promote the removal of radioactive waste from Orchid Island. But because Taipower had not found a new disposal site, this committee did not set out a timetable for Taipower – a failure criticised by Mr. Sharman, a Yami artist: ‘We believe the government sincerely wants to remove the radioactive waste from Orchid Island. But the committee is useless. It has no timetable. If the government does not start to remove the rubbish I am afraid some of the young generation will use very radical ways to protest’²⁴. The latest recorded meeting of the CLYRR was held on 14 August 2007, but with no site named to host radioactive waste, the discussion focused

²⁴ Interview with Mr. Sharman on 23 December 2003.

on the hypothetical procedure of siting the new repository, whereas committee members who represented people of Orchid Island were more concerned about compensation for, and employment of, local people. Since 2007, the committee has not functioned at all, and the website site of CLYRR has not been updated.

After 2002, Taipower changed its strategy towards people in Orchid Island. Before then, there were no employees from Orchid Island in the repository, but since 2002, Taipower hired more local people, and since 2006 there have been 22 local people out of the 37 employees who work at the repository (*United Daily* 2006). Moreover, whereas before 2002, Taipower employees at the repository who were from Taiwan Main Island conducted negotiations between Taipower and people in Orchid Island, since 2002, six of the 22 local people employed by Taipower communicate and negotiate with the local community (*United Daily* 2006). Their responsibilities include liaising with local elders and distributing compensation to people in Orchid Island who need help. These negotiators have a difficult job because, on the one hand, they have to face criticism from their own tribe about their attitude to radioactive waste, but on the other hand, they have to work for Taipower in helping the locals. The level of financial compensation keeps increasing: according to *United Daily Newspaper*, from 1982 to 2006, there was a total of about NTD 760 million (approximately £13.2 million) (*United Daily* 2006), and since 2002, Orchid Island has accepted about NTD\$ 200 millions each year which has been spent on medical and educational services, public infrastructure, community development, emergency aid, and electricity bills (Taiwan Indigenous TV Station News 2011).

Taipower's strategy has defused the anti-radioactive waste movement in Orchid Island, and more local people are returning to the island from Taiwan as workers to fix the rusty radioactive waste barrels in the repository. But progress on siting a new repository for

radioactive waste is very slow. The government was supposed to announce the new site for a radioactive waste repository by June 2005, but due to the enacting of the Law on Site Selection of Low Level Waste Final Disposal in 2006, the siting process had to start again. As of August 2011, none of the radioactive waste has been removed from Orchid Island.

5.4 Siting for a final repository for nuclear waste

Although Taipower has reduced opposition in Orchid Island by hiring local people to communicate with other locals and by increasing the amount of financial compensation paid out to the community, the demand for removal of radioactive waste from Orchid Island has never disappeared. Yet since there are six reactors with three nuclear power plants in Taiwan, the volume of radioactive waste is increasing day by day. This new radioactive waste is being stored at the nuclear power plants but the space in these plant areas is limited, and each nuclear power station will very soon reach its capacity for storing its radioactive waste. So since the opposition to expanding the Lan Yu (Orchid Island) repository is still strong, the siting of a new repository for radioactive waste is becoming more and more urgent.

In 1993, Taipower began to look for another site to replace the Orchid Island site for its new nuclear waste, but it encountered so much local opposition that in 1997 it considered transporting radioactive waste to other countries. This section will first trace the steps that Taipower took to find another site within Taiwan, and then examine its attempt to find another country willing to receive its radioactive waste. Both strategies aroused considerable opposition, and both failed.

5.4.1 Financial support – a nuclear backend fund

Siting a permanent repository for radioactive waste is very costly. A lot of financial support is needed to conduct research, negotiate with local people, and compensate host communities. In 1986, in order to ensure that the financial burden would not be imposed on future generations who would not benefit from today's nuclear power generation (Oon 2001: 5), the Taiwan government asked Taipower to establish a nuclear backend fund to cover the cost not only of managing radioactive waste, but also of decommissioning nuclear power plants (Shieh 1996), and since 1986, Taipower has contributed NTD\$ 0.17 (£0.34 pence) per unit of electricity produced by nuclear power plants to such a fund. By 2008, the total amount of money in the fund had reached NTD\$9.97 billion (approximately £199.4 million) (Taipower 2009). According to Taipower, the fund would be used for the following purposes:

1. Final disposal of nuclear waste;
2. Packaging, transport, interim storage and final disposal of spent fuel;
3. Decommissioning of Taipower's nuclear facilities and disposal of decommissioned wastes.

The fund would also cover the cost of compensation for local communities hosting the radioactive waste, as well as expenditure incurred in exporting radioactive waste to other countries. The establishment of the nuclear backend fund ensured that the cost of siting a new repository would not come from governmental departments or from future generations of Taiwanese people. Another advantage was that because the amount of money in the fund was huge, although this would encourage local communities to ask for more compensation, it would attract many local councillors to serve as Taipower's agents to persuade local people and local government to agree to host radioactive waste. Also internationally, this huge amount of money would be very attractive to those countries which were willing to host radioactive waste from Taiwan.

5.4.2 Siting a permanent LLW repository in Taiwan

In February 1993, Taipower formed a 'Siting Committee' comprising 15 professors and scholars from local universities and research institutes. The main task of this committee was to conduct investigations and surveys for selecting a suitable site for new nuclear waste around Taiwan, and Taipower hoped to recommend three candidate sites to AEC by February 1998. Taipower's programme for LLW disposal was planned to be carried out in the following six phases:

1. Selection of disposal site and method of disposal
2. Environmental survey and assessment
3. Site characterisation, engineering design and licensing
4. Site construction
5. Operation
6. Post-operation monitoring (Cheng and Wu 2003)

At the end of 1995, Taipower had identified thirty potential sites with a total land size of 1,500 square kilometres (Shieh 1996). But after several years of anti-nuclear protest in Taiwan, Taiwanese people were more aware of the safety issues of nuclear waste, and the surveys and investigations of several sites were facing a lot of local opposition. Taipower acknowledged that the Taiwanese people did not welcome its surveys, and in 1997, Taipower decided to change its strategy again to adopt a voluntary scheme (Li 1998: 8). This voluntary scheme was designed to encourage local counties to allow Taipower to conduct investigations and evaluations in their areas for the final disposal site of LLW. The local county would be given NTD\$1 million (approximately £20,000) if they signed a letter of consent to provide land to Taipower for the final disposal site of LLW (Li 1998: 8), and Taipower would evaluate the suitability of the proposed final disposal site of LLW in the towns that had signed the letter of consent. If the site were

chosen for the final disposal site and construction started, Taipower would provide compensation of NTD\$3.2 billion (approximately £64 million) to the local communities.

Under this scheme, several towns signed letters of consent with Taipower to allow Taipower to conduct the suitability survey for the final disposal site, including Ju-kuwn (莒光) in Matzu (馬祖), Mu-Dan(牡丹) in Pingtung County (屏東縣), Fu-Li (富里) in Hualien County (花蓮縣), and Da-Ren (達仁) and Jing-Fong (金峰)in Taitung County. Because local opposition was still quite strong, Taipower also considered some small islands previously used for military purposes. In February 1998, Taipower chose six towns to propose to AEC as the potential sites for LLW final disposal: Little Ciou Yu (小丘嶼) in Wuciou Township, Peng Chia Yu (彭佳嶼)in Keelung City (基隆市), Little Lan Yu (小蘭嶼) in Orchid Island (Lan Yu), Da-Ren in Taitung County, Dung-Ji Yu (東吉嶼)in Wang-An in Penghu, and Mu-Dan in Pingtung. In 2003, the government added Da-Wu in Taitung County as another potential site (*China Times* 2003a: 8). From these sites, Taipower identified Little Ciou Yu in Wuciou as its most favoured or priority site, while Da-Wu was designated the next most favoured site, despite the fact that some of the strongest opposition to repositories was found in these two areas. We discuss the cases of Wuciou and Da-Wu in more detail below.

5.4.2.1 Wuciou

Table 5.3 Location of Taiwan and Wuciou



Sources: Wikipedia

(<http://upload.wikimedia.org/wikipedia/commons/1/11/Kinmen,Matsu,Wuciou.png>)

Wuciou is the smallest township in Taiwan with only 2.6 square kilometres and a population of 366 people (Kinmen County Government). It is situated in the Taiwan Strait, 80 nautical miles from Taiwan's west coast (See Table 5.3) and only 9 nautical miles from the territory of Mainland China. Local resistance in Wuciou was the strongest among the original six sites, but Wuciou Township signed a letter of consent with Taipower in November 1996 to provide a 0.4 square km area within Little Ciou Yu village as a final disposal site (*China Times* 1998e: 8). Wuciou Township thought it was impossible for Taipower to choose Little Ciou Yu in Wuciou as the final disposal site because Taipower's siting criteria (then) allowed surveys only in places more than 1 square kilometre (*China Times* 1998f: 8). So why did Wuciou sign the agreement to allow Taipower to start a survey? The answer is that in accordance with the voluntary scheme, any county that allowed Taipower to conduct a survey would get NTD\$1 million (approximately £20, 000). Wuciou Township thought, therefore, that they could

get the NTD\$ 1 million but that no final disposal site would be located in Wuciou. Wuciou Township duly obtained its NTD\$ 1 million from Taipower in September 1997 (*China Times* 1998e: 8), but the situation had changed because Taipower now allowed investigations of any area more than 0.2 square kilometres (*China Times* 1998h: 8), and this meant that Little Ciou Yu in Wuciou had become a real option.

Taipower chose Wuciou as its priority site for the following seven reasons:

1. Less population: there are only 69 people in Little Ciou Yu. Even within 2 kilometres, there are only 123 people;
2. There are water tank and military facilities already there, so it would be easy to convert these facilities for Taipower's employee who would be in charge of the site;
3. The rock is suitable to store radioactive waste;
4. There are no obvious geological difficulties;
5. There is a small harbour to make shipment easy;
6. No road needs to be built on this islet; and
7. There are no obvious obstacles for construction (*China Times* 1998c: 8).

Another advantage of using the Little Ciou Yu site was that the land in Wuciou has never belonged to local people - it has always belonged to the national government as a frontier line because it is very close to Mainland China (*China Times* 1998h: 8) - so the government could use the land in Wuciou for any purpose it chose. Taipower planned to store 20,000 barrels of radioactive waste in Little Ciou Yu but there was still a long way to go before the construction of the final disposal site could begin. First, Taipower had to get the approval document from Wuciou Township before June 1998. Second, Taipower had to submit an Environmental Impact Statement Report and a Safety Analysis Report to AEC and the Environmental Protection Agency (EPA), and to submit

an Investment Feasibility Study Report to the Ministry of Economic Affairs (*China Times* 1998b: 8), and Little Ciou Yu could only be named as a final site after receiving approval from these three governmental organisations (Cheng and Wu 2003).

By the time Wuciou was chosen by Taipower as a priority site to host radioactive waste, the Wuciou people felt that they had been treated unfairly by the national government by asking them to accept radioactive waste, and they called on the government to respect their human rights. The leader of Wuciou Forum, Mr. Kao Wu-Ciou, said that ‘Taipower and the government forced opposed Wuciou residents to accept nuclear waste’ (*China Times* 1998h: 8). To express their opposition to nuclear waste, residents of Wuciou held a protest on 6 March 1998 (*China Times* 1998g: 8), and more than 100 Wuciou residents, including many who were living in Taiwan Main Island, gathered angrily in front of Taipower’s headquarters. They raised the changing of Taipower’s siting criterion for allowing surveys from an area of more than 1 square kilometre to 0.2 square kilometre (*China Times* 1998g: 8). ‘If they could allow 0.2 square kilometre, why did they set the 1 square kilometre criterion in the first place?’²⁵ asked the leader of the protest, Mr. Lin (*China Times* 1998g: 8).

In answer to the charge that Taipower had changed its siting criteria simply in order to made it suitable for Wuciou, the head of Taipower’s Nuclear Backend Management Department explained to the Wuciou people that experts and scholars from the siting committee had suggested that Taipower loosen its criterion on the area of the final disposal site, and Taipower’s decision to change the criterion from 1 square kilometre to 0.2 square kilometres had been approved by the AEC (*China Times* 1998g: 8). The change was not, therefore, especially designed for Wuciou. Moreover, Taipower

25 Quote from *China Times* (1998g) “Anti Nuclear Waste-Wuciou People Shouted: Protest until We Die” 6 March, 8. (in Mandarin)

emphasised that the final disposal site of radioactive waste had not yet been decided. Taipower still needed to submit many geological investigations and environmental impact assessments to AEC, the Ministry of Economic Affairs (MOEA), and Environmental Protection Agency (EPA), and there were still other potential sites needing investigation, so the final site would not necessarily be Wuciou (*China Times* 1998h: 8).

On the issue of compensation, the head of Taipower's Nuclear Backend Management Department said that 'Taipower would try our best to negotiate with Wuciou people in many ways such as telephone interviews or visits in person. People who Taipower would negotiate with included 600 Wuciou people who lived in Taiwan Main Island and people resident in Wuciou. After Taipower gets the approval letter from Wuciou Township to allow Taipower to start conducting its investigation, Taipower would pay NTD\$ 50 million (approximately £1 million). Secondly, before Taipower actually began their investigation, Taipower would pay another NTD\$ 50 million. Finally, after Taipower finished the investigation, Taipower would pay another NTD\$ 50 million. The total compensation was NTD \$150 million (approximately £3 million)' (*China Times* 1998g: 8). Moreover, in addition to the NTD \$150 million compensation payable if Wuciou were named as the final site for radioactive waste, the amount would increase to NTD\$ 3 billion (approximately £60 million) if the repository were built there. Wuciou Township leader Mr. Li said 'thirty per cent of the compensation fee would go to Kinmen County Government (*China Times* 1998d: 8)²⁶, which has Wuciou under its jurisdiction. NTD\$ 1 billion (approximately £20 million) would be used to buy the land (though since the government owned the land, this would mean the national government handing the money from their left hand to their right hand (*China Times* 1998d: 8)²⁷.

²⁶ Quote from *China Times* (1998d) "Wuciou People Roar to Reject Nuclear Wastes" 28 February, 8. (in Mandarin)

²⁷ Quote from *China Times* (1998d) "Wuciou People Roar to Reject Nuclear Wastes", 28 February, 8. (in

The other NTD\$ 1.1 billion (approximately £22 million) would be managed by Taipower and Wuciou Township for the development of Little Ciou Yu – though since half of Little Ciou Yu would be covered by radioactive waste (*China Times* 1998d: 8), and its residents would all be living on top of the radioactive waste, any development would be too dangerous. . Mr. Li asked the national government to stop considering Wuciou as a disposal site for radioactive waste and accused Taipower of playing a compensation numbers game to misguide and lure the Wuciou people into accepting serious health risks (*China Times* 1998d: 8).

An official of AEC told *China Times* on 7 March that whether or not Wuciou town signed the letter of approval to allow Taipower to start the investigation, Taipower would carry out the geological investigation and environmental impact assessment (*China Times* 1998i: 8). The official meant that if people in Wuciou would not agree to Taipower starting the geological investigation and environmental impact assessment, the government would compulsorily require the Wuciou people to allow the investigation to go ahead, since Taipower would apply to the Executive Yuan for a permit for a Significant Public Project (*China Times* 1998i: 8). However, in order to defuse the opposition, AEC would ask Taipower to negotiate with the Wuciou community and try to get approval from local people.

In June 1998, Taiwan did begin its investigation and environmental impact assessment (*China Times* 1998j: 8), but because of strong local opposition, Taipower did not pay the compensation fee of about NTD\$150 million until October 1998 (*China Times* 1998k: 8), though both Taipower and AEC claimed that they never stopped negotiating with people in Wuciou (*China Times* 1998k: 8). Taipower promised to employ local people before outsiders, and also to help improve the local water quality and electricity supply

(*China Times* 1999: 8). In June 1999, Taipower claimed that the opposition in Wuciou had been placated and that it was confident that it would finish the investigation and the environmental impact assessment and begin to operate the site by 2002 (*China Times* 1999: 8).

After two and half years of investigation, in November 2002, Taipower submitted the Environmental Impact Statement Report and the Safety Analysis Report to AEC, the Ministry of Economic Affairs and the Environmental Protection Agency (EPA). But there were still many issues to be settled. First, the Chinese Ministry of Defence claimed that constructing a harbour to allow a 10-ton ship to land at Wuciou was a provocative action. The Mainland Affairs Council in the Taiwan cabinet, which was in charge of Mainland China affairs, was very concerned about this response from the Chinese government (*China Evening Times* 2001b: 5). Second, China raised questions about the loss of fisheries, and risk of radioactive contamination to marine life generally. Taipower claimed that the impact would be very small unless Chinese fishing vessels interfered with the construction work in Wuciou, or blocked the waterway when the site began operation (*China Evening Times* 2001b: 5). Third, the anti-nuclear DPP government came into power in Taiwan in 2000. Fourth, the Chairman of EPA, Dr. Lin Jun-Yi, was a former leader of the Asia Antinuke Forum (*China Times* 2000: 8), and experts from the EPA were not happy with Taipower's report (*China Evening Times* 2001a: 5), asking it to supply a more comprehensive concrete report on the management of the site, the emergency measures, environmental safety precautions, and the impact on land and ocean ecosystems (*China Evening Times* 2001b: 5). In order to deal with these issues, EPA asked Taipower to conduct a further Environmental Impact Assessment, and revise and resubmit the three reports by May 2001.

In August 2002, at the same time that Taipower resubmitted the Environmental Impact Statement Report, the Safety Analysis Report, and the Investment Feasibility Study

Report on Wuciou for approval by the AEC, the EPA and the Ministry of Economic Affairs, the Ministry of Economic Affairs asked Taipower to examine the feasibility of other alternative sites. In November 2002, Taipower named four alternative sites – Da-Ren and Da-Wu in Taitung County, Wang-An in Penghu islands and Mu-Dan in Pingtung (*China Times* 2005: 8) and undertook to name a favoured site for a radioactive waste repository in June 2005. But because of the enacting of the ‘Act on Site for Establishment of Low Level Radioactive Waste Final Disposal Facility’ and ‘Law on Site Selection of Low Level Waste Disposal’ in 2006, the entire selection process had to start again from the beginning.

5.4.2.2 Da-Wu

Of the four alternative sites to that of Wuciou, Da-Wu was evidently the most favoured. While Taipower’s project in Wuciou was still awaiting approval by the AEC, the EPA and the Ministry of Economic Affairs, President Chen Shui-Bian visited Taitung County on 9 April 2003 and declared a government promise to clear the radioactive wastes in Orchid Island (Lan Yu) by the end of 2003. After his visit, *China Times* reported that Da-Wu in Taitung County would be the final disposal site of LLW (*China Times* 2003a: 8). The report revealed that Taitung County Mayor Mr. Hsu Ching-Yuan together with Da-Wu Township Chief, Mr. Wang Fu-Yuan, several representatives of the Da-Wu people including village leaders from Da-Wu, together with two Taipower officials, went on a trip organised by Taipower to Japan to visit a nuclear waste site and nuclear facilities (*China Times* 2003a: 8). The Taitung County Mayor acknowledged that Taipower was organising another trip for Taitung County Councillors to Europe to visit the newest technology of radioactive waste management (*China Times* 2003a: 8). According to this report, people in Da-Wu did not refuse to host radioactive waste, though a Taipower official said there was not yet any agreement with any township

about the final disposal site of nuclear waste; that the whole process would need more than ten years to begin operation; and that it was too early to say where the final disposal site would be (*China Times* 2003a: 8).

After the news about the choice of the Da-Wu site was revealed, many people in the village were very angry that the government promised to remove radioactive waste from Orchid Island only to shift it to Da-Wu which would host the new repository (*China Times* 2003b: 8), so the radioactive waste would never leave Taitung. Responding to this public anger, several members of Taitung County Council issued the following statement on 18 April 2003: 'Although we joined the trip organised by Taipower it did not mean that we would agree to Taipower establishing a final disposal site for nuclear waste in Taitung' (*China Times* 2003c: 8) . Some councillors indicated that they joined the trip to Europe because people in Orchid Island (Lan Yu) still kept questioning the safety of the radioactive repository, and it was necessary therefore for them (the Taitung County Councillors) to inspect the latest technology in order to oversee Taipower's safety measures (*China Times* 2003c: 8).

The Da-Wu Anti-Nuclear Waste Group was established on 23 April 2003 and went to Da-Wu Township to express their opposition to the repository plans (*China Times* 2003d: 8). Da-Wu Township leader Mr. Wang had just come back from the trip to Japan and told the Da-Wu Anti Nuclear Waste Group that his concern was not only about hosting nuclear wastes but also about the future prosperity of Da-Wu (*China Times* 2003d: 8). Whether Da-Wu was a suitable site for final disposal of radioactive wastes would be determined by experts, but the final decision must be made by local people (*China Times* 2003d: 8). Spokesman of the Da-Wu Anti Nuclear Waste Group said 'but Lan Yu [Orchid Island] has not become more prosperous since the repository began operation. In order to save the last beautiful area in Taiwan, we are strongly against Da-Wu or any

other place in Taitung hosting radioactive wastes'²⁸.

For its part, Taitung County Government issued the following statement on 23 April 2003 (*China Times* 2003d):1. Taitung County Government would ask the national government to consider other counties as the final disposal site of nuclear waste. If no other county were willing to host radioactive wastes, Taitung County Government would not escape from the responsibility;

2. Taitung County Government would help Lan Yu (Orchid Island) to remove the low level radioactive wastes stored there for more than twenty years;

3. In order to achieve the nuclear-free homeland policy and deal with the wastes from decommissioning of nuclear power generation, Taiwan needs a safe and permanent low level radioactive waste repository;

4. The Taitung County Government does not intend to let Taipower choose the final disposal site for radioactive wastes in Taitung. But if there are no other counties willing to accept, Taitung would support the policy of the national government; and

5. If the national government decided to build a final disposal site for radioactive wastes in Taitung, it must follow the following three conditions:

- a. to treat radioactive waste by using the newest technology;
- b. to negotiate with local communities and local people, respecting their opinions;
- and
- c. to help local communities with development and compensation.

On 30 April, nearly 300 Da-Wu residents protested outside Taitung County Council; the leader of Taitung County Council, Mr. Wu Jun-li, cancelled the trip to Japan arranged by Taipower in May; and Taipower officials went to Taitung County Council for briefing

²⁸ Quote from Interview with spokesman from Da-Wu Anti Nuclear Waste on 23 December 2003. (in Mandarin)

(Central News Agency 2003a). On 24 June 2003, Taitung County Council passed a resolution opposing the establishment of any nuclear waste dump in Taitung County, and Taitung County Mayor, Mr. Hsu, declared that he would stand firm with the county's resolution (*Central News Agency* 2003b). On 3 July 2003, members of the Da-Wu Anti-Nuclear Waste Groups and the Taitung Anti-Nuclear Coalition held a press conference in Legislative Yuan (*Cyberbees News* 2003), and declared that:

1. It needs a referendum by local people or 2/3 of the members of the County Council to agree to the disposal site for radioactive wastes. Taitung County Government could not decide to host the radioactive waste on its own.
2. Geological investigations and environmental impact assessments should be conducted before the final decision is made.
3. Exporting radioactive waste should be the first priority
4. Industries that produce nuclear waste should be responsible for disposing of it (*Cyberbees News* 2003).

After 2003, the opposition in Da-Wu asked for help at the national level, and became involved in many hearings on AEC's draft 'Law on Site Selection for Low Level Waste Final Disposal'. In September 2003, the AEC promulgated and implemented the 'Regulations on Final Disposal of Low Level Waste and Safety Management of the Facilities', authorised by the Nuclear Materials and Radioactive Waste Management Act in 2002 (AEC 2006a). Amended in 2005, the regulations established the safety requirements for the sites for final disposal facilities, making the policy on radioactive waste in Taiwan more thorough.

In December 2002, the AEC drafted the 'Act on Sites for Establishment of Low Level Radioactive Waste Final Disposal Facility' (AEC 2006a), though because of opposition,

this draft was not enacted until April 2006 (Central News Agency 2006). The Act is the most important single document in the management of nuclear waste in Taiwan, because it provided guidance not only for siting a new repository for radioactive waste in Taiwan, but also for public participation in the siting process. On the siting criteria it laid down for the first time that the disposal facilities must avoid the following areas:

1. Areas where active faulting or geological conditions could endanger the safety of disposal facility.
2. Areas where the geo-chemical conditions are unfavourable for preventing the diffusion of radioactive nuclides.
3. Areas where the hydrological conditions of surface water or groundwater are likely to endanger the disposal facilities.
4. Areas of high population density.
5. Areas that cannot be developed according to the law (Taiwan. Act on Sites for Establishment of Low Level Radioactive Waste Final Disposal Facility 2006).

The Act also stated that a 'site selection group' should be established by the implementing authority (in this case the Ministry of Economic Affairs (MOEA)) consisting of 17-21 representatives of relevant government agencies, experts, and scholars (the experts and scholars must be no less than 3/5 of the total members) (Taiwan. Act on Sites for Establishment of Low Level Radioactive Waste Final Disposal Facility 2006). Taipower as a radioactive waste producer should carry out the works necessary for site survey, safety analysis, public communication, and land acquisition, and to provide the site selection group with this data, and the group would draft a disposal facility site selection plan for the MOEA. With regard to public participation, the 'Act on Sites for Establishment of Low Level Radioactive Waste Final Disposal Facility' stated that a local referendum would be held at the county level in which the

site is located, and with the consent of the public through the referendum, the site may be listed as a candidate site. The Act also decided the amount of compensation ('feedback subsidies' as stated in the Act) must be no more than NTD \$5 billion (approximately £100 millions). The local township which hosts the radioactive waste should be awarded not less than 40%; the townships nearby not less than 30%; and the county not less than 20% (Act on Sites for Establishment of Low Level Radioactive Waste Final Disposal Facility 2006). This compensation package looked very attractive to some of the townships located in very poor areas of Taiwan.

Taipower submitted its 'Final Disposal Plan for Low Level Waste' on 25 December 2003, and AEC approved it in January 2004 (AEC 2006a). According to the plan, Taipower would submit its most favoured site to the AEC and Executive Yuan in 2008 and start to operate the new repository in 2013 (AEC 2006a), though according to the 'Law on Site Selection of Low Level waste Final Disposal', it takes five years to site a new repository and the construction of the new site would need another five years (*United Daily* 2006).

However, after the enactment of the 'Act on Sites for Establishment of Low Level Radioactive Waste Final Disposal Facility' in 2006, the site at Da-Wu was abandoned because of strong local opposition. The site at Wuciou was also abandoned because the Executive Yuan claimed that it was too close to China and would be seen by China as a provocative action endangering its national security. On 17 March 2009, Taipower announced that two other potential sites had been identified for the final disposal of radioactive waste: Da-Ren in Taitung County and Wang-An in Penghu County²⁹. Da-Ren in Taitung County is located on the south east coast of Taiwan Main Island and

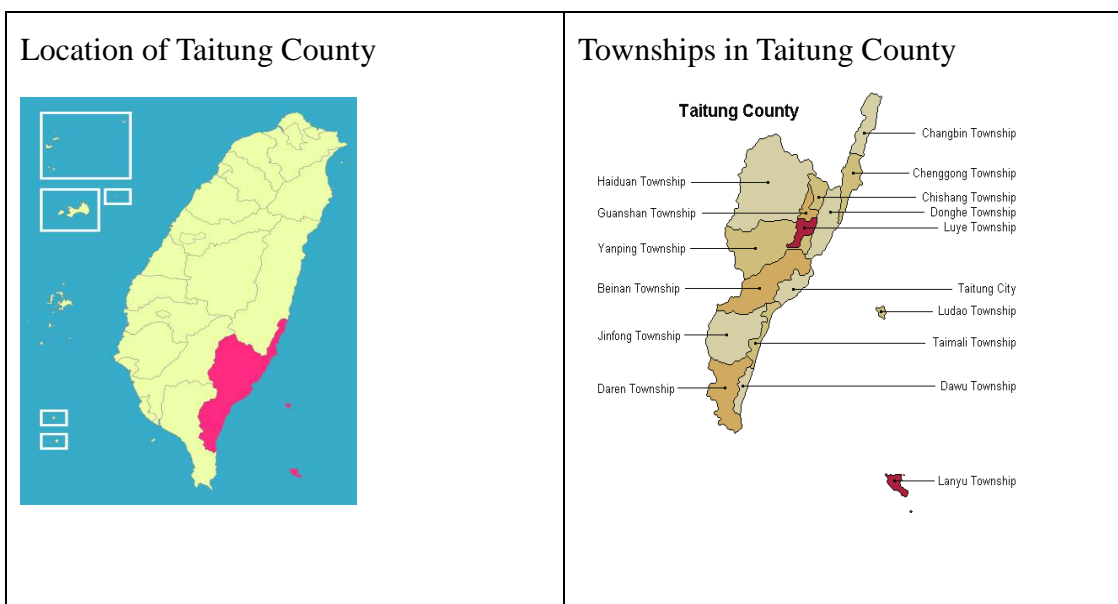
²⁹ Penghu islands are an archipelago off the western coast of Taiwan in the Taiwan Strait consisting of 90 small islands and islets covering an area of 141 square km. The whole archipelago forms Penghu County.

is occupied by the aboriginal Paiwan tribe, while Wang-An in Penghu is one of the small islands forming the Penghu islands, which is a very popular tourist destination. According to the ‘Act on Sites for Establishment of Low Level Radioactive Waste Final Disposal Facility’, there would have to be a local referendum in the respective counties (Penghu County and Taitung County) in two months time but if there were any disagreement on the matter, the referendum could be postponed. At the time of writing, no referendum has been scheduled.

The two local communities’ responses to the government announcement were different. In Da-Ren, a newspaper report claimed that 60% of the population was willing to host radioactive waste because the amount of compensation would improve their economic situation (Chen 2009). But in Wang-An, the local people strongly opposed the decision to host radioactive waste.

5.4.2.3 Da-Ren

Table 5.4. Maps of Taitung County



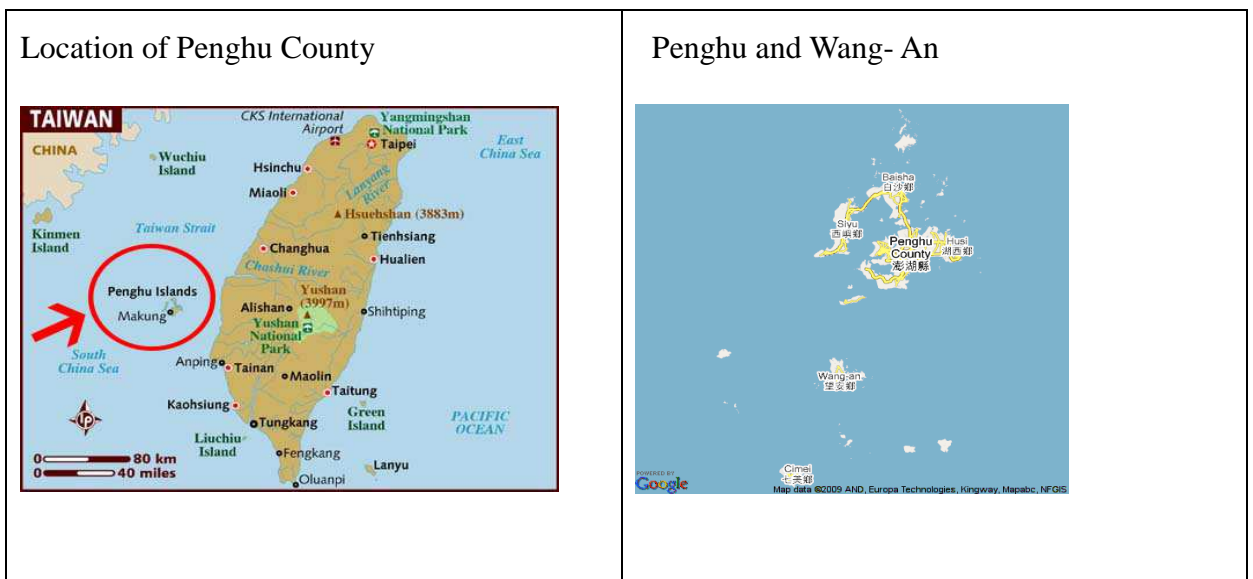
Sources: Wikimedia. File:Taiwan ROC Political Division Map Taitung County.

and <http://www.taiwan.com.au/Envtra/Geography/Maps/Taitung02.html>

Da-Ren, situated on the southeast corner of Taiwan Main Island (See Table 5.4), is occupied by the aboriginal Paiwan people, who, after the announcement of Da-Ren as the potential site for hosting radioactive waste, accused the government of violating ‘The Indigenous Peoples Basic Law’ because Article 34 of the law states that ‘The government may not store toxic materials in indigenous peoples’ regions contrary to the will of indigenous peoples’ (Taiwan. The Indigenous People Basic Law 2005). Also some small anti-nuclear waste campaigns took place in other parts of Taitung and in Taipei. On the other hand, after Taipower pointed out that compensation would benefit the local people and increase their employment, according to the village leader in Da-Ren, 60 percent of the local people agreed to host the radioactive waste (Chen 2009). Given the controversy, Taitung County Council withdrew the draft law to set up a referendum committee on radioactive waste. At the time of writing, the referendum has not yet been held.

5.4.2.4 Wang -An

Table 5.5. Maps of Penghu and Wang-An



Sources: Wimaxian,

(http://www.wimaxian.com/wp-content/uploads/2009/04/taiwan_map.jpg), and

Travelpod.

(http://www.travelpod.com/cache/city_maps/penghu-taiwan.gif)

Since 2002, there has been speculation that Wang-An (See Table 5.5) would be the final disposal site for radioactive waste, but the people in Wang-An were very strongly opposed to such a proposal. Penghu County Mayor, Mr. Wang Chien Fa (王乾發), told the Central News Agency that Penghu is rich for its natural resources and that in 2005 the government had promised the Penghu people that radioactive waste would never be dumped in Penghu (Kao 2009b: 5). Wang hoped the government would keep its promise, and he affirmed that people in Penghu would protect their lives and national resources. He accused Taipower of misleading people in Penghu by stating in a booklet which it distributed to every household in the community that the repository would host LLW, whereas in fact, the plan was to host HLW. Taipower's representative in Penghu admitted that the specification for the repository was up to the standard which could host HLW, but this did not necessarily mean that the repository would host HLW (Kao 2009b: 8).

Penghu County sought to block the plan of hosting radioactive waste by designating the area in Wang-An as a natural conservation area which meant that, according to the law, any development in the natural conservation area would not be allowed. In June 2009, after the Prime Minister visited Penghu County, a Taipower representative in Penghu admitted that its attempt to persuade local people to agree to host radioactive waste had ended because the MOEA recognised that since the area was now a natural conservation area, the issue had become legally complicated. Therefore, Taipower's negotiators with local people had returned to their headquarters in Taipei, though a MOEA official

denied the claim that the referendum would not take place (Liu, Tzeng, and Huang 2009: 9).

5.4.3 HLW and spent fuel management

Turning now to the more difficult issue of HLW and spent fuel disposal, AEC was very concerned about the treatment of HLW and spent fuel. Since its nuclear power plants began operation, Taiwan's nuclear raw materials came from the USA, and the US government required Taiwan to ask its permission before any HLW nuclear materials could be transferred by Taiwan to other countries (though the U.S did not restrict Taiwan's freedom in dealing with spent fuel) (Oon 2001: 155). In 1972, after the Taiwan government decided to build the first nuclear power plant in Taiwan, AEC invited international bids for reprocessing its spent fuel, and British National Fuel Co Ltd (BNFL) won the contract (Oon 2001: 251). However, three years later, BNFL announced that it had insufficient capacity to reprocess spent fuels from Taiwan, and the negotiations came to a halt in August 1975 (Oon 2001: 252).

As a result, the spent fuel has been temporarily stored in the pools of each nuclear power plant in Taiwan since the first nuclear power plant began operation in November 1978 (Shieh 1996). In 1987, Taipower conducted projects in each of the nuclear power plant to re-rack the storage system in order to increase capacity for housing the spent fuel. These projects were completed in 1999 for nuclear power plant I; 1992 for nuclear power plant II; and 1995 for nuclear power plant III (Cheng and Wu 2003). But it reported that the capacity would be full in 2008 for nuclear power plant I; in 2009 for nuclear power plant II; and in 2016 for nuclear power plant III (Shieh 1996). In the meantime, Taipower would adopt a strategy of storage of spent fuel in pools for the short term, onsite dry storage for the medium term, and final disposal for the long term

(AEC 2006b). With regard to onsite dry storage, Taipower submitted a proposal for spent fuel dry storage at nuclear power station I (AEC 2006b), and the construction began in 2007 and but the process was very slow due to strong local opposition.

With regard to the final disposal of HLW, Taipower launched town study projects in May 1986 and November 1988 (Liu and Wu 2001). In June 1991, these two projects were completed with a 40-year technology development plan based on two considerations: (1) a long-term investigation is required to select a suitable site for developing a geological repository and to gain sufficient information for safety assessment; (2) interim storage of spent fuels for 40 years or longer would provide enough time for carrying out the final disposal plan which would ensure flexibility for adopting other options that are proven to be beneficial and feasible in the future (Liu and Wu 2001). Bearing these two considerations in mind, Taipower produced a long-term plan with four phases:

1. 1999-2007 : Potential host rock characterization and evaluation;
2. 2008-2018: Detailed site investigation and confirmation;
3. 2019-2023: Facility design and licensing; and
4. 2024-2031: Facility construction (Taiwan. FCMA 2003: 4).

Taipower submitted this Spent Nuclear Fuel Final Disposal plan to AEC, the review of which was completed in 2007. However, Taipower has not yet submitted its feasibility study at the time of writing in August 2011.

5.4.4 Exporting Radioactive Waste from Taiwan

Siting a radioactive waste repository abroad was always a potential option for Taipower and AEC. Four countries were considered – China, North Korea, the Marshall Islands, and Russia.

5.4.4.1 China

The siting committee, which was formed in 1993, considered exporting radioactive waste to China (World Tibet Network 1993). But since 1949 there were political tensions between Taipei and Beijing, and the Taiwan government withdrew this idea.

5.4.4.2 North Korea

North Korea was a much more serious option for the export of radioactive waste, and on 11 January 1997, Taipower signed a USD\$300 million commercial contract for shipment of 200,000 barrels of radioactive waste to North Korea (WISE News Communiqué 1997). Taipower chose North Korea because the economic situation in North Korea was very poor, and North Korea needed money desperately to carry out its development goals. But when news of the deal was unveiled, it caused considerable controversy, both inside and outside Taiwan.

Domestic reaction to the deal was mixed. On the one hand, the Taiwan Environmental Protection Union (TEPU), the largest environmental NGO in Taiwan, announced its opposition to the exportation of nuclear waste to North Korea, and argued for an end to nuclear power in Taiwan. On 29 January 1997, six members of South Korea's second largest environmental groups, Green Korea, went to Taiwan to join the protest held by TEPU and Green Party Taiwan. The six members of Green Korea argued that Taiwan's exporting radioactive waste was unjust and against human rights. Also, they believed that North Korea's acceptance of the radioactive waste for money in order to improve its own economic plight ignored environmental considerations. Members of Green Korea asked the South Korea government to stop this deal between Taiwan and North Korea by helping North Korea to improve its economic situation (Fu 1997). The six Green

Korea members, accompanied by members of TEPU and Green Party Taiwan visited the Legislative Yuan, Taipower and the Ministry of Economic Affairs (MOEA) to express their opposition to Taipower's contract with North Korea. Finally, they conducted a peaceful sit-in protest in front of Taipower headquarter in Taipei (Green Party Taiwan 1997).

However, some pro-nuclear Taipower employees destroyed the banners and handouts of the protesters, and on the following day, a member of the New Party (Taiwan's third largest party at that time which is in favour of re-unification with China) and his followers physically beat the six members of Green Korea, and the Taiwan government deported them (Green Party Taiwan 1997).

The Yami people's reaction was neutral. Their abiding desire was to remove all radioactive waste from Orchid Island, not to comment on where it might be moved to: 'Our wish is to move all radioactive waste from Lan Yu [Orchid Island]. Taipower put their rubbish to our homeland; we have a right to ask Taipower to remove the rubbish. But it is not our business where the rubbish moves. We do not and shall not think about where to dump nuclear waste for Taipower'³⁰.

As for the political parties, they were also divided. The largest opposition party at that time, the Democratic Progressive Party (DPP), which is anti-nuclear, supported the Yami peoples' stance and asked the government to stop building any more nuclear power plant until the radioactive waste problem was solved. By contrast, the second largest opposition party in Taiwan at that time, New Party, which was in favour of unification with China, was not particularly interested in this issue, though it did ask the government to make sure that North Korea was able to deal with the management of

³⁰ In the interview with Lan Yu's Yami artist Mr. Shaman on 23 Dec 2003.

radioactive waste. For the government, the Ministry of Foreign Affairs argued that the agreement between Taipower and North Korea was a reasonable and legal business contract, because North Korea had technology to deal with the radioactive waste properly and Taiwan is a sovereign country, so the government of South Korea should not intervene in this deal between Taiwan and North Korea. The Ministry of Economic Affairs added that the final sites for Taiwan's radioactive waste would not be in a single country: the government would seek international cooperation with other countries. Similarly, Taipower emphasised that the exportation of radioactive waste to other countries is legal; that Taipower would not export nuclear waste to a country which did not have the technology to deal with it; that many small-scale nuclear power plants have been operating in North Korea for over ten years; and that the country is experienced and capable of dealing with radioactive waste. AEC stated that as a regulator it would appoint an official to North Korea in three month's time to conduct an environmental impact assessment, which would be the basis for AEC to permit the export of Taipower's radioactive waste.

International reaction to the Taiwan-North Korean deal was also mixed. International environmental groups responded negatively to the contract. For example, the Executive Director of Greenpeace International jointly with the Executive Director of Greenpeace China and Greenpeace Japan made a statement expressing their complete opposition to Taiwan shipping and dumping nuclear wastes in North Korea (Greenpeace 1997a). They called upon Taipower and North Korea to cancel the contract immediately; they urged the Taiwan government to find an interim solution for dealing with nuclear waste; and they asked people in the world to write a protesting letter to their nearest Taiwan Representative Office. Greenpeace held a protest with Taiwanese and Koreans on 14 February 1997 in front of Taipei's Economic and Cultural Representatives Office in Washington DC. 'It is a height of irresponsibility by Taiwan to dump nuclear waste on

North Korea. Taiwan must halt its exploitation of the economic and food crisis in North Korea and cancel plans to dump nuclear waste in that country' said Tim Clements, spokesperson for the Greenpeace anti-nuclear campaign (Greenpeace 1997b).

However, the International Atomic Energy Association (IAEA) did not oppose this contract, claiming that it was a commercial contract between Taiwan and North Korea; that South Korea had not made any objection on this issue to IAEA; that even if they did make an objection, IAEA could not step in because Taiwan and North Korea were not members of IAEA; and that all IAEA can do is to go to North Korea to clarify whether North Korea is capable of dealing with radioactive waste – and even this action needs to be approved by the government of North Korea.

Turning to the reactions from the five foreign countries most closely affected by the deal, three were hostile (USA, South Korea, and China); one was largely neutral (Japan); and one (North Korea) was in favour. The USA was not happy with the deal, because the US government wanted to prevent North Korea obtaining any material that could be used to develop nuclear weapon. The US government authorised its diplomats in Taiwan to ask the country to end its negotiations with North Korea (China Evening Times 2000a: 5).

Predictably, the most strongly opposed country was South Korea, whose government stated they would ask China, Japan, the USA and IAEA to bring pressure to bear on the Taiwan government because the exportation of radioactive waste from Taiwan to North Korea would affect the ecological environment of northeast Asia. South Korea would not, therefore, recognise the deal as purely a commercial contract. In China, the Ministry of Foreign Affairs of the PRC condemned the deal, claiming that Taiwan was one of China's territories, and that the Taiwan government was simply trying to create

two Chinas, or 'one China, one Taiwan' in the international community by this proposal. As for Japan, although the Prime Minister acknowledged that the deal would adversely affect the environment of northeast Asia, the Japanese government stated that since they had no official diplomatic relationship with either Taiwan or North Korea, Japan would not intervene.

Only North Korea defended the deal as a commercial contract, affirming that the country had the technology and ability to deal with radioactive waste, and that this was recognised by IAEA. However, at the end of 1997, the contract almost ended because Taipower had a disagreement with North Korea (*China Times* 1997: 8). Although the North Korea government had issued an import permit for radioactive waste from Taiwan (Taipower 2005), AEC in Taiwan would not allow the exportation of radioactive waste, because according to the regulations in Taiwan, AEC could only permit the exportation of radioactive waste to North Korea if the facilities there met all the requirement set by IAEA. But at that time, North Korea had not yet completed the necessary engineering work: according to the contract, the repository was planned to finish construction in September 1997 but due to lack of money, North Korea could not finish the work on time. North Korea wanted Taipower to pay the money for storing the waste first to help them complete the construction work, but Taipower would only pay the storage money after the site began operation. The construction work halted in December 1997, and Taipower confirmed that the plan had almost come to an end (*China Times* 1997: 8).

However, after the Korea summit in 2000, the tension between South and North Korea eased, and Taipower restarted negotiations on the deal with North Korea (*United Daily* 2001b: 7). Taipower asked North Korea to extend the contract to 2009, in return for which, Taipower would pay USD\$8 million to help North Korea to complete the site

(*Liberty Times* 2001b: 5). North Korea agreed, and re-issued the importation permit. However, AEC still refused to issue the export permit because AEC and Taipower stipulated that the nuclear waste from Taiwan should be stored in trenches which only hosted nuclear waste from Taiwan (Chi 2004). In any case, continued pressure from South Korea and the USA meant that the contract could never have been implemented.

5.4.4.3 Marshall Islands

The Republic of the Marshall Islands (RMI) is about midway between Hawaii and Australia (see Table 5.6). With a population of approximately 51,000, the country consists of 34 islands scattered over 1.3 million square kilometres, with a total land area of 181 square kilometres (BBC Country Profile). The Marshall Islands were one of the nuclear test sites used by the US between 1946-1958. Taipower started negotiations to site a storage repository on the Marshall Islands in 1995, but due to diplomatic pressure from China, negotiations halted in the same year. However, in November 1998, Taipower restarted negotiating with the Marshall Islands, and in December 1998, Taipower confirmed that they had signed an agreement by which the Marshall Islands would host radioactive wastes from Taiwan and in return, Taipower would pay USD\$1 billion to the government of the Republic of the Marshall Islands.

If the agreement between Taipower and the Marshall Islands had come into effect, Taipower would have exported 10,000 barrels of radioactive waste from Orchid Island to the Marshall Islands. However, although, according to the Director of FCMA in December 2003, the negotiations between Taipower and Marshall Islands were still going on during that time, Taipower has never applied for a permit to export radioactive

wastes to any country³¹. A newspaper report from Taiwan revealed that the plan to export nuclear waste from Taiwan was within a project led by the USA, but the plan did not work out because the price which the Marshall Islands government asked was too high, and the US withdrew from the project (Ou 2003).

Table 5.6. Map of Marshall Islands



Source: World Atlas.com

(<http://www.worldatlas.com/webimage/countrys/oceania/mh.htm>)

5.4.4.4 Russia

Finally, Russia was also one of Taipower's targets. According to a news release by ECODEFENSE, Russia's largest non-governmental environmental group, Taipower signed a memorandum in 1998 with the Kurchatov Institute (KI), Russia's largest nuclear weapons centre, to transport 200,000 barrels of LLW to Russia via Japan within 10 years (*Taipei Times* 2000: 5). The memorandum was organised by KI and a Taiwanese-Japanese company, Asia Tat Trading Co Ltd (ATT) (ECODEFENCE 2002). In the memorandum, Taipower would pay a total of USD\$8 billion to dump radioactive waste in permanent sites in Siberia or Simushir Island in Sakhalin province in Russia (See Table 5.7) (*China Evening Times* 2000b: 5). The transportation would be carried

³¹ Interview with the Director of FCMA on December 30, 2003.

out by Russian military aircraft for which Japan and Russia would be responsible: Taipower's duty was only to ensure that the radioactive waste was safely transported to the Russian aircraft within Taiwan (*China Evening Times* 2000b: 5). The plan would create thousands of job opportunities (*Taipei Times* 2000: 5); Taipower would have kept its promise to the Yami people to remove radioactive waste from Orchid Island; the search for a dumpsite in Taiwan would have ended; and ATT would get commission by acting as an agent.

Table 5.7. Map of Russia



Source: Russian National Tourist Office

Although Russian law prohibited any import of radioactive waste, in December 2000, the lower house of the Russian Parliament passed an amendment to allow the importation of radioactive waste from Germany, South Korea, Japan, Spain, Taiwan and Switzerland (*United Daily* 2000: 5). However, environmental groups in Russia strongly opposed the importation of radioactive waste, and on 19 February 2001, nearly 300 people from environmental groups and some MPs held a protest in front of the Russian Parliament in Moscow (*China Times* 2001: 4). They were strongly opposed to Japan, South Korea, Taiwan and other countries dumping nuclear waste in Russia (*United Daily* 2001a), and they asked the Russian President Vladimir Putin to withdraw the amendment and demanded that the Prosecutor General investigate and punish any

illegal lobbying of the MPs (ECODEFENCE 2002). But other countries voiced no objection to the proposed deal between Taiwan and Russia. Relations between the USA and Russia were improving, so the USA did not disrupt the plan. The European countries were happy because the dumpsite would be in the Far East (*China Evening Times* 2000: 5), while Japan and South Korea had already signed a contract with Russia, and the new amendment of Russian law would benefit these two countries.

Nevertheless, the plan was suspended on March 2001. The Minister of Atomic Energy in Russia, Evgeny Adamov, was not re-appointed by President Putin in the cabinet reshuffle of March 2001. Adamov had been a very controversial figure in the cabinet (*China Times* 2001b: 4), strongly in favour of importing radioactive waste from other countries including Taiwan, and the USA was worried about his willingness to sell nuclear reactors to other countries such as India and China. It seems that because Adamov's position was constantly at odds with those of the USA and domestic environmental groups, President Putin removed him from office (*Concerned Citizens for Nuclear Safety News* 2001). The new Atomic Power Minister said that Russia would reconsider the plan to import of radioactive wastes, and denied the government had signed a contract with Taipower on 7 June 2001 (*Liberty Times* 2001a: 4), claiming that Russia had never issued any permit to allow radioactive waste to import into their country. Therefore, the plan to host radioactive waste from Germany, South Korea, Japan, Spain, Taiwan and Switzerland has never been implemented (Ou 2003).

With the opposition against a new repository in Taiwan still very strong, and the government failing to keep its promise to remove radioactive waste from Orchid Island by 2002, the plan to export radioactive waste to other countries seemed an ideal solution. But as we have seen, siting a radioactive waste outside Taiwan has itself been fraught with difficulties which have caused considerable opposition internationally. Three

further issues compound these difficulties. First, the transportation of the radioactive waste risked damage to countries near to Taiwan and the hosting countries. Second, it merely transfers the environmental justice problem of distributing radioactive waste inequitably to another country, making local people in that host country suffer the health risk which had been removed from local people in Orchid Island. Third, did the local people in the hosting countries consent to Taipower dumping radioactive waste in their areas? These questions indicate that Taipower and the government cannot credibly claim that this was purely a business contract between Taipower and those countries.

Since 2004, Taipower's siting strategy has been highly ambiguous. At first, it indicated that it had ended all negotiations about exporting radioactive waste to other countries and was now focused solely on siting a new radioactive waste repository within Taiwan. But in August 2008, during the site selection process for a new repository for radioactive waste within Taiwan, Taipower announced that the new repository would be an interim repository, and that radioactive waste stored in it would be transferred to other countries such as the USA or France after 40 years (Kou 2008). Yet in April 2009, a spokesman for Taipower told *Central News Agency* that the priority for radioactive waste management was to site a repository in Taiwan rather than export it to other countries, because storing radioactive waste in other countries was very difficult in terms of management and regulation (Tzeng 2009).

5.5 Conclusion

In examining the history of nuclear waste in Taiwan, this chapter has shown how difficult it has been for the government to find a repository for its LLW, ILW, HLW and spent fuel. In addition to the physical and technical problems of finding a safe site, the government has faced considerable opposition from both environmental groups and

local communities. It managed to overcome these obstacles and find a suitable site at Orchid Island (Lan Yu), where it constructed repositories to store 97,671 barrels of LLW between 1982 and 1996. However, saturation of the site combined with increasingly vociferous protests by the local Yami people and environmental justice groups, meant that the government had to seek a more permanent site elsewhere. But this search has proved abortive, both at home and abroad, and with the failure to conclude deals with China, North Korea, Russia, and the Marshall Islands, Taiwan is today no nearer a solution to its LLW storage problem than it was 15 years ago. Moreover, the more serious problems of permanently storing ILW, HLW, and spent fuel have not even been addressed, and they are currently temporarily stored in pools near the six reactors. The issues raised in this chapter will be discussed at greater length in the next two chapters.

Chapter 6. Understanding Opposition I: Empirical Analysis

6.1 Introduction

Chapter six and chapter seven focus in more detail on the opposition to nuclear waste siting in two areas in Taiwan - Da-Ren in Taitung County and Wang-An in Penghu County. I chose these two cases for detailed study because they were the most recent potential sites selected by the government, and so they could be studied as on-going struggles. Chapter six conducts an empirical analysis of the two cases, while chapter seven presents a thematic analysis of them, picking out the most salient issues.

Taiwan's Ministry of Economic Affairs (MOEA) announced on 17 March 2009 that Da-Ren in Taitung County and Wang-An in Penghu County were its two favoured potential sites for the final disposal repository of radioactive waste. This announcement intensified discussion and debate in the local communities in Da-Ren and Wang-An, and this provided a good opportunity for me to conduct qualitative research to investigate how local opponents to nuclear waste construct their opposition and the experiences they encountered in the decision-making process. As explained in chapter one, I carried out interviews between September and October 2009 with people from Taitung and Penghu who were active in the movement campaigning against nuclear waste.

The aim of this chapter is to understand the context of the two chosen sites. It begins with a discussion of the government's process of selecting the two potential sites. Then it explains the geo-political context of the sites, discussing the geographical and demographic features of Da-Ren and Wang-An. Next is an account of their similar economic conditions, but different cultural characteristics, followed by a description of their political situations.

6.2 The selection of Da-Ren and Wang-An

6.2.1 Identification of the potential sites

On 17 March 2009, Taipower and MOEA announced that Da-Ren in Taitung County and Wang-An in Penghu County had been identified as potential sites for the final disposal of radioactive waste. Da-Ren in Taitung County is located on the south west coast of Taiwan Main Island, inhabited by the aboriginal Paiwan tribe. Wang-An in Penghu County is a small island located in the Penghu islands, which is a very popular tourist destination. The siting announcement was under the aegis of the ‘Act on Sites for Establishment of Low Level Radioactive Waste Final Disposal Facility’. The site selection group was established in August 2006 and site selection criteria were based on Article 4 of the ‘Act on Sites for Establishment of Low Level Radioactive Waste Final Disposal Facility (Act on Sites for Establishment of Low Level Radioactive Waste Final Disposal Facility 2006 and AEC 2006a)³² and other laws which regulate the development in certain areas according to their particular geological, hydrological, culture, national defence, conservation, and recreational characteristics. The site selection group chose 48 sites from 359 townships around Taiwan as possible sites based upon the land transportation conditions, sea transportation circumstances, environmental acceptability, and land areas. They subsequently narrowed down the 48

³² Act on Sites for Establishment of Low Level Radioactive Waste Final Disposal Facility 2006: Chen Shui Bian. Article 4. Taipei: Executive Yuan Article 4: A site of disposal facility must not be located in any of the following areas:

1. Area where active faulting or geological conditions could endanger the safety of the disposal facility,
2. Area where the geochemical conditions are unfavourable for effectively suppressing the diffusion of radioactive nuclides, and it is likely to endanger the safety of the disposal facility,
3. Area where the hydrologic conditions of surface water or groundwater are likely to endanger the safety of the disposal facility,
4. Area of high population density, and
5. Areas that cannot be developed according to the law.

See also. Atomic Energy Council, AEC (2006a) Radioactive Waste Management in Taiwan: Low Level radioactive Waste Final Disposal. AEC website: <http://www.aec.gov.tw/english/>, 22 January 2007.

potential sites to 8 possible sites, which included some that had been considered as potential sites before the ‘Act on Sites for Establishment of Low Level Radioactive Waste Final Disposal Facility’ was established, such as Da-Wu, Wuciou, and Orchid Island (Lan Yu) (MOEA 2009: 1-15 and 1-20). The eight potential sites were further assessed according to ethnicity³³; demography; and local election turnout rate³⁴ in 2006 and 2007, and on 29 August 2008, MOEA announced three sites - Mu-Dan in Pingtung County, Da-Ren in Taitung County, and Wang-An in Penghu County - as potential sites for a nuclear waste repository. Before the final announcement of the potential candidate sites in March 2009, Mu-Dan in Pingtung County was eliminated from the list because its geological characteristics would make the engineering cost higher than for the other two sites. As a result, Da-Ren in Taitung County and Wang-An in Penghu County were identified as potential sites for a nuclear waste repository and both were scheduled for a local referendum in 2010.

Following the announcement by Taipower and MOEA, according to the ‘Act on Sites for Establishment of Low Level Radioactive Waste Final Disposal Facility’, there was a clear commitment by the government to hold the referendums in June 2010. However, Penghu County Government made an important decision to designate Wang-An as a nature conservation area. Since by law, no development could be allowed in a nature conservation area, and because the law required the government to nominate at least two sites, this decision meant that Taipower and MOEA had to abandon the two sites and restart the siting process all over again. Because of the considerable attention raised by both cases, locally and nationally, Da-Ren and Wang-An provided a very good opportunity for me to conduct qualitative research into the two areas to understand the

³³ Sites were further assessed according to ethnicity because the government might not like to violate Indigenous People Basic Law since radioactive waste has been stored in Lan Yu which more than 90% of the population are indigenous people.

³⁴ Sites were further assessed according to election turn-out rate to see how local people react to public issues.

nature of the opposition to nuclear waste storage.

6.2.2 Important opportunity to understand opposition

The government announcement transformed the local opposition to a new stage. Before the announcement, local anti-nuclear waste groups had been established in Taitung County and Penghu County, but the campaigns were rather small and did not attract a lot of attention locally and nationally. The main focus for local anti-nuclear waste groups at that time was to send messages to the government and Taipower that local people do not want to host nuclear waste. After the announcement there was a clear commitment by the government to hold local referendums on hosting nuclear waste at county level in Penghu and Taitung, and as a result, the discussion about nuclear waste and the campaign against nuclear waste storage became very lively. In Penghu, people from Wang-An who lived in Taiwan, held demonstrations in Wang-An and Taiwan Main Island, where they expressed their opposition to nuclear waste very strongly. Similarly, in Taitung, led by the Taitung Branch of the Taiwan Environmental Protection Union and the Paiwan Anti-Nuclear Union, they held demonstrations in local villages in Taitung County, distributing leaflets about nuclear waste, and demanding public hearings on the issue. These anti-nuclear waste groups in both areas expressed the feelings of unfairness which local people experienced during the decision-making process. They accused the government and Taipower of exploiting local economic disadvantage and disrespecting local indigenous culture. Both campaigns raised concerns about health risks of nuclear waste, economic inequality, political inequality, and cultural inequality, and asked local people to vote against the proposed siting of nuclear waste in the local referendum.

This heightened public engagement with the nuclear waste issue in Taitung and Penghu

gave me a unique opportunity to explore how local opponents conceptualised and constructed their opposition.

6.2.3 Previous work on the environmental justice of nuclear waste storage in Taiwan

To help understand how local opposition to nuclear waste storage in Taiwan was constructed, we can draw upon previous work on the issue. In the past, most research on nuclear waste in Taiwan was concerned with the technical aspects of the problem. However, more recently, M.F. Fan has studied the environmental justice of the nuclear waste storage issue in Orchid Island (Lan Yu) in Taiwan (see previous chapter), which is the traditional living area of the indigenous Yami tribe. As we have seen, Orchid Island (Lan Yu) is a particularly controversial case, because local people there have claimed that the authoritarian government in Taiwan did not have their consent for dumping nuclear waste in Orchid Island (Lan Yu) between 1986 and 1996.

Fan's studies were based upon data gathered from participant observations, numerous informal conversations, and nine focus groups on Orchid Island (Lan Yu) (Fan 2006a, 2006b, and 2009). In order to represent the local population and to reflect the variety of social experiences, the focus groups consisted of two groups of fishermen and housewives, two groups of Yami professionals, two groups of Yami teenage students from high school, one group of Yami Taipower employees, and two groups of Taiwanese professionals who worked in Orchid Island (Lan Yu). Each group was about five to nine people (Fan 2006a, 2006b, and 2009). Participants from each group were encouraged to express their experiences, views, and feelings, and to interact with one another.

The data were analysed by Fan within an environmental justice framework which made

use of themes such as the good life, duty, the right to life, utilitarianism, fairness, and democratic procedures (Fan 2006a). She discovered that the understandings of environmental justice held by Yami and non-Yami participants were very different. Yami participants perceived the nuclear waste as the source of evil spirits, and considered that their way of life had been destroyed by the risks of nuclear waste, and that it was the Yami people's duty to stop the nuclear waste storage. They perceived nuclear waste issues to be connected to their cultural survival, recognition, and exclusion from democratic participation. By contrast, Fan discovered non-Yami participants downplayed the issue of nuclear waste in Orchid Island, claiming that the nuclear waste repository had no significant influence on human health and environment (Fan 2009:173). They argued that there were social problems such as binge drinking and smoking that could have had a more serious impact on people of Orchid Island. . Despite the differences, both Yami and non-Yami participants shared the same goal of reducing the amount of nuclear waste, and Fan (2006a) suggested that environmental pragmatism could be employed to defuse any tension between groups of different ethnicities through dialogue processes, so that the groups could work together to establish an alliance aimed at producing a more just nuclear waste management system in Taiwan.

Fan's work focussed solely on a single case – Orchid Island (Lan Yu) – where nuclear waste has been stored. My research is different in that it is a comparative analysis of two sites selected by the government for nuclear waste storage in neither of which has nuclear waste yet been stored; it is a study of events as they unfolded; and its cases are more recent – in 2009-2010 – when we would expect the techniques of opposition to have become more streetwise, and the debates over environmental justice to have become more sophisticated. However, I have benefited from the pioneering work carried out by Fan.

6.3 The geo-political context of the two cases

In order to understand the local communities in Da-Ren and Wang-An, this section discusses the geographical, demographic, cultural, economic, and political characteristics of these two areas.

6.3.1 Geography and demography

Da-Ren township in Taitung County is located on the south east of Taiwan Main Island (See Table 5.4), surrounded by mountains and facing the sea, with a total land area of 306 square kilometres (Taiwan. Taitung County Government) of which 90 per cent is hills and mountains. Da-Ren is the traditional territory of the aboriginal Paiwan tribe, which has lived there by farming and fishing for generations.

Table 6.1 shows the population and population density in Da-Ren in 2009. According to the national statistics of population, the population density in Taiwan is 639 people per square kilometre. Taitung County is the least populated county in Taiwan with a population density of only 66 persons per square kilometre. Da-Ren has a population of 4,103, with a population density of only 13 persons per square kilometre - the 4th lowest population density township of the 16 townships in the County, making it one of the least populated areas in Taiwan.

Wang-An township is made up of 18 islands located in the south of Penghu County³⁵ in the Taiwan Strait. Among the 18 islands, only six are inhabited –Wang-An Island, Jiangjyunao-yu (Jiangjyun Village)(將軍澳嶼, 將軍村), Dungji-yu (Dungji Village)

³⁵ Peng-Hu is an archipelago off the western coast of Taiwan in the Taiwan Strait consisting of 90 small islands and islets covering an area of 141 square kilometres.

(東吉嶼, 東吉村), Dongyuping (Dongping Village) (東嶼坪, 東坪村), Siyuping (Siping Village) (西嶼坪, 西坪村) and Huayu (Huayu Village) (花嶼, 花嶼村) (Taiwan. Wang An Township). The total land area of Wang-An township is approximately 13.8 square kilometres with a total population of 4,522 people. Unlike Daren, people in Wang-An are non-aborigines. In Wang-An, the islands are generally flat with no high mountains or rivers (Taiwan. Wang-An Township), therefore farming is very difficult for local people because lack of water resources. The locals sustain their lives in fishing and nowadays tourist industry.

The population of Wang-An is about the same as Da-Ren, but its population density is much higher, at 329 compared with 13 person per square kilometre (Taiwan. Peng-Hu County Government), reflecting the much higher population density in Penghu County than in Taitung County (758 versus 66 person per square kilometre).

Table 6.1: Land area, population, and population density in Da-Ren and Wang-An in 2009

| Locality | Land areas (Square Kilometre) | Population | Population Density (per/ km ²) |
|----------------|-------------------------------|------------|--|
| Taiwan | 36,191.4667 | 23,119,772 | 638.82 |
| Taitung County | 3,515.2526 | 232,497 | 66.14 |
| Da-Ren | 306.4454 | 4103 | 13.39 |
| Penghu County | 126.8641 | 96,210 | 758.37 |
| Wang-An | 13.7824 | 4522 | 329.11 |

Sources:

Peng-Hu County Government. Statistics Office;

Taitung County Government. Statistics office; and

Table 6.2 Population by age and gender in Da-Ren and Wang-An in 2008

| Location | Population | Gender | | | | AGE | | | | | |
|-------------|------------|------------|-------|-----------|-------|---------------|-------|----------------|-------|-------------------------------|-------|
| | | Male | % | Female | % | 0-14 years | % | 15-64 years | % | 65years of age and over | % |
| Taiwan | 23,037,031 | 11,626,351 | 50.47 | 11,410,68 | 49.53 | 3,905,203 | 16.95 | 19,729,608 | 72.62 | 2,402,220 | 10.43 |
| Taitung | 231,849 | 122,041 | 52.64 | 109,808 | 47.36 | 38,244 | 16.50 | 163,617 | 70.57 | 29,988 | 12.93 |
| Da-Ren | 3,722 | 2,069 | 55.59 | 1,653 | 44.41 | 552 | 14.83 | 2,802 | 75.28 | 368 | 9.89 |
| Penghu | 92,390 | 47,705 | 51.63 | 44,685 | 48.73 | 14,472 | 15.66 | 64,045 | 69.32 | 13,873 | 15.02 |
| Wang- An | 4426 | 2369 | 53.52 | 2057 | 47.48 | 523 | 11.81 | 3072 | 69.40 | 831 | 18.77 |

Sources:

Peng-Hu County Government. Statistics Office;

Taitung County Government. Statistics office; and

Directorate-General of Budget, Accounting and Statistics 2010.

Tables 6.2 and 6.3 show the population by age groups in Da-Ren and Wang-An in 2008, indicating that both Taitung and Penghu County have fewer working age people (aged 15-65) than the national average. In the percentage of working age people in 25 counties and cities in Taiwan, Taitung was the 17th and Penghu was the 21st. The lack of working age people suggests that local people have moved in search of jobs to other parts of Taiwan. This was certainly true in Wang-An, where the percentage of working age people was below the national average, and the elderly and child populations together were higher than the national average, indicating that many working age people had

moved out from Wang-An to seek work elsewhere in Taiwan. However, the population structure in Da-Ren was different: the percentage of working age people in Da-Ren was higher than the national average, probably because the aboriginal Paiwan people have a stronger relationship with their traditional lands and are reluctant to leave them. Hence whereas in Da-Ren, the dependency ratio (i.e. the ratio of the elderly and children to the working population) was lower than the national average, in Wang-An, the dependency ratio was much higher than the national average (See Table 6.5).

Table 6.3: Dependency ratio in Da-Ren and Wang-An in 2008

| Locality | Child Dependency Ratio | Elderly Dependency Ratio | Dependency Ratio ³⁶ |
|----------|------------------------|--------------------------|--------------------------------|
| Taiwan | 23.34 | 14.36 | 37.70 |
| Taitung | 23.37 | 18.33 | 41.70 |
| Daren | 19.70 | 13.13 | 32.83 |
| Penghu | 22.60 | 21.66 | 44.26 |
| Wang An | 17.02 | 27.05 | 44.08 |

Sources:

Peng-Hu County Government. Statistics Office;

Taitung County Government. Statistics office; and

Directorate-General of Budget, Accounting and Statistics 2010.

³⁶ Dependency Ratio <http://www.economicshelp.org/dictionary/d/dependency-ratio.html>

Definition of Dependency Ratio: The dependency ratio measures the % of dependent people (not of working age) / number of people of working age (economically active)

A dependency ratio of 12% means that for every 100 workers there are 12 people not of working age.

Children Dependency Ratio = (Number of Children (0-14) + Number of elderly people (age > 65)) / (Number of Working age 15-64) * 100%

Elderly Dependency Ratio: Number of elderly people (age > 65) / (Number of Working age 15-64) *100%

Table 6.4: Educational attainment of populations in Taiwan 2009

| Place | Population over 15 | Literate | | | | | Illiterate | |
|----------------------|-----------------------|---------------|-----------------------|-----------------------|---|------------------|------------|------|
| | | Literate % | College and above | High Schools | Junior High Schools and Primary Schools | Self- taught | total | % |
| Taiwan | 19,131,828 | 97.78 | 5,889,998 (35.91%) | 6,297,758 (32.91%) | 5,651,893 (28.56%) | 74538 (0.39%) | 403516 | 2.22 |
| Taitung | 193,605 | 97.61 | 41,013 (21.18%) | 66,008 (34.09%) | 81,047 (41.87%) | 914 (0.47%) | 4623 | 2.39 |
| Da-Ren | 3,170 | 99.46 | 396 (12.59%) | 936 (29.53%) | 1,762 (56.58%) | 1 (0.32%) | 17 | 0.53 |
| Penghu ³⁷ | 77,918 | 97.95 | 17,889 (22.96%) | 23,393 (30.02%) | 34,625 (44.44%) | 416 (0.53%) | 1,595 | 2.05 |
| Wang-An | 3,903 | 97.16 | 493 (12.63%) | 911 (23.34%) | 2363 (60.54%) | 25 (0.64%) | 111 | 2.84 |

Sources:

Peng-Hu County Government. Statistics Office;

Taitung County Government. Statistics office; and

Directorate-General of Budget. Accounting and Statistics 2010.

³⁷ The data of Penghu is 2007

Table 6.4 shows that the education profiles of the people in Da-Ren and Wang-An, were similar, in that both areas had a high rate of education to junior high school level, and a low rate of education to college level or above. This indicates that local people in Da-Ren and Wang-An can write and read but are not highly educated.

6.3.2 Economics

Table 6.5: Average income in five Townships/Districts in Taiwan in 2008

| Locality | Annual Income in 2008 per person (NT\$1000) | Rank positions among the 359 Town/district in Taiwan |
|-------------------------------------|--|--|
| Da-An District, Taipei City | 1,476 | 1/359 |
| Wang-An Township, Penghu County | 590 | 179/359 |
| Bai-Sha Township, Penghu County | 589 | 180/359 |
| Da-Ren Township, Taitung County | 491 | 341/359 |
| Lai-Yi Township, Pingtung County | 382 | 359/359 |

Sources: Average income of townships in Taiwan. <http://gaan.com/deepdish?p=84198>
(access: 20 May 2010)

Economically, the two townships were not very prosperous. Table 6.7 shows that the income earned by people in Wang-An ranked them halfway down the list of 359

townships/districts in Taiwan, while the income earned by people in Da-Ren ranked them almost at the bottom of that list - people in Da-Ren only received one-third of the annual income of the richest township/district in Taiwan.. A similar picture of economic disadvantage can be seen at the county level: people in Taitung and Penghu only earned 60 to 70 percent of the average income of people in the whole of Taiwan.

The economic weakness of the two townships (especially Da-Ren) is also revealed in Table 6.8 produced by the Industry, Commerce and Service Census (ICS) in 2006, where it was reported that the business sector in Da-Ren contributed only 0.3 per cent of the total income of the business sector in Taitung County, while the business sector in Wang-An contributed only 0.7 per cent of the total income of the business sector in Penghu County (See Table 6.8). These figures show that Da-Ren and Wang-An are not important commercial areas: indeed, the level of urbanisation in them is low, and they are located in mainly rural areas, which added to their attractiveness to the site selection committee in MOEA.

Table 6.6 also shows that people who worked for the business sector in Taiwan as a whole earned an average income of \$541,155 New Taiwanese Dollars (NTD), but in Taitung County and Penghu County, people who worked in the business sector only earned NTD\$380,304 and NTD\$330,720, respectively. This evidence of economic disadvantage in the two areas (especially in Da-Ren) explains why some of their residents were particularly vulnerable to offers of compensation for hosting nuclear waste.

Table 6.6: Revenues and Payroll of Business Sectors in Taiwan

| Locality | Number of enterprise units | Number of Persons engaged | Annual Payroll for persons engaged (NT\$1000) /per person | Total Revenues (NT\$1000) | Total Expenditures (NT\$1000) |
|----------|----------------------------|---------------------------|---|---------------------------|-------------------------------|
| Taiwan | 1,105,102 | 9549912 | 541.155 | 45,309,441,725 | 42,031,416,160 |
| Taitung | 9,418 | 30,750 | 380.304 | 58,187,670 | 57,543,771 |
| Daren | 56 | 96 | 271.281 | 184,608 | 17,6178 |
| Peng-hu | 4,388 | 11,871 | 330.720 | 18,579,325 | 16,410,275 |
| Wang An | 48 | 127 | 295.087 | 121,704 | 101,754 |

Source: Directorate-General of Budget, Accounting and Statistics 2007. The Industry, Commerce and Service Census (ICS) in 2006

6.3.3 Culture

Wang-An in Penghu County is demographically similar to most non-aboriginal townships in Taiwan where the majority of residents are Han Chinese descendants, and therefore share the same traditions. But in Da-Ren, 90% of the population are members of the indigenous Paiwan tribe, and in order to understand this community, we must explain the Paiwan culture which is very different from the dominant Han Chinese culture in Taiwan. The total population of Paiwan people in Taiwan is around 86,000, which makes them the third biggest indigenous tribe in the country (Council for

Indigenous people), and they live mainly in the southeast corners of Taiwan Island in Taitung County and Pingtung County. Historically, the Paiwan people consider themselves to be the descendants of the hundred pacer snake, which often appears on their clothing and carvings (Overseas Compatriot Affairs Commission) (See Table 6.9).

Table 6.7: Paiwan tribe distribution and Paiwan Clothing



Source: Council for Indigenous People.

One of the most distinctive features of Paiwan culture is its hierarchical social structure. Paiwan society is divided into four classes: chief, nobility, warrior, and commoner (Overseas Compatriot Affairs Commission). Tribe members inherit their social classes at birth, though Paiwan custom allows marriage between members of different classes, whereby an individual's status can change by union with someone of a different class. Generally, the chief is the ruler of the tribe – literally the landlord of the tribe he rules, since houses built on the chief's land are owned by the chief, and people living in the house are under the command of the chief. The chief is the ritual leader as well as the leader of all affairs regarding the tribe, and the chief's status is inherited by his eldest son. The nobility class are the chief's brothers, sisters, and cousins: the closer to the kingship of the chief, the nobler they are. Only the upper class can wear colourful clothes decorated by snake skin and the teeth of animals, and their houses are often decorated with carvings. Warriors are those who have special achievements and talents,

such as carving teachers and outstanding hunters (Taiwan Indigenous People's Culture Park), and they are highly respected by tribe members. Commoners are those who have a very distant or no family tie with the chief, and they are the tenant farmers of the chief who rent their lands and houses from the chief.

Formal decision-making power in Paiwan culture lies with the tribe council, the members of which are elected by people from different land areas under the different chiefs, and its decisions are made through majority voting. Although the tribe councils are not recognised by the government, their influence dominates public opinion within the Paiwan tribe. Substantial informal influence is also exerted by chiefs, nobility, and church leaders on every issue, since these people are the opinion leaders and shapers in the local areas. In recent years, especially in Da-Ren, issues of nuclear waste have divided the community into pro- and anti-nuclear waste group, and this situation has caused conflict not only within the local communities but also among family members. Local politicians are drawn mostly from the chief or nobility class, and are seen by the government as agents to negotiate with local people.

With regard to religion, Paiwan culture holds that the Gods protect people if they follow the rules recognised by society. These rules are called taboos, and violating a taboo is punished by disease and injury (Digital Museum of Taiwan Indigenous People). Paiwan rituals embrace every aspect of life: the Paiwan people pray for good weather, good harvests, and to thank their ancestors. The chief is the leader of all the ritual ceremonies but the rituals are practised by priests. In the festival of harvest, commoners pay their tributes to the chief by presenting animals they hunted and crops they grew, and in return, the chief offers his people alcohol and cooked food (Overseas Compatriot Affairs Commission). Like other indigenous tribes in Taiwan, the Paiwan were introduced to Christianity by missionaries from North America and Europe in the late

19th century, and they now practise both Christianity and traditional rituals. The Christian church is the religious centre of every village and it has an important influence on Paiwan people, playing a powerful role in the campaign against nuclear waste: founding pressure groups like the Paiwan Anti-Nuclear Waste Union; educating local people about nuclear waste; and organising demonstrations in Paiwan areas.

Finally, economically, Paiwan people sustain their living by hunting and fishing. For Paiwan men, hunting is their first job and fishing the second (Digital Museum of Taiwan Indigenous People), because despite the influence of modern lifestyles, hunting is still seen as an important skill for Paiwan males. Living in mountain areas, slash and burn agriculture is also conducted by Paiwan tribes.

6.3.4 Local politics

Local politics is also important in understanding the local communities. In this section, I will start by discussing local political arrangements in Taiwan generally and then I will discuss local politics at county and township level in Da-Ren, Taitung County, and Wang-An, Penghu County.

6.3.4.1 Local politics in Taiwan

Local government in Taiwan is divided into three levels: (1) special municipalities; (2) counties and cities; and (3) townships and county-administered cities (Government Information Office. 2010). According to the Local Government Act, an area with a population of over 1.25 million would be granted special municipalities status; an area with a population of over 500,000 would be given the status of county or city; and an area with a population of over 150,000 would be granted township status in rural areas

or county-administered city status in urban, industrial areas (Government Information Office, 2010). Counties such as Taitung County and Penghu County are headed by county mayors, and townships/ county-administered cities are headed by township/city mayors, all of whom are popularly elected for a term of four years and may be elected to a second term. In order to protect the interests of indigenous people, mayors of indigenous townships must themselves be indigenous people (Local Government Act 2010: Article 57). Below the level of township there is the village, which has a village leader, who, under the supervision of the mayor of township/city, or chief administrator, handles village affairs and carries out commissioned tasks. The village leader is popularly elected for a term of four years and may only run for election for two terms.

County/city governments are responsible for organisation and administration; finances (including taxes and levies); social services; education, culture and sport; labour administration; urban planning and construction; economic services (including agriculture, forestry, fishery, livestock industries); nature conservation; water resources; health and environmental protection; transportation and tourism; public safety (including policing and fire services); and management of businesses within the county (Local Government Act 2010: Article 18). Townships/county-administered cities have similar responsibilities, apart from water resources, labour administration, and economic services (Local Government Act 2010: Article 19). However, central government still controls the resources allocation, funding allocation, economic affairs, and policing and fiscal management personnel, and in the case of a dispute between central government and county/city government, the dispute shall be resolved by the Legislative Yuan (Parliament) (Local Government Act 2010: Article 77).

In addition to the above executive bodies, there are legislative bodies or Councils in Taiwan's local government system. Councillors of a special municipality, county/city

councillors, and township/city representatives are elected by the residents of their respective areas for a four-year term and may be re-elected to a second term (Local Government Act 2010: Article 33). The responsibilities of such councils are to pass resolutions on the regulations enforced by the governing the authority; approve budgets, taxes, and the disposal of properties; review auditors' reports on the final accounts; approve proposals made by the township/city representatives; and listen to petitions from citizens (Local Government Act 2010: Article 36).

6.3.4.2 Local politics in Taitung County

Turning to local politics in Taitung County, the first point to note is that after the Chinese Nationalist Party (Kuomintang, KMT) government retreated to Taiwan in 1949, KMT allied itself with local elites in order to dominate local elections and thereby legitimise its governing base (Wu 2003). In return, the KMT government granted local elites a monopoly of economic privilege (Wu 2003). Taitung County is one of the areas where KMT has been dominant since 1949: despite the first regime change in the presidency in 2000, the victorious DPP regime (2002-2008) still failed to establish strong support in Taitung County.

Over the last decade, politics in Taitung County at county level has been monopolised by four families - Wu family (吳), Hsu family(徐), Huang family(黃) and Rao family (饒) – all of whom represented KMT in the local elections. Members of the Wu family have been involved in the politics of Taitung since the first Taitung County Mayor election in July 1961; members of the Hsu family have been county councillors for over 30 years and have served as county mayors; members of the Rao family have represented Taitung in the Legislative Yuan for over fifteen years - one of the members of the Rao family is the deputy leader of Taitung County Council; and members of the

Huang family have been involved in local politics in Taitung since the 1960s – Justin Huang (黃健庭) was a member of the Legislative Yuan for Taitung and is the current Taitung County Mayor.

However, local politics in Taitung has been characterised by scandals and murky deals, one of which involved Justin Huang. He participated in drafting the ‘Act on Sites for Establishment of Low Level Radioactive Waste Final Disposal Facility’, and during the election campaign for county mayor in 2009, he refused to sign the petition against nuclear waste being stored in Taitung. In 2005, KMT nominated Mr. Chun-li Wu (吳俊立) (Wu family) to run for Taitung County Mayor. Mr. Chun-li Wu was prosecuted and sentenced for corruption before the election but still managed to get elected, but he did not serve as a Mayor of Taitung. Instead, the KMT nominated his ex-wife Ms. Li-Chen Kuang (鄭麗貞) to run in the by-election and she was elected as Mayor of Taitung from 2005 to 2009. However, Ms. Kuang was a very controversial figure, and she was accused of over-spending government money on travelling while Taitung County is the poorest county in Taiwan. In 2009, Ms. Kuang, aware that her negative reputation would make her unelectable for a second term, asked KMT to nominate Mr. Justin Huang, and in exchange, she would stand for his vacated seat in the Legislative Yuan once he was elected as county mayor. Mr. Huang was duly elected but only narrowly, as the DPP obtained its highest share of the vote in the history of Taitung County Mayor elections: he got 52.59 per cent, and the DPP candidate got 47.41 per cent (*Apple Daily* 2009). This result showed that the Taitung people were tired of being dominated by the four families close to KMT who failed to deliver economic development in Taitung County. With strong support from local people and the sullied reputation of Ms. Kuang, the DPP won the subsequent Legislative Yuan election in January 2010, and so for the first time, Taitung County is represented in the Legislative Yuan by a DPP legislator.

Another sign of change in Taitung local politics took place in the county councillor elections of 2009, when among 30 County Councillors, although the KMT gained 22 seats, the DPP gained 1 seat (seven seats were won by other parties or independents). What is significant about this result is not only that it was the first time the DPP has won a seat on the Taitung County Council, but that the DPP candidate who won it has been an environmental campaigner for many years, and strongly opposed to nuclear waste being stored in Da-Ren. This suggests that people in Taitung had become aware of the issue of nuclear waste storage, and approved of opposition to it.

At the township level, local politics in Da-Ren has similarly been tarnished by nepotism. The township mayor has always come from either the Pao(包) family or the Chang(張) family, both of which are in the noble class in Paiwan's hierarchical social system. National political parties have some influence at the township level but it is not as strong as it is at the county level, because Da-Ren is an indigenous people's area, and family has a substantial impact on voting behaviour, so local nepotism is very strong. Importantly, this nepotism has been mobilised in the last decades over the issue of nuclear waste storage, making this the most important issue in local elections. For example, in the 2005 mayoral election, the incumbent mayor, Mr. Shih-Ching Pao (包世晶), was seeking a second term but he was not re-elected because of speculation of corruption with Taipower, and instead, his rival Mr. Chin-Sheng Chang (張金生) got elected. In the 2009 mayoral election, Mr. Pao and Mr. Chang were again the only two candidates, but because Mr. Pao had signed the petition against dumping nuclear waste in Taitung while Mr. Chang had not, Mr. Pao was elected as mayor: local people believed that Mr. Chang supported the development of a nuclear waste repository in Da-Ren.

6.3.4.3 Local politics in Penghu County

In Penghu County politics, for 50 years the military had a very strong influence because the area was seen as a frontier line against China. As a result, candidates for the mayoral election would never be elected unless they gained support from the military and the KMT. However, this influence was eroded in the late 1990s with the end of martial rule, and during the last decade, politics of Penghu at county level has been dominated by several individuals. Unlike in Taitung, these individuals do not owe their success to their family memberships, but to their networking skills in forging strategic alliances to control the politics of Penghu. These individuals currently include the County Mayor Mr Chien-Fa Wang(王乾發), the Legislative Yuan member, Mr. Pin-Kuan Lin(林炳坤), and a former member of the Legislative Yuan member, Miss Su-Yeh Hsu (許素葉) . These three people are close to the KMT, and formed an alliance to support one another in local mayor elections, local councillor elections, and general elections. In the county mayor election in 2009, Mr. Chien-Fa Wang sought a second term, and faced a very strong challenge from DPP candidate Mr. Chien-Hsing Tsai (蔡見興). The main issue in the election was a referendum on the development of a casino in Penghu³⁸: the DPP candidate, who was strongly opposed to the casino development, obtained 48.07% of the vote; but the pro-casino Mayor Chien-Fa Wang obtained 49.37 per cent of the vote and was duly elected, no doubt helped by his network of influential individuals.

³⁸ Residents in Penghu country rejected the idea of opening a casino within their county in local referendum. The result were as follows:

| | | |
|----------------------------|---------------------------|----------------------|
| Voters: 73,651 | Vote cast: 31054 | Turn out rate: 42.16 |
| Valid Vote: 30756 (99.04%) | Invalid vote: 298 (0.96%) | |
| Support: 13,395 (43.56%) | Against: 17,359 (56.44%) | |

A total of 17,359 votes, 56.44 percent of the total valid ballots, were cast against the proposition, while 13,395, or 43.56 percent, supported it. (*Liberty Times* 2009; Central News Agency 2009).

Before the referendum, the KMT-controlled central government and Penghu County Government supported opening a casino within Penghu County. The Penghu referendum result might suggest that the central government and local government are not comfortable using referendums.

In Wang-An, local politics has always been dominated by two families, the Hsu (許) family and the Yeh (葉) family. Members of the Hsu family have long been elected as county councillors, and Mr. Lung-Fu Hsu (許龍富), the leader of the Hsu family, was elected as Wang-An Township Mayor in 2001 and again in 2009. The leader of the Yeh family is Mr. Ming-Sieng Yeh (葉明縣), who was a county councillor for over ten years, while his brother was elected as township mayor in 2005. These two families compete with each other and have controlled the local politics of Wang-An for the last 10 years. But again there are murky elements in the system. For example, Mr. Lung-Fu Hsu was a controversial figure who was prosecuted for election bribery after his successful campaign in 2009, and his trial is currently in progress. Penghu County Government has appointed its own representative as acting township mayor.

6.4.4.4 Local nuclear waste politics

We have already touched on some aspects of local nuclear waste politics, but there is much more to discuss. The politics of nuclear waste at county level in Taitung was not as lively as at township level in Da-Ren. At county level in Taitung, politicians usually responded to the issue by blandly saying ‘we will act in accordance with the laws’. Typically, neither the current nor former county mayor signed the petition organised by the Taitung Branch of the Taiwan Environmental Protection Union to stop the hosting of nuclear waste in Taitung. Moreover, Taitung County Council refused to hold a local referendum by not setting up a referendum committee on radioactive waste. However, perhaps the politicians were right to be equivocal, since according to newspaper reports, 60% of local people were happy to host radioactive waste in Da-Ren (Chen 2009). This suggested that public opinion on the issue of hosting nuclear waste in Taitung was divided.

Local politics in Da-Ren is dominated by the issue of nuclear waste. At the local level, judging by the electoral experiences of 2005 and 2009, candidates running in the local township mayoral election could only be elected by expressing opposition to hosting nuclear waste in Da-Ren. In the 2005 local township mayoral election, Mr. Shih-Ching Pao was not elected for a second term because people believed that money from Taipower had been transferred to his wife's bank account. Instead, his rival Mr. Chin-Sheng Chang was elected as township mayor. But in 2009, Mr. Chin-Sheng Chang in turn failed to secure re-election because he was believed by local people to have switched his position to support hosting nuclear waste in Daren: he refused to sign the petition against hosting nuclear waste and his son was working for Taipower as a negotiator in local villages. In fact, in Da-Ren, the issue of hosting a nuclear waste site divided the local community into two groups – pro-nuclear and anti-nuclear. People who supported hosting a nuclear waste site held the view that the compensation would improve the living standards of local people, whereas people who opposed it argued that a nuclear waste site would not only cause health risks but would destroy the Paiwan tribe and local culture. People in Da-Ren have struggled to balance the values of family, health, and culture against higher living standards.

In Penghu, the situation was rather different. All politicians at both county and township level were very strongly against hosting nuclear waste. Penghu County Mayor Mr. Chien-Fa Wang told the Central News Agency that Penghu is rich in natural resources and the government has promised Penghu people in 2005 that radioactive waste would never be dumped in Penghu (Kao 2009). He hoped the government would keep its promise and people in Penghu would protect their lives and national resources. The Mayor also accused Taipower of misleading people in Penghu. He claimed that Taipower's booklet which was distributed to every household stated that the repository would host LLW but actually it was designed to host HLW. Taipower's representative in

Penghu admitted that the plan for the repository is to a standard which could host HLW but that did not mean that the repository would host HLW (Kao 2008).

The strong opposition to nuclear waste led to Penghu County making the decision to designate the whole Wang-An township as a natural conservation area in August 2009. This decision was strategic because, according to the laws, no development would be allowed in a natural conservation area, so it ruled out the possibility of Wang-An being the repository for nuclear waste. This decision also meant that the siting process had to start from the beginning again because according to Article 9 of the 'Act on Sites for Establishment of Low Level Radioactive Waste Final Disposal Facility'³⁹, the government must nominate at least two sites as candidate sites and then conduct a referendum in both counties on the same day. As soon as the Wang-An site became impossible, the government could not nominate only Da-Ren as a potential site.

6.4 Conclusion

This chapter is the first of two chapters in this thesis to analyse in depth the two townships of Da-Ren in Taitung County and Wang-An in Penghu County, which were the potential sites selected in 2009 by the Ministry of Economic Affairs for the storage of nuclear waste. These two communities provided ideal case studies for my study of the opposition to the siting of a permanent nuclear waste repository on the island of Taiwan. This chapter has focused on the empirical details of the two cases, preparing the ground for chapter seven's thematic analysis of the issues arising from these details. The

³⁹ Executive Yuan (2006) Act on Sites for Establishment of Low Level Radioactive Waste Final Disposal Facility 2006: Chen Shui Bian. Article 9. Taipei: Taiwan

Article 9: The site selection group shall, within 6 months after the list of potential sites is publicized, submit a report on the selection of recommended candidate sites to the implementing authority and recommend at least two recommended candidate sites.

chapter has encompassed the geography, demography, economics, culture and politics of the communities, creating snapshots of their many-sided identities. The two cases shared many similar features – e.g. both were relatively poor rural areas with comparatively sparse populations – but they also differed in significant respects – e.g. Da-Ren was a community made up almost exclusively of an indigenous tribe (the Paiwan) whereas Wang-An was made up mostly of people of Chinese Han origin. In the next chapter we shall see how these similarities and differences play out in the thematic analysis of the issues raised by the controversy over nuclear waste siting in the two areas.

Chapter 7. Understanding Opposition II: Thematic Analysis

7.1 Introduction

This chapter follows on from chapter six, complementing its empirical analysis of the opposition to nuclear waste storage in the Da-Ren and Wang-An areas by a thematic analysis of the main issues raised in that chapter. As we shall see, this thematic analysis is centred on the notion of environmental injustice. But before beginning that analysis, it is worth reflecting on the intensity of feeling generated in the Lan Yu case against four of the most reviled sources of environmental injustice committed by the government and Taipower – secrecy; bribery; duplicity; and inequality. First, the government and Taipower saw the issue of nuclear waste disposal siting virtually as a state secret, and systematically failed to inform Lan Yu residents about plans to dump nuclear waste in their community even after those plans had been implemented. Second, the government and Taipower blatantly bribed local people with trips and public benefits in exchange for their acceptance of nuclear waste. Third, the government and Taipower duplicitly assured Lan Yu residents that Taipower's nuclear waste repository had stopped expanding at the same time as giving Taipower permission to continue expanding. Fourth, inequality of power between the government and Taipower on the one hand, and local government and communities on the other hand, was exploited and exacerbated by the government's deliberate policy of marginalising participative processes in Lan Yu. As we shall see, public resentment at this unjust treatment fuelled popular protests which honed conceptions of procedural environmental injustice by aggrieved groups. But the actions of the government and Taipower also generated conceptions of distributive environmental injustice, as communities felt disadvantaged compared with other communities by decisions over the siting of nuclear waste disposal facilities.

These themes are among those analysed in this chapter within the framework of justice/injustice, divided into five sections: (1) distributive environmental injustice; (2) procedural environmental injustice; (3) economic injustice; (4) political injustice; and (5) cultural injustice. As we shall see, the issues that are discussed under the headings of distributive and procedural environmental injustice are seen to be symptoms and reflections of the broader forms of economic, political and cultural injustice.

7.2 Distributive environmental injustice

Four themes of distributive environmental injustice emerged from the interviews: unfair distribution of benefits and burdens; seriousness of health problems; safety risks of nuclear waste management; and intergenerational injustice considerations. The unfairness of the distribution of the benefits and burdens of nuclear energy and nuclear waste was identified by many of the opponents of a nuclear waste repository in Penghu and Taitung. For example, the interviewee D21 said:

Taitung is less populated compared to other counties in Taiwan and we use less electricity. It's not fair to ask us to host nuclear waste. Why should we bear this burden for the whole Taiwanese society? (Interviewee D21– interviewed on 2 October 2009.)

Similarly, interviewee W 1 said:

We Dungji⁴⁰ use so little electricity, there are only about 10 residents in this island, and totally about 30 people live on this island including policemen and civil servants. It's not fair to put nuclear waste on our island. Why not just put the waste

⁴⁰ Dungji 東吉村 is the village where the nominated nuclear waste repository would be located.

in the capital or the industrial areas where those big companies use a lot more electricity than us! (Interviewee W1 - interviewed on 10 September 2009).

The same message came from Interviewee W4 :

Now there are only about 30 people live and work in Dunji village. How much electricity can they use? They consume a very small portion of the electricity but they have to host the rubbish from producing electricity. It is not fair at all. Why Tungji? Why we are so unlucky? (Interviewee W4- interviewed on 1 October 2009.)

Likewise, Interviewee D7 said:

Taitung is the place we use the least electricity in the whole country, but why we have to bear the result of dumping nuclear waste to our place? Those computer technology companies near Taipei, they use far more electricity than us. Why shouldn't they share most of this nuclear waste? (Interviewee D7 - interviewed on 18 September 2009.)

For these people, storing nuclear waste at Penghu and Taitung is 'not fair' because their communities receive only a very small share of the benefits of nuclear energy but a nuclear waste repository in their communities would mean that they would suffer all of the burdens of nuclear energy. They do not see how this can be a fair allocation of the benefits and burdens associated with the nuclear industry. These interviewees were arguing for a principle of distributive justice - that those who benefit from nuclear energy should also bear the burden. In their view, nuclear waste should be stored in industrial areas and economically advanced areas because those who benefit the most from nuclear energy are those who actually cause the problem.

This unfairness is particularly acute in the case of Taitung County, because it has been the repository for nuclear waste for nearly 30 years: Lan Yu (Orchid Island) which is an island within Taitung County has stored nuclear waste since 1982. Although in 1996 Taipower stopped adding to the stock of nuclear waste in Lan Yu (Orchid Island) the waste has not been removed, so the Taitung area is still bearing the risks of nuclear waste storage. Understandably, therefore, some interviewees in another part of Taitung County, Da-Ren, feel upset about being nominated by the government as a potential site for a permanent nuclear waste repository. For example interview D5 said:

Since Lan Yu [Orchid Island], Taitung has accepted nuclear waste for more than 20 years. Why we have to accept those rubbish which people do not want? We Taitung have suffered the burden of nuclear waste for more than 20 years. Why should we have to bear this anymore? (Interviewee D5- interviewed on 16 September 2009.)

Similarly, interviewee D21 said:

Why we should bear this burden for the whole Taiwanese society? And why it is in our aboriginal areas again? Lan Yu [Orchid Island] is enough. We don't want nuclear waste in Taitung anymore (Interviewee D21- interviewed on 2 October 2009)

Likewise, Interviewee D6 member of the Taitung Branch of Taiwan Environmental Protection Union said:

Why Taitung again? Why we have to host nuclear waste when no one wants it! Why people in Taitung have to suffer from the risk of nuclear waste? It's not fair at all. Other parts of Taiwan use more electricity than us. They should host nuclear waste,

not us! (Interviewee D6 - interviewed 17 September 2009).

One interviewee from Dungji pointed out that Taiwan also hosted three nuclear power plants, so the county was in danger of being inundated by nuclear waste:

They should never put nuclear waste in Dungji,...We have already had two nuclear power stations in northern Taiwan and one in the southern Taiwan and they all store nuclear waste. We also got Lan-Yu [Orchid Island] on the west....If they put the nuclear waste in Dungji, the whole Taiwan would be surrounded by nuclear waste.....Nuclear waste would become the biggest threat to Taiwan...(Interviewee W2- interviewed on 15 September 2009.)

Some opponents put forward the more radical argument that the burdens of nuclear waste should not be borne by anyone. They argued for an end to nuclear energy in Taiwan. These interviewees argued that nuclear energy should not be used until we have solved the problem of nuclear waste. For example, Interviewee D1 said:

Nuclear waste is poisonous rubbish. We should stop producing it because we have failed to find a solution for it..... I think we should stop building the fourth nuclear power station Also, we should start to decommission nuclear power stations which are in operation now. (Interviewee D1 - interviewed on 11 September 2009)

Also, Interview D25 argued:

It is the rubbish of civilisation. If we cannot deal with it properly then why should we use it? We should build a nuclear free Taiwan and use more renewable energy. (Interviewee D25 - interviewed on 7 October 2009)

Some interviewees questioned whether people needed such a lot of electricity in Taiwan:

The new government would like to build more nuclear reactors in Taiwan.It is a very difficult issue. Do we really need such great amount of electricity?
(Interviewee D2 -interviewed on 15 September 2009)

These opponents of nuclear waste held that nuclear power should come to an end in Taiwan, claiming that Taiwan did not need a great amount of electricity, and so should not build new reactors and should decommission the existing nuclear power plants. And they wanted the existing nuclear waste stored within nuclear facilities such as nuclear power stations. For example Interviewee D25 said:

Storing radioactive waste in the nuclear waste plants can save the transportation cost. When the nuclear power plants are decommissioned, then the sites can be use as repositories. (Interviewee D25 - interviewed on 7 October 2009).

Similarly, Interviewee D3 held that

All the nuclear waste should stay in the nuclear power stations until the nuclear power stations are decommissioned then turn them into repositories. (Interviewee D3 - interviewed on 15 September 2009).

The same message was conveyed by Interviewee D1:

I think we should stop building the fourth Nuclear Power Station and to use the site as a repository for nuclear waste. Also, we should start to decommission the existing

nuclear power station, and leave all the nuclear waste on sites since those locations have already been contaminated...(Interviewee D1 - interviewed on 11 September 2009.)

The second theme of distributive environmental justice in the interviews was the nature of the effects of nuclear waste on human health. The opponents of nuclear waste explained the burdens associated with nuclear waste, claiming that nuclear waste would affect their ways of living by contaminating their crops and fisheries, and causing long-term health problems. For example, Interviewee D20:

How safe can this nuclear waste be?If it discharges to the sea or into the soil, our crops, our fishing, and our lives will be endangered... (Interviewee D20 - interviewed on 1 October 2009.)

Also, Interviewee D1 argued that :

Nuclear waste has a very long term effect to human health. It can cause genetic problems... (Interviewee D1 -interviewed on 11 September 2009)

Similarly, Interviewee D18 said that

Once if it (nuclear waste) discharges into the sea or the air, the damage to our health is not only many years but hundreds or thousands of years. If the nuclear substance discharged into the sea, the radioactivity would affect all Taiwan.... (Interviewee D18 -interviewed on 1 October 2009.)

The third theme of distributive environmental justice in the interviews was the adequacy

of safety procedures to prevent leakage of nuclear waste. Despite the fact that the government and Taipower often reassured them by claiming that nuclear waste would be safely packed, stored, and monitored, local people doubted Taipower's capacity for safeguarding the nuclear materials. Lack of trust between local people and Taipower has always existed. For example, Interviewee D19 said:

The nuclear waste in Lan Yu [Orchid Island] already had a leaking problem. I don't believe Taipower can safely manage the nuclear waste. (Interviewee D19- interviewed on 1 October 2009.)

Likewise, Interviewee 24 said:

I am not very confident of Taipower's technology credibility...Do not forget that in Lan Yu [Orchid Island] there are thousands of barrels of nuclear waste rusty and leaking too. I doubt about how they can manage nuclear waste better this time. (Interviewee D24 - interviewed on 6 October 2009.)

Interviewee D1 was also critical of Taipower's safety record:

Taipower always claimed it (nuclear waste) is very safe since we have had nuclear power plants in Taiwan. But Taipower's safety record is really poor. Each year, some accidents happened causing radiation exposure and discharging to outside of nuclear power plants. Also, the barrels of nuclear waste in Lan Yu [Orchid Island] are rusty and leaking. How can Taipower manage nuclear waste safely? I'm doubtful. (Interviewee D1 - interviewed on 11 September 2009.)

The fourth theme of distributive environmental justice in the interviews is about

intergenerational justice. Opponents of nuclear waste storage emphasised the unfair burdens that would be placed on future generations. In particular, they focused on the future generations of their community who are their own descendants.

Once we accept nuclear waste, the danger would last for hundreds or thousands of years. Not only would the present generation suffer but the future generations and generations after that. I cannot agree to host nuclear waste on behalf of our future generations. (Interviewee D19 -interviewed on 1 October 2009.)

Similarly, Interviewee D20 argued:

The present generation which makes the decision to accept nuclear waste will all pass away one day but it is our future generations who would be suffering the health risk (from nuclear waste). Radioactivity could last for hundreds or even thousands of years, we would suffer generations after generations and never recover again. (Interviewee D20 - interviewed on 1 October 2009)

Opponents from the aboriginal tribe in Da-Ren identified a range of damaging future effects on land and traditions of their community, and argued that the tribe would be 'ruined' by accepting nuclear waste. For instance, Interviewee D12 said:

We have to protect our land for us and for future generations. It is the land our people have been living in, farming, and fishing for generations. It is our responsibilities to keep our traditions and keep our land for future generations. Nuclear waste would ruin our land and ruin our traditions. Refusing to accept nuclear waste coming to Da-Ren is not only for us but also for our future generations. (Interviewee D12- interviewed on 24 September 2009.)

Similarly, Interviewee D17 argued:

We cannot allow nuclear waste dumping in our land. It is our native land; our family has been living here for generations. If we decided to host nuclear waste, not only us but also our future generations would suffer. The government would tell our descendants that it was your ancestors who decided to host nuclear waste in here. Our descendants in future generations would hate us because our decision today ruins their home. We cannot decide for our future generations. We have to protect our native land for our future generations. (Interviewee D17- interviewed on 30 September 2009.)

One interviewee suggested that agreeing to host nuclear waste would be ‘selling our land and our soul’. Future generations of the community would rightly be mocked for the actions of their ancestors who sold them out. This emphasises the importance of the idea of a transgenerational community for many of the opponents. For example, Interviewee D14 argued:

If we accept nuclear waste, it is not only us but also our descendants who will suffer. People will laugh at our descendants that it was your ancestors agreed to host the nuclear waste. We have to preserve this land for our future generations. Our fight against nuclear waste is not only for us but also for our future generation. We can’t sell our land and our soul. Nuclear waste will ruin our tribe. (Interviewee D14- interviewed on 25 September 2009.)

These interviewees linked the issue of hosting nuclear waste to the survival of local tribes, local traditions, and local culture. If nuclear waste was stored in their communities, their culture, tradition, and racial identity could all disappear.

7.3 Procedural environmental injustice

The opponents of nuclear waste thus emphasised the distributive environmental injustice of locating nuclear waste in their community. But they talked more about the procedural environmental injustice or unfairness that they saw in decision-making about nuclear waste. In this section, there are five themes of procedural environmental justice that emerged from the interviews: (1) lack of information from Taipower/government; (2) absence of opportunity to discuss issues with Taipower/government; (3) exclusion from the decision-making process; (4) asymmetry of power between the people and Taipower/government; and (5) corrupt dealings between Taipower and local politicians.

Three of these five themes were touched on by Interviewee D12 :

They [Taipower] never really told us anything about this nuclear waste thing ... They never give us opportunity to discuss this issue. Our voice is never been heard. We don't have any power to go against them. (Interviewee D12 – interviewed on 24 September 2009.)

On the first theme, many interviewees reported that geological investigations began before the public were informed, and that they viewed this level of secrecy and lack of information and transparency as characteristic behaviour of the government and Taipower. Moreover, they felt that these characteristics had persisted ever since the Lan Yu (Orchid Island) case over 30 years ago. For instance, Interviewee D19 said:

Taipower or government never told us they are doing some work at our places. We discovered this by ourselves. They always do this kind of thing secretly. (Interviewee D19 - interviewed on 1 October 2009.)

Similarly, Interviewee D1 argued:

Taipower never inform local people that they would conduct any investigations in their village. Local people discovered.....that they were the sub-contractor from Taipower and doing some work for Taipower to see whether it is suitable for hosting nuclear waste. (Interviewee D1 - interviewed on 11 September 2009.)

Opponents of the nuclear waste repository felt that Taipower was untrustworthy, never told the truth, and did whatever they wanted:

Taipower never told local people what they are doing. They just asked their subcontractor company to do the investigation work. And local people found out by asking the workers; those workers told them they were investigating the suitability for nuclear waste repository. Taipower just do what they want and never tell local people the truth. (Interviewee D6 -interviewed on 17 September.)

The lack of transparency in the initial stages of investigation of the suitability of the Da-Ren site had potentially serious consequences, according to a local geologist who claimed that the suitability of the site was not investigated properly by Taipower's survey work:

From mine and other scholar's report, we believe this area is very unstable and has lots of earthquakes each year.....this area would never be chosen as a site for a nuclear repository because of the earthquakes. Also, the active geological movement would cause the leak of nuclear waste into the sea and soil.....I suspected that Taipower's survey had already presumed that Da-Ren is the site before they published their report! (Interviewee D11- interviewed on 24

September 2009.)

Interviewees held that Taipower's communications policy was deliberately opaque to confuse the public and obfuscate the issue through the use of technical language. For example, Interviewee D4 reported that:

Taipower and government never mention the term 'Nuclear Waste'. Instead, they use the term 'Low Level Radioactive Waste'. They tried to use this very technical term to fool people. I've asked them what 'Low Level Radioactive Waste' is. They said they are some tools, clothes, and gloves which people use in the nuclear power stations. (Interviewee D4- interviewed on 16 September 2009.)

Similarly, Interviewee D18 said:

They changed the term 'nuclear waste' to 'Low Level Radioactive Waste'. I asked them what LLW is, they told me they are the clothes and gloves from people work in the nuclear power plants. But I don't think it is as simple as that. Even if it is low level radioactive waste, the radiation could still exist for hundreds of years causing health risks to the human body. LLW is just a misleading term in order to minimise people's worry because it is 'low' level. (Interviewee D18- interviewed on 1 October 2009.)

Interviewees also accused Taipower of misleading the people by producing misinformation about tourism. For example, Interviewee D23 said:

Taipower claimed that people would come to visit the nuclear waste repository. Some local people do believe Taipower's argument. But from the experience of Lan

Yu [Orchid Island], no one who goes to Lan Yu [Orchid Island] would like to visit the nuclear waste site. We want more people to come to visit us and bring the money in but once you host nuclear waste who will come to visit this place? It is wrong to promote tourism and also accept nuclear waste. (Interviewee D23 - interviewed on 6 October 2009.)

Similarly, Interviewee D20 argued:

Taipower told our villagers that like in Japan or Korea, the repository would generate more tourists to visit our place. But is that true? Would people come to visit a nuclear waste repository for fun? I doubt it very much. (Interviewee D20- interviewed on 1 October 2009.)

The second theme of procedural environmental injustice – lack of opportunity for the people to discuss the issues of nuclear waste storage with Taipower and the government - is illustrated by interviewees both in Penghu and Taitung, emphasising inadequate consultation in the siting process. For example, Interviewee W1 reported:

I don't think there is any consultation in the process and they just published their decision on their website. They never come to ask us any question. (Interviewee W1 - interviewed on 10 September 2009.)

Similarly, in Taitung, Interviewee D15 said:

I don't think there is any consultation. They never asked our opinion. And there's no discussion with Taipower. (Interviewee D15 - interviewed on 29 September 2009.)

Opponents of nuclear waste in Taitung and Penghu accused the government of merely publicising their decision to nominate two potential sites on their website. They felt that their opinions were not heard and there was no discussion with Taipower. Although interviewees did report some meetings with Taipower officials, they pointed out that they were merely one-sided presentations designed by Taipower to tell people how safe nuclear waste was and how a nuclear waste repository would benefit the local community. For example, interviewee D22 reported that:

.....the local village leader asked us to get together for a meeting... Taipower's officials were there. They gave a talk about the safety and cleanness of nuclear waste. They also advertised the benefits of accepting nuclear waste. (Interviewee D22- interviewed on 5 October 2009.)

Another interviewee, D16 said:

Taipower asked village leaders to get us together... the time we were there, Taipower officials started to talk about how clean and safe the nuclear waste is and that we will all get free health care, free school fees for kids, free utility bills and all the infrastructures in the town will be well-maintained by the government. They also showed us a film that a nuclear waste repository in Japan has generated lots of tourists to visit local villages and that their most famous agricultural product – apples - were not affected by the nuclear waste and are still very popular around the world. So Taipower said to us that the nuclear waste would not only benefit local people but bring tourism to the communities. (Interviewee D16 -interviewed on 29 September 2009.)

Interviewee D5 shared his similar experience of local meetings:

There were many time that we heard our village leader asking us to attend a village meeting. We went there and thought maybe there is something that our villagers have to discuss. But when we got there, Taipower's employees showed us a film about the safety and cleanness of nuclear waste in Japan and Korea. After the film, they asked us some quiz from the film and nuclear waste, if we answered the quiz correctly, we got some prize (such as a pack of rice or some cakes) for it. And after the meeting, all of us got a torch as a gift. (Interviewee D5- interviewed on 16 September 2009.)

So the interviewees saw the consultative exercises conducted by Taipower as strategic, manipulative and dishonest. Taipower's intention was not to provide clear information on which local people could make an informed decision, nor to engage in a meaningful consultation or dialogue with local people, but to present unconvincing reassurances about safety and tourism benefits. For example, Interviewee D15 reported that:

They don't give us opportunity to discuss this issue with them. Each time they come to us is just to say how clean and safe the nuclear waste it is and how it would bring benefit and money to local people and communities. (Interviewee D15- interviewed on 29 September 2009.)

Similarly, Interviewee D22 reported that:

They didn't give us opportunity to express our views thoroughly. They only told us how safe it is and gave us torches or rice as gifts for attending the meeting.....(Interviewee D22-interviewed on 5 October 2009).

According to interviewees, therefore, Taipower's attitude was only to talk about the

benefit of nuclear waste for local communities: they never talked about the dangers of nuclear waste. The information provided by Taipower was a one-sided story that ‘nuclear waste is safe and clean and good for local communities’.

The third theme of procedural environmental injustice – exclusion from the decision-making process – has two elements – one exemplified by the proposed referendum, and the other exemplified by the public hearing. On the proposed referendum, the central issue was who would be included and who excluded from taking part in it. Many interviewees raised the issue of scale with regard to the boundaries for the proposed referendum. For example, Interviewee D1 said:

It is not fair that the referendum should be held within the [Taitung] County because the site in Da-Ren is located on the border between Taitung County and Pingtung County. The government should draw up an area which would be potentially affected by hosting the nuclear waste. And people in this area could have a referendum. (Interviewee D1-interviewed on 11 September 2009.)

Similarly, Interviewee D13 said:

The fact is that Da-Ren is just beside Mu-Dan which is in Pingtung County. It is not fair that those who live about 60km from Da-Ren but in Taitung County have the right to vote, but people who live in Mu-Dan, a town just nearby have no right to vote because Mu-Dan is in a different county. (Interviewee D13 - interviewed on 25 September 2009.)

Similarly, in Penghu, Interviewee W2 said:

Dungji is about 20 nautical miles from Tainan City(台南市) and 26 nautical miles from Penghu Main Island. I think the government should draw up an area and people in this area would have a referendum on this issue because if Dungji hosts nuclear waste, these places would be affected too. (Interviewee W2 - interviewed on 15 September 2009)

Another issue about the referendum that was raised by interviewees was anxiety that Taipower would bribe electors to vote in favour of nuclear waste storage. For example, Interviewee D1 said:

In any election in Taiwan, if candidates give people any gift worth more than NTD\$ 30 (approx. £0. 60), this candidate would be charged with bribery. But there is no such a law to regulate referendums like this. People told us that Taipower gave local people rice and torches in order to ask them to vote for accepting nuclear waste. It is bribery. Taipower is playing in this grey area of law and we will try to sue Taipower when the referendum is about to take place.....(Interviewee D1 - interviewed on 11 September 2009)

More general anxieties about lack of fairness in the referendum were expressed by Interviewee D22:

Is this referendum fair? Taipower only tell us how good follows from accepting nuclear waste and using anything they could to bribe local people. When there is no consultation, and people do not have a chance to express their views about this issue, is this referendum a fair one? (Interviewee D22 -interviewed 5 October 2009.)

One interviewee raised another issue about the exclusionist nature of the referendum,

questioning the idea of majority rule determining the outcome:

In our Paiwan culture, there is no such a thing as majority rule. Every issue related to our tribe would only be decided when all members of our tribe are agreed. So if Taipower would like us to accept nuclear waste in our land, they would have to have the permission from everyone in the whole Daren Town.--- (Interviewee D17 -interviewed on 30 September)

For the Paiwan tribe, decisions should be consensual not majoritarian – i.e. inclusive of everyone, not exclusive to the majority.

With regard to the second element of the third theme of exclusion from decision-making – the public hearing – the central issue here was about the meaningfulness and fairness of the one public hearing that took place. The public hearing was held in Taitung County Council on 17 April 2009, as a result of the demand by local people and environmental groups in the protest against nuclear waste repository after the government announcement on 17 March 2009. In this protest, local people and environmental groups handed a petition to Taitung County Council asking for a public hearing on the decision. The leader of Taitung County Council organised the public hearing, which Taipower officials, local people, environmental groups, Taitung County Councillors and the leader of Taitung County Council attended. However, during the public hearing, two members of the Taitung Branch of Taiwan Environmental Protection Group were arrested by the police, accused of disturbing the meeting, and taken to a remote place to prevent them expressing themselves at the public hearing, releasing them two hours later when the meeting had ended. The two people expressed their anger at being excluded from the public hearing. Interviewee D24 said

I was taken by the police when I was attending the public hearing which is held in the Taitung City Council. They (the police) accused me of disturbing the public hearing but I had not said a word. I just held up a banner which stated 'Anti-nuclear waste! That is bad for our good health'. The police took me into their car and took me to a very remote place then released me. (Interviewee D24-interviewed on 6 October 2009.)

Interviewee D3 said:

We were taken to by the police from the public hearing. They took us to a very remote police station and held us there for about two hours. They intended to not let us to speak in the public hearing. (Interviewee D3- interviewed on 15 September 2009.)

Opponents of nuclear waste thought that the public hearing was potentially a real chance to express themselves. But when the two members of the environmental group were taken away by the police, it raised questions in the minds of the opponents of nuclear waste about the meaningfulness and fairness of the public hearing. They were not convinced that Taipower genuinely wanted to communicate with them. Some interviewees pointed out that Taipower did not respond to their demands. For example, Interviewee D15 said:

the only chance [for discussion] was in April 2009, the public hearing held by Taitung County Council. We expressed our views but Taipower just responded by saying that they will take these suggestions back and think about it. (Interviewee D15 - interviewed on 29 September 2009.)

The fourth theme of procedural environmental injustice - asymmetry of power between the people and Taipower/government – was illustrated by the referendum; by Taipower’s general system of incentivisation (or bribes); and by its hegemonic pro-nuclear waste storage discourse. The Executive of Paiwan Anti-Nuclear Waste Union claimed that the referendum was unfair because there was not a level playing field between the pro- and anti- forces:

It is not a fair competition between government and our anti-nuclear waste group. They didn’t inform us in the beginning and there is no consultation. All they want us to do is to vote yes for the nuclear waste in the referendum. It is not a fair competition. (Interviewee D5-interviewed on 16 September 2009.)

Interviewees portrayed the referendum as a ‘David and Goliath’ struggle between two sides with very unequal power and resources: Taipower and the state on the one hand, versus local people on the other. For example, a minister from Paiwai Presby of the Presbyterian Church in Taiwan argued that:

When the government is using all its resources to ask you to accept this, it is really difficult to fight against it. We have no money, no resources, and no power. It is so difficult to compete with the government and Taipower. They do their best by using all their resources to try to persuade people in our communities to accept it but we will fight to the end. (Interviewee D21- interviewed on 2 October 2009.)

Similarly, Interviewee D5 said that:

We don’t have power and we don’t have money. It’s so difficult to organise this protest. We need money to organise protests - we need money to hire a coach taking

us to Taitung city. What we can do is only to visit our people to tell them about the danger of nuclear waste and the outcome of accepting nuclear waste. But compared to Taipower we have so little resources. (Interviewee D5 - interviewed on 16 September 2009)

This asymmetry in power between Taipower/government and people on the referendum was symptomatic of a more general asymmetry, illustrated by interviewees' claims that Taipower coerced poor people by routinely offering them economic inducements to accept nuclear waste in their areas. For example, a member of Taitung Branch of Taiwan Environmental Protection Union reported that Taipower offered to sponsor events in Taitung County in order to persuade people to support nuclear waste siting:

For any event in Taitung, you can ask for funding from Taipower. They will give you NTD\$ 20,000 (approx £400) but you have to let them hang the banner of 'LLW is Clean and Safe' and let them take a photo of this banner in this event. (Interviewee D8- interviewed on 22 September 2009.)

Interviewees explained that Taipower would pay for the expenses of the harvest festival⁴¹ for aboriginal tribes in Taitung, For example, Interviewee D17 said:

During the harvest festival season, Taipower representatives approached us to offer to pay the expenses. They said they can provide food, drink, and money for the event and the only demand from them is to let them hang the banner of 'LLW is Clean and Safe' and let them take a photo of this banner in this event. (Interviewee

⁴¹ Harvest festival is the most important event for Taiwan's aboriginal people - their New Year celebrations. Each tribe has a different time for their harvest festival according to where they live. The celebration includes traditional dance as well as food (mainly pork from whole pigs) and drinks. It can last for up to seven days.

D17 - interviewed 30 September 2009.)

Interviewees also told of Taipower offering trips to local people in order to make them accept nuclear waste. For example Interviewee D23:

Taipower offered local people a trip.... Some people did not know the trip was organised by Taipower in the first place. They only realised after they went to visit the nuclear power station and Taipower officials explained to them the benefit of accepting nuclear waste. On joining the trip, for insurance purposes they would ask people to sign their names, addresses, and ID number. Taipower then used these data to know where those who were against nuclear waste lived and go to visit them regularly. Also, Taipower has taken local township mayors and local representatives to Japan and Koran to visit nuclear waste repositories. (Interviewee D23- interviewed on 6 October 2009.)

This practice was confirmed by Interviewee D17:

Taipower had offered local people free trips... We did join the tour ...before coming home; they took us to the No.3 Nuclear Power Plant. At there, Taipower's employees told us how safe the nuclear waste is... briefing us about the benefits we would get from accepting nuclear waste. (Interviewee D17 - interviewed on 30 September 2009.)

The asymmetry of power between Taipower/government and the people was also illustrated by the hegemonic dominance of the discourse used by the former. For example, interviewees drew attention to the way that Taipower and the government used their superior intellectual and scientific resources to overwhelm the people who had less

educational advantage.

In the law, it stated 'Low Level Radioactive Waste', who knows what this is? The government and Taipower just use this term of LLW to mislead people.....because they thought 'Low Level' would decrease people's worries. Most of our local people are not very well-educated; they don't really know what LLW is. But they understand that nuclear waste is not a good thing from Lan Yu [Orchid Island]'s experience. (Interviewee D12 -interviewed on 25 September 2009.)

Some interviewees claimed that this terminology policy was adopted by Taipower and the government because they knew that local people had relatively low levels of education.

The fifth theme of procedural injustice raised by interviewees was the murky relationship between Taipower and local politicians. Indeed, several interviewees explicitly linked Taipower with corruption in local politics, suggesting that local politicians, representatives, and opinion leaders were bribed by Taipower. For example, Interviewee D1 said:

Taipower asked the local politicians to negotiate with local people. The current Da-Ren Township Mayor, Mr. Chang was elected because he discovered that some money from Taipower was transferred into the hands of the former Township mayor, Mr. Pao's wife, and people believed that Mr. Pao was bribed by Taipower⁴². Mr. Chang was elected in 2004 but now Mr Chang's son works for Taipower in Da-Ren as a negotiator. (Interviewee D1 - interviewed on 11 September 2009.)

⁴² Interestingly, Mr. Pao subsequently stood as a Township Mayor candidate in March 2010, attacking Mr. Chang's pro-nuclear waste position, and he was successfully re-elected.

Similarly, Interviewee D14 said:

Taipower started to persuade local politicians and local representatives, and opinion leaders. ... I suspect the local Township mayor has been bribed by Taipower. He supports the acceptance of nuclear waste in this township and his son works for Taipower in the village to negotiate with people who are against dumping nuclear waste in our town. (Interviewee D14 - interviewed on 25 September 2009)

This was recognition that local leaders were important opinion-shapers, making them obvious targets for Taipower. Several interviewees reported the changed position adopted by the township mayor, and raised questions about his motivations. For instance, Interviewee D25 said:

Taipower...knows we would listen to our local representatives, local village leaders, or Township mayor. They made these local politicians agree to host nuclear waste and asked them to persuade local people. ...Da-Ren Township Mayor's son works for Taipower to negotiate with local people. The Township Mayor was elected in 2004 because of his anti-nuclear waste position, but now he's on the same side as Taipower. (Interviewee D25 - interviewed on 7 October 2009.)

Also, Interviewee D18 claimed that politicians switched their positions on the nuclear waste issue after they got elected:

Politicians are only against nuclear waste when there is an election coming. Four years ago, the current township mayor signed an agreement with the Taitung Branch of Taiwan Environmental Protection Union that when he got elected he would be against nuclear waste. He got elected because the former Da-Ren Township Mayor,

Mr. Bao, was discovered to have corrupt dealings with Taipower, but since Mr. Chang got elected, he's become pro- nuclear waste and his son works for Taipower. (Interviewee D18 -interviewed on 1 October 2009.)

The perception of corrupt local politicians was more pronounced among interviewees from Taitung County than from Penghu County. For example, Interviewee D3 argued:

We feel very frustrated because in Penghu from the County mayor, Township mayor, and local village leaders all are strongly against dumping nuclear waste in their land, but in Taitung our local politicians are not against it but in favour of it. Our voice is relatively weak. But if some more high-profile politicians would stand up against nuclear waste, we will have a better chance to say no to nuclear waste. (Interviewee D3 - interviewed on 15 September 2009.)

We have observed that the local opponents of a nuclear waste repository raised many issues of distributive and procedural injustice. We have also discovered that many interviewees link these issues of 'nuclear waste justice' to broader, more general issues of economic, political and cultural injustice, which can be seen as underlying issues in Taiwan. In the next three sections, these more fundamental issues of economic, political, and cultural injustice touched on by the interviewees are discussed.

7.4. Economic Injustice

In chapter four we saw how Taiwan enjoyed prodigious levels of economic growth until 2000. However, the gap between richest and poorest 20 percent of the population widened to its peak (6.39 times) during 2001(see table 4.12). In 2009, this gap was still at its second highest level (6.34 times). This is evidence of economic injustice in Taiwan.

From the data in table 6.7, Wang-An was ranked 179 among 359 district/townships in Taiwan in terms of income, and Da-Ren ranked even lower, 341 among the, 359 district/townships in Taiwan, Da-Ren was one of the poorest townships in Taiwan, in which local people only earned one-third of the income of the richest township/district in Taiwan. Table 6.8 also shows that people in Taitung and Penghu earned only 60 to 70 percent of the average income of people in Taiwan. Da-Ren and Wang-An were clearly among those communities which are most economically disadvantaged in the country, which helps to explain their vulnerability for hosting nuclear waste in order to get compensation money.

Several interviewees point to the lack of resources held by the aboriginal community and, therefore, the relative weakness of their position. They emphasise the poverty of their local communities and the attractiveness of potential ‘compensation’ payments for storing nuclear waste. For example, Interviewee D2 said:

Because Taitung is the poorest county in the whole of Taiwan, so the government thinks it is easy for them just to use money to exchange Taitung people’s willingness for hosting nuclear waste. (Interviewee D2- interviewed on 15 September 2009.)

Similarly, Interviewee D14 said:

They think we are easy to buy out: just give us some money and we would accept nuclear waste. Some people are attracted by the money, and I don’t blame them but I worry about the situation if more and more people are attracted by those compensations. (Interviewee D14 - interviewed on 25 September 2009.)

Some interviewees acknowledged how seductive the promises of compensation were to

poor people:

Those free health care, free utility bill, free school fees, and all the compensation are really attractive. These do make lots of people in favour of nuclear waste because some of our aboriginal people are really poor. (Interviewee D 25 - interviewed on 7 October 2009)

However, other interviewees were sceptical about how much compensation would actually be given. For example, Interviewee D21 stated that:

Taipower told us after we accept the nuclear waste; we will get NT \$5 billions. It is very attractive. But in fact, do we know how this money will actually be given to us or not? It is an impractical dream for our local people. How much can we really get? We don't know. (Interviewee D21 - interviewed on 2 October 2009.)

Interviewee D10 questioned:

How do they distribute the money?⁴³: In the Act it is stated that there are NTD\$5 billion for the compensation but we don't know how this money will be used? How much of it will actually go into people's pocket? (Interviewee D10 -interviewed on

⁴³ Act on Sites for Establishment of Low Level Radioactive Waste Final Disposal Facility 2006, Taipei: Executive Yuan. Article 4

Act on Sites for Establishment of Low Level Radioactive Waste Final Disposal Facility: Article 12
In order to advance the work of selecting the site of disposal facility, the implementing authority may allocate outlay from the Nuclear Backend Management Fund as feedback subsidies.

The total amount of feedback subsidies referred to in the preceding paragraph shall be calculated at the present value of the time when the site of disposal facility is approved by the Executive Yuan, and must be no more than NT \$5 billions. The distribution of the feedback subsidies is as follows:

1. No less than 40% to the township (city) in which the site of disposal facility is located.
2. No less than 30% to all the townships (cities) nearby the site of disposal facility; in absence of such nearby township (city), 15% more to each of the township (city) and the county (city) in which the site of disposal facility is located.
3. No less than 20% to the county (city) in which the site of disposal facility is located.

The implementing authority shall lay down other regulations on the use of feedback subsidies.

23 September 2009.)

Likewise, Interviewee D5 said:

Taipower told us that when once we accept the nuclear waste, we will get the money, free health care, free utility bills and so on and on. It gave local people an impractical dream. (Interviewee D5 - interviewed on 16 September 2009.)

Another interviewee (D16) noted that the experience of Lan Yu (Orchid Island) was not encouraging:

See Lan Yu [Orchid Island], they have hosted nuclear waste for more than 20 years, yet they only got NTD \$60,000 (approx £1,200) ever since. (Interviewee D16 - interviewed on 29 September 2009.)

In these statements, there was a common feeling that Taipower and the government were seeking to exploit economic inequality, and in particular, the poverty of the local community. For some, this was a clear case of bribery which was grounded in a lack of respect. For example, Interviewee D16 said:

Because our aboriginal people are poor, the quality of living is lower. So they try to use money to bribe us to exchange for hosting nuclear waste. I am disgusted by this attitude from Taipower. They look down us and think we are easy to bribe. (Interviewee D16 - interviewed on 29 September 2009.)

Interviewee D25 warned that residents would be giving away much more than they would be compensated for:

The NT \$5 billions is really attractive. But have people really thought about it? Why do they want to give you this money? There's no free lunch. We exchange our land, our environment, and our health and also our future generation's health for this money. (Interviewee D25 - interviewed on 7 October 2009.)

Interviewee D14 expressed disgust at this exploitative strategy:

That compensation did make lots of people in favour of accepting nuclear waste. The government and Taipower used this strategy to buy us off. I am disgusted by this strategy from Taipower and the government. (Interviewee D14 - interviewed on 25 September 2009.)

To sum up this section, background economic inequality and poverty provides a context in which Taipower's offer to pay compensation in return for agreeing to host nuclear waste is seen as exploitative. It takes advantage of the economic weaknesses of people in the local community by offering them a deal that they would not accept if their circumstances were better.

7.5 Political injustice

Political inequality also contributes to the vulnerability to hosting nuclear waste of local communities in Da-Ren and Wang-An. The experience of Orchid Island (Lan Yu) was clear evidence that the decision making on the issue of nuclear waste excluded the members of local communities: there was no genuine public participation at all. Taipower provided insufficient information to local people and used very technological terms in the hearings or meetings which would mislead local communities. According to interviewees, instead of giving local people an opportunity to express their ideas about

nuclear waste, Taipower tried to corrupt local politicians in exchange for their acceptance of nuclear waste repository.

The interviewees' concerns about procedural injustice reflected more general concerns about political injustice. In other words, the procedural injustice they experienced in the nuclear waste dispute was symptomatic of a wider form of political inequality they had always suffered in the country. Many interviewees believed that their voice was not heard in the politics of Taiwan. For example, Interviewee D15 complained that:

Our aboriginal people....Our voice is relatively weak and has never been really heard by the government. .. (Interviewee D15 - interviewed on 25 September)

Similarly, Interviewee D5 remarked that:

This is the sorrow for our aboriginal people. We are always the last to be considered. Our voice is always neglected. We voted for our government but they never really do anything good for our aboriginal people. (Interviewee D5 - interviewed on 16 September 2009.)

Some opponents of nuclear waste perceived a lack of freedom of speech and media in Taitung, claiming that Taipower exerted undue influence on local TV and radio stations through financing programmes in order to promote nuclear waste and to minimise the voice of opposition. For example, Interviewee D6 talked about his appearance on a radio programme:

I was once invited to a radio programme to talk about nuclear waste. There were three people...in the programme, one Taipower official, one medical doctor and me.

I was always the last one to talk before the commercial break, and at the end of the show the Taipower official even gave us money. This programme that I thought was neutral, was actually organised and financed by Taipower. (Interviewee D6 - interviewed on 17 September 2009.)

Interviewee D1 spoke of his similar experience on a TV programme:

Once I was interviewed by a local TV station during a protest against nuclear waste. But when I watched the news report, I saw that the images and voices of all the Taipower officials and government officials were broadcasted, but for my part...what I said in the interview was cut off....Interviewee D1 Chairman of Taitung Branch, Taiwan Environmental Protection Union- interviewed on 11 September 2009.)

The two protesters who were ejected from the public hearing on 17 April 2009 accused the government of violating their basic human rights of freedom of expression and speech. The hosting of nuclear waste in Taitung was very much in the hands of Taipower and the government, and they had the money and resources to minimise the voice of opposition. But when the police also acted to help curb the freedom of speech and expression of the opponents of nuclear waste in Taitung, this showed how powerless local people were in Taiwan.

Some opponents of nuclear waste storage accused the government of a breach of the Indigenous Peoples Basic Law⁴⁴⁵ by choosing Da-Ren as a potential site. For example,

⁴⁴ The Indigenous Peoples Basic Law 2005, Taipei: Executive Yuan. The Indigenous Peoples Basic Law approved by the Legislative Yuan and promulgated in February 2005 which was influenced by the U.N. declaration. It could be recognised as a landmark document that declared that indigenous peoples "have the right to self-determination" and "by virtue of that right they freely determine their political status and freely pursue their economic, social and cultural development."

Interviewee D16 claimed that:

Building a nuclear waste repository in Da-Ren has broken the 'Indigenous Peoples Basic Law'. They didn't have the consent from us. The Law is established by the government and now the government can do whatever they want. We are very disappointed and feel we are being neglected. (Interviewee D16 - interviewed on 29 September 2009.)

Likewise, Interviewee D20 said that:

The government breaks the law by choosing us as a potential site. We feel we are being cheated. The law is what they established so they can't do whatever they want. But we don't trust the government anymore. (Interviewee D20- interviewed on 1 October 2009.)

7.6 Cultural injustice

Behind much of the animus felt by indigenous residents against the economic and political injustice of siting a nuclear waste repository in their areas was a sense of cultural injustice. For example, the reaction of some interviewees to Taipower's promise of compensation was regarded as a cultural slap in the face. As one interviewee argued,

http://www.etaiwannews.com/etn/news_content.php?id=1284019&lang=eng_news, 17 June 2010.

⁴⁵ The Indigenous Peoples Basic Law 2005, Taipei: Executive Yuan. Available at:

http://www.apc.gov.tw/main/docDetail/detail_official.jsp?isSearch=&docid=PA000000001795&linkSelf=231&linkRoot=231&linkParent=231&url=, 17 June 2010.

Article 31

The government may not store toxic materials in indigenous peoples' regions contrary to the will of indigenous peoples.

Article 32

the government may not forcefully evict indigenous persons from their land, except in the case of imminent and obvious danger.

the idea of an exchange of money for hosting nuclear waste reflected a lack of cultural understanding and respect:

A Taipower official once said to me: “why don’t you just sell your land to us? We give you a good price then you can move out”. They don’t understand us. They don’t understand our aboriginal people always have a very strong connection with the land we live. They don’t respect and don’t understand our culture. They look down on us. Because we are poorer than other part of the country so they think it is easy to use money or compensation to buy us out....After all, we all would like to live in or near our native land. (Interviewee D25- interviewed 7 October 2009.)

The Paiwan people in Da-Ren felt that Taipower and the government were ignorant of the relationship between their land and their culture. Taipower and government took the view that because they could give residents compensation, the residents could move away from the nuclear waste if they thought nuclear waste was dangerous. But such a view overlooks differences between different cultures: the Paiwan people saw nuclear waste as an issue about ethnic survival - about their well-being and the well-being of future generations on the land which they have been farming, fishing, and living for centuries.

The Paiwan interviewees constantly emphasised the importance of their culture: they clearly understood themselves in terms of their tribal identity, i.e., primarily as indigenous Paiwan people rather than as Taiwanese. This tribal identity informs their values and how they believe that others see them and why others discriminate against them. Many of them felt hurt by Taipower’s and the government’s lack of respect for, and understanding of, their culture during the siting process. They were particularly sensitive to ignorance of their primal relationship with their land, as Interviewee D25

noted:

A Taipower official once said to me: “why don’t you just sell your land to us? We give you a good price then you can move out”. They don’t understand us. They don’t understand that we aboriginal people always have a very strong connection with the land where we live. They don’t respect and don’t understand our culture. (interviewee D25 - interviewed on 7 October 2009.)

Similarly, Interviewee D15 pointed out that:

When our lands are all contaminated by the nuclear waste, we can only move to other places. But we aboriginals have a very strong relationship with our land. Our culture, our living is very much related to our land. Taipower don’t understand our culture they just want us to accept the nuclear waste.....(Interviewee D15- interviewed 29 September 2009).

Interviewee D25 explained that:

The site in Da-Ren is actually situated in the middle of an ancient trackway called Alanyi. This ancient trackway was the causeway which our ancestors communicate with the outside world. It has a very significant cultural, historical, and biological value. Once we accept the nuclear waste, the government would build a road on it in order to transport the radioactive waste, which will totally destroy our culture and history. (Interviewee D25 - interviewed on 7 October 2009.)

Interviewee D13 affirmed that:

We Paiwan people have been fishing and farming in this land for generations. This is not our land but our ancestors' land. This is the land that feeds us Paiwan people. Nuclear waste is an evil thing as the Lan Yu [Orchid Island] people have described. (Interviewee D13 - interviewed on 25 September 2009)

For some interviewees, the very survival of the culture and the people was at stake if nuclear waste came to their land. For example, Interviewee D21 said:

If we accept these nuclear waste, all our people would suffer from the health risk of radioactivity. Not only that, our farm, our fish would all be contaminated. It is an issue of our survival. The government name us as a potential site... just like to kill us and try to demolish the whole race. (Interviewee D21 - interviewed on 2 October 2009.)

Similarly, Interviewee D17 argued:

If we accept nuclear waste, our culture will be gone; our tribe will not exist anymore. It is damage to our culture. Why they always choose the aboriginal land? ... They don't respect us, and our culture. (Interviewee D17 - interviewed on 30 September 2009.)

For one interviewee, agreeing to host nuclear waste would be 'selling our land and our soul'. Future generations of the community would rightly be mocked for the actions of their ancestors who sold them out. This claim reflects the importance of the idea in the minds of tribal respondents of a transgenerational cultural community.

If we accept nuclear waste, it is not only us but also our descendents who will suffer.

People will laugh at our descendents that it was your ancestors who agreed to host the nuclear waste. We have to preserve this land for our future generations. We are fighting against nuclear waste not only for us but also for our future generations. We can't sell our land and our soul. Nuclear waste will ruin our tribe. (Interviewee D14 - interviewed on 25 September 2009.)

Many of the interviewees were particularly critical of the government's failure to take seriously the requirements of the 'Indigenous Peoples Basic Law' which forbids the siting of toxic wastes on tribal land. For example, Interviewee D19 pointed out that:

'The Indigenous Peoples Basic Law' said that 'The government may not store toxic materials in indigenous peoples' regions contrary to the will of indigenous peoples'. But now if they dump nuclear waste in our place, it is against our will and violates the law. But this is what our government do. They established the law and they can break it. They do whatever they want according to their interest and don't bother looking at our interests. We feel betrayed. (Interviewee D19 - interviewed on 1 October 2009.)

Another interviewee (D22) asserted that the legal status of the Indigenous Peoples Basic Law was as inviolate as the constitution itself:

The 'Indigenous Peoples Basic Law' should be as superior as the constitution. The government asking us to host nuclear waste has already violated the Indigenous Peoples Basic Law. They don't take the Indigenous Peoples Basic Law seriously. We are very angry about it. (Interviewee D22 -interviewed on 5 October 2009.)

However, one interviewee – a specialist in Environmental Law – drew attention to

weaknesses in the 'Indigenous Peoples Basic Law'.

Actually this 'Indigenous Peoples Basic Law' is an ideal. There are lots of articles in it which are like basic principles. But the government have not established any regulations or bylaws to implement it. And also it is doubtful whether its legal status is superior to other laws such as 'Act on Sites for Establishment of Low Level Radioactive Waste Final Disposal Facility'..... The legal status of this Indigenous Peoples Basic Law, in my opinion, is not clear. (Interviewee N2 - interviewed on 22 September 2009.)

As we saw earlier, one interviewee also raised questions from a cultural standpoint about majoritarian decision-making. So, while most interviewees argue that Taipower and the government failed to show respect for the indigenous people by not securing genuine political equality for them, such as fair political competition, this interviewee argued against a majoritarian understanding of political justice and democratic decision-making and for a consensus-based or unanimity-based view of decision-making. Therefore, using a majoritarian decision-making process to decide the result of the proposed referendum was itself seen as a form of cultural injustice.

To sum up this section, much of the animus expressed by interviewees from Da-Ren against a nuclear waste storage repository in their community stems from their cultural identity as a tribe, giving them a very strong bond with their ancestral lands. The situation is, however, different in Wang-An, where the cultural norms are largely similar to the majority Chinese Han culture in Taiwan. In principle, this would suggest that Taipower and the government would have less difficulty in siting a nuclear waste repository in Wang-An than in Da-Ren. But in practice, the reverse was the case, because Penghu County designated the whole Wang-An Township a natural

conservation area in August 2009, thereby making it illegal for the government to site a repository there. Since siting the repository in Da-Ren Township would also be illegal (violating the law protecting indigenous communities), the government was forced back to the drawing board. This suggests that opposition groups are far from powerless after all.

7.7 Internal conflict in local communities

In addition to the wider forms of injustice generated by (and reflected in) the distributive and procedural environmental injustices of the government's nuclear waste policy, there was also internal conflict caused within local communities. As Interviewee D15 said:

The nuclear waste issue has caused a lot of conflicts within our communities. People don't trust each other and the relation between families is not as good as it used to be. Because we are all relatives, for example, I am against nuclear waste but our village leader who is my mother's cousin, he supports hosting nuclear waste. So one day last month he came to my house to blame me for not respecting the elderly. It made my parents very embarrassed, and I have no idea what I can do. It not only happened to me but also to many of my friends who are against nuclear waste in our town. (Interviewee D15 - interviewed on 29 September 2009.)

Similarly, Interviewee D22 stated that:

This nuclear waste has divided our community. People don't trust each other and doubt each other's position because they are in favour of nuclear waste or not. People accused others of being bribed by Taipower but on the other side, some

others accuse people of being against their chances to have a better life. We were a peaceful little village but now are divided by Taipower. (Interviewee D22 -interviewed on 5 October 2009)

Another interviewee (D20) said:

I am worrying about the situation. Our community has been separated because of this nuclear waste issue. God told us to love each other like brothers and sisters, and indeed we are brothers and sisters. But because of the different positions in accepting nuclear waste or not, people do not trust their families as they used to. We are a community in which everyone is more or less related to each other biologically or through marriage. I see some parents accusing their sons of not respecting the elderly in the family and the sons are struggling. It's a very, very difficult situation. (Interviewee D20 - interviewed on 1 October 2009.)

Interviewee D25 talked about her experience as a teacher of being threatened by parents who held a different view from hers on nuclear waste:

When we taught kids in school about nuclear waste, some parents came to see the headmaster of the school to ask him to stop teachers teaching this to kids. And parents even rang us to ask us not to teach their kids about nuclear waste. They asked us to be neutral on this issue and not stop their chance to have more money. (Interviewee D25 - interviewed on 7 October 2009)

So the issue about nuclear waste has not only created injustice for local people, but also created conflict and distrust within local communities.

7.8 Conclusion

The environmental justice framework provides a useful framework for interpreting the perspective of opponents to nuclear waste in the case studies. From data gathered from interviews, it is clear that opponents of nuclear waste feel unfairly treated in the decision-making process. They identified this unfairness in both the inequitable distribution of the benefits and burdens of nuclear energy and nuclear waste, and the procedural failures of decision-making, including the lack of information and consultation. That this sense of distributive and procedural environmental injustice was connected to deeper forms of economic, political, and cultural injustices, became evident from the interviews. Economic injustice was felt in interviewees' experience of Taipower and the government exploiting the poverty which made local people vulnerable to offers of compensation for hosting nuclear waste. Political injustice was felt in interviewees' experiences of exclusion from the nuclear waste decision-making process. Cultural injustice was felt in interviewees' experiences of ethnic discrimination against tribal minorities in nuclear waste siting policy. Moreover, these different forms of injustice were inter-connected, reinforcing each other, and reflected the way in which interviewees felt treated by Taiwan society as a whole. They perceived their position in Taiwan in general to be economically marginalised, politically excluded, and culturally patronised. So their unjust treatment over the nuclear waste issue was seen by them as part of a broader pattern of injustice in the country at large, and would be unlikely to end until the government tackled this wider problem. Until and unless this background pattern of injustice was dismantled, it would continue to fuel and legitimise the unjust treatment of local communities on nuclear waste policy.

Chapter 8. Conclusion

8.1 Introduction

In this concluding chapter, there are three sections: (1) summary of the thesis's findings; (2) future research directions; and (3) recommendations for policy makers

8.2 Summary of the thesis's findings

This thesis is a study of the opposition to nuclear waste storage in several sites in Taiwan. Its most important finding is that this opposition is based on principle, not nimbyism ('not in my backyard'ism). Nimbyism is the selfish response of a community which demands special treatment for itself that it would deny to other communities. But the opposition to nuclear waste storage in the sites studied in Taiwan was not based on selfishness: none of the interviewees wanted the waste to be sent *anywhere else*, but ideally stopped from being produced altogether, or failing that, hosted by areas that benefitted most from nuclear energy. In other words, the opposition was principled, not opportunist. It was based on two principles of environmental justice: distributive environmental justice and procedural environmental justice. For example, on the principle of distributive environmental justice, opposition to the siting of a nuclear waste repository in communities such as Lan Yu (Orchid Island), Wuciou, Da-Wu, Da-Ren and Wang-An exposed the unfair treatment meted out to residents by Taipower and the Taiwan government in distributing the harm of a repository (e.g. the risk of radio-active contamination; the loss of tourist revenue) disproportionately to disadvantaged areas, whilst distributing the benefits of nuclear energy (e.g. cheap and reliable electricity supply) disproportionately to advantaged areas (who consume more power). Similarly, on the principle of procedural justice, opposition to the siting policy

exposed the transgressions of Taipower and the government in failing to ensure that proper consultation processes were put in place or that stakeholder participation in decision-making occurred.

The second most important finding of the thesis is that behind these breaches of the principles of distributive and procedural environmental justice over the nuclear waste storage siting issue – and what made those breaches possible – lay a systemic structure of economic, political, and cultural injustice. This structure is evident in the way that disadvantaged groups were denied economic opportunities, excluded from political decision-making, and culturally discriminated against. Until an attempt is made by the Taiwan government to address these wider injustices, it is unlikely that the environmental injustices suffered by the local communities in the nuclear waste issue will be removed. Evidence supporting the claim of systemic injustice comes from another nuclear environmental issue – the building of nuclear energy power plants.

From discussion, it also provided a picture about how environ meal politics works in Taiwan in local and national level. The documentary Gongliao, ‘How are you?’ (貢寮你好嗎) revealed that the same attitudes displayed by Taipower and the government on the nuclear waste issue were shown on the issues surrounding the building of the fourth nuclear power plant in Gongliao, a small seaside village in New Taipei County. The documentary started with the called the "1003 incident which occurred on 3 October 1991 when members of local communities protested against the AEC outside the site of the fourth nuclear power station. Local communities held the protest because the AEC passed the environmental impact assessment (EIA) without the consent of local people, and because at the final meeting of EIA, those EIA members who opposed the building of the nuclear power station at Gongliao were excluded from attendance. In the protest, a policeman was killed and Mr.Shun-yuan Lin (林順源), who was 26 and joined the

demonstration by chance, was sentenced to life in prison. The documentary shows how anti-nuclear activists remembered Lin's suffering and sent their regards to him in jail, and interviews of local anti-nuclear activists described the local anti-nuclear campaign and local people's struggle against suppression from the government and betrayal by politicians. In 1993, a local referendum showed that 96 per cent of local people opposed building a nuclear power plant at Gongliao but the KMT government still decided to go ahead. In 1999, the government banned fishing activities at Gongliao, again without the consent of local people. The members of local communities asked Taipower to investigate the site together, and although Taipower agreed, it failed to provide a map of the site and delayed the process. Local people felt that the whole process of fighting against the nuclear power plant was a David and Goliath struggle. Evidence from this documentary on nuclear power plan siting thus shows that there are many similarities with the siting of nuclear waste repositories, in that in both cases, Taipower and government see nuclear issues as state secrets; do not provide accurate information to local people; duplicitly ignored local people's opinion; and marginalised the local communities.

So injustice seems systemic throughout the nuclear industry in Taiwan. But is it systemic in other policy areas? One policy area where it is claimed that public participation and consultation works better than in the nuclear industry is health insurance, where reforms took place during the 1980s. However, this reform process was pretty much a top-down approach, and the little public participation/consultation that did occur was probably because health insurance reform was not as controversial as nuclear waste and plant siting, since it aimed to redistribute medical resources and to make society more equal, whereas nuclear waste and plant siting threatened to create a more unequal distribution of risks.

The third finding is that there are few signs that the Taiwanese government and Taipower have responded to the above demands for environmental justice. It is true that national legislation has been passed to provide a legal basis for the siting of nuclear waste repositories which includes mandatory referendums on potential site selection, and that this should contribute to the democratisation on the policy making in the nuclear environmental field in Taiwan. It is also true that the change of ruling parties in Taiwan in 2000 and 2008 seemed to promise greater sensitivity to these issues. Furthermore, it is true that Taipower has realised that keeping the whole process of siting nuclear waste repository secret is impossible because Taiwan has become a more democratic and open society. Accordingly, Taipower now hires local people as negotiators, which it hopes will facilitate public acceptance of its plans. However, Taipower still does not completely share information about nuclear waste with local communities and still tries to buy off local communities with support for local events, trips, and other material benefits, especially for local opinion leaders, and local people claim that this strategy continues to divide the local communities. This suggests that the legacy of authoritarian rule in Taiwan is still heavily existent in Taipower's company culture. Moreover, political corruption is still rife in Taiwan, especially at the local level, and this could affect future referendums in local communities on siting plans for nuclear waste. This situation is more clearly evident in Da-Ren, where in Paiwan culture chiefs are respected by their people, have higher social status, and are very influential in issues affecting land use. Generally, people who campaign for township mayoral elections are from the chief's clans, so when the township mayors are corrupted by the government or Taipower, they promote acceptance of nuclear waste repositories and strongly influence the result of local referendums.

The fourth finding is the crucial role played by environmental non-governmental organisations (ENGOS) in this dispute. A distinction must be drawn between

Taipei-based ENGOs and local anti-nuclear waste groups. Taipei-based ENGOs have generally been established by intellectuals who are concerned about a range of environmental issues, including nuclear waste, and they usually have more resources which can enable them to conduct surveys and provide education on environmental issues for members of the public. By contrast, local anti-nuclear waste groups are formed by members of local communities who have personally suffered (or potentially would suffer) from the unequal distribution of risk from dumping nuclear waste, and they often have very limited resources which makes it very difficult to compete with the government and Taipower. The support given by Taipei-based ENGOs to local anti-nuclear waste groups was invaluable in educating local communities about nuclear waste, providing information to the public, and developing campaign strategies for the local groups. For example, it was the Taiwan Environmental Protection Union (TEPU) that first discovered the existence of nuclear waste dumping at Lan Yu, and used this finding to educate the Lan Yu people about nuclear waste.

The fifth finding is that Taiwan can learn many lessons from other countries in how to deal with its nuclear waste siting problem. In particular, it can learn from Sweden, the USA and Canada. From Sweden, Taiwan can learn how to engage the public in siting decision-making. Sweden seems to be the country most successful at finding a solution for a final storage of nuclear waste, because it focused on social not technical factors. Most countries started the siting process by looking for the most suitable area for host nuclear waste solely by geological criteria. Instead, the Swedish Nuclear Fuel and Waste Management Company (SKB) who is responsible for the site selection believes that because safety engineer barriers can prevent the leaking of nuclear waste, virtually every area in Sweden could host nuclear waste, so the crucial factor is public acceptance. Accordingly, SKB sought a voluntary scheme whereby it came face to face with local communities in framing the issues relevant to nuclear waste repository by extensive

public consultation. SKB holds the position that they are partners with local communities, sharing the same common goal. This is lesson that the Taiwan government and Taipower must learn - that public acceptance is the key issue of siting nuclear waste repository, and that transparency and public consultation are vital factors for success.

From the USA and Canada, Taiwan can learn how to avoid cultural injustice – i.e. injustice to minority groups. Before the 1980s, in the U.S.A. and Canada, many nuclear waste dump sited were located in Native lands, but after the 1980s, together with the civil right movement, Native Americans started to campaign for moving nuclear waste from their lands and claimed for compensation. Although, because nuclear waste is a very sensitive issue and finding new repositories is far from easy, much of the nuclear waste stayed on native land, since the 1990s, the U.S government and Canadian government have been very concerned about the issue of native land, recognising how important that land is to native cultures, and they are very careful to consult with local communities' especially local indigenous people. This is a lesson which the Taiwan government and Taipower are only slowly beginning to learn.

Each chapter has played a role in contributing to these findings. Chapter One shows how controversial the issue of nuclear waste storage siting is, and how other countries have struggled to find ways of dealing with it, experiencing varying degrees of success. A brief literature review chronicled studies which have investigated opposition campaigns against siting decisions, drawing on the theoretical framework of environmental justice. Chapter Two explains the technical characteristics of nuclear waste disposal, and describes the measures taken by six leading nuclear energy countries to manage the risks. Chapter Three presents the theory of environmental justice in detail, as the fundamental perspective running through the thesis. The origin

and evolution of the concept is explained, and its two main constituent components are analysed – distributive and procedural environmental justice – as well as the three conceptions of justice that lie behind it – economic, political, and cultural. Chapter Four describes the case study of Taiwan in detail, including its geography, demography, political history, political economy, foreign policy, and civil society. Chapter Five traces at length the history of the problem of nuclear waste disposal in Taiwan, showing the regulatory structure established for managing it and the complex (and usually abortive) attempts to find a permanent repository site. Most of the focus is on five domestic sites – Orchid Island (Lan Yu) (where a temporary site is still in use 29 years after its inception), Wuciou, Da-Wu, Da-Ren, and Wang-An – and four foreign locations – China, North Korea, Marshall Islands, and Russia. Chapter Six presents a detailed analysis of the empirical data from the fieldwork conducted in 2009 on the opposition to nuclear waste storage siting in the two most recently proposed areas – Da-Ren and Wang-An – comparing the geographical, demographic, economic, cultural, and political characteristics of the two communities. Finally, Chapter Seven provides a thematic analysis of these data, using the theoretical framework of environmental justice. The chapter is divided into five sections – distributive environmental justice; procedural environmental justice; and the three deeper forms of justice which lie behind them – economic justice; political justice; and cultural justice.

8.3. Future research directions

Three future directions for research in this area suggest themselves. First, an investigation could be undertaken into the deeper levels of economic, political, and cultural injustice that lie behind the environmental injustices demonstrated here in Taiwan's nuclear waste siting policy. Second, future research could conduct a more comprehensive analysis of other countries' experiences in nuclear waste siting policy in

order to produce a checklist of best practice guidelines. Third, to obtain a better balance of perspectives, interviews could be carried out with those people who were in favour of nuclear waste siting in their areas.

8.4. Recommendations for policymakers

Eight recommendations for policy-makers in Taiwan arise from these findings, the first three relating to distributive justice (and economic justice); the next four relating to procedural justice (and political justice); and the last relating to cultural justice. First, given the extreme difficulty experienced by the Taiwan government (and other governments) to find areas where residents are willing to host permanent storage facilities for radioactive waste, policy-makers are advised to reconsider the future of nuclear energy in Taiwan and seek for other alternatives such as renewable energy. This would not only decrease the scale of the problem of nuclear waste (by reducing the amount of new nuclear waste), but also defuse the tension between opponents and proponents of nuclear energy in Taiwan. In the 2012 presidential election electoral debates, the candidate from DPP argued for the end of nuclear energy by 2025 and the KMT candidate stated that he would reconsider the use of nuclear energy. However, since the KMT candidate was re-elected, the issue of nuclear energy seems not an immediate priority. Second, policy makers in Taiwan must minimise the unfairness of the impact of existing nuclear waste on the host communities. Although it is impossible to distribute nuclear waste equally, it is possible to reduce its risk of leakage by tightening up safety standards. Also, it is possible to devise a means of compensation that is not manipulative or demeaning but meets standard criteria of equity. Third, policy makers in Taiwan must deal with the inter-generational implications of the nuclear waste storage issue. They must understand that nuclear waste facilities are irreversible, and that once the nuclear waste repository begins operation, the risk of

impact will last hundreds and thousands of years, affecting not only the present generation but countless future generations. This means that policy makers must ensure not only that safety standards are robust enough to protect residents for the indefinite future, but that compensation should be set aside in a special fund to provide for an endless number of future generations.

Fourth, as opponents of nuclear waste claimed that there was no genuine public participation in the siting process, policy makers of nuclear waste in Taiwan must recognise that public participation is a key element for successfully siting nuclear waste facilities. Public participation can be in various forms such as consultation exercises, public hearings, and stakeholder meetings. In the siting process, local people from the potentially affected areas must be consulted at every stage of the decision-making process, and they should have the right to express their feeling towards nuclear waste facilities. Moreover, policy makers should not only listen to the voices of local communities towards nuclear waste facilities but also take their opinions into consideration in the decision-making process. Also, the government should help members of local communities to take up the opportunity of participation in the decision-making process.

Fifth, the decision makers must provide clear and sufficient information about nuclear waste to people who are concerned about nuclear waste, especially people in communities hosting nuclear waste or potentially hosting nuclear waste in the future. Information provided to people about nuclear waste should not be opaque propaganda to promote the hosting of nuclear waste, but accurate, up-to-date, intelligible, comprehensive, and freely available factual information on the health risks of nuclear waste and other issues concerned with nuclear waste facilities. Sixth, policy makers must explain clearly and sincerely to local communities considering hosting nuclear

waste precisely how the compensation will be distributed to them, and what other benefits they will receive from hosting nuclear waste. This is essential to enable local people to make the right decision for themselves.

Seventh, the decision makers in Taiwan must not bribe local opinion leaders to get them to persuade other local people to accept nuclear waste. Decision about nuclear waste should be transparent and open, and any secrecy or bribing should be made illegal in the decision-making process of nuclear waste facilities. Finally, decision makers should be aware of the cultural distinctiveness of ethnic minorities, and all decisions regarding nuclear waste should respect local cultures. This is especially important in the case of siting nuclear waste facilities in the communities of ethnic minorities, because opponents of nuclear waste in such communities often linked the issue of accepting nuclear waste with the survival of their own culture and ethnic identity.

Appendix I. Interviewee Lists

A .Interviews List in 2003/2005

| Interviewee | affiliations | Interview Date | Gender | Age Group | Ethnicity/ other remarks |
|--------------------------|---|---------------------|--------------|-----------------|-----------------------------|
| Mr. Chi | TEPU | 17 December 2003 | Male | 55-60 | |
| Mr. Cheng | TEPU | 17 December 2003 | Male | 55-60 | |
| Mr. Lin | TEPU | 19 December 2003 | Male | 65-70 | |
| Mr. Yang | Da-Wu Anti-Nuclear Waste Union | 23 December 2003 | Male | 35-40 | |
| Mr. Sharman | Lan Yu artist | 23 December 2003 | Male | 45-50 | Aboriginal |
| Dr. Yang And Dr. Tang | Director of FCMA; Deputy Director of FCMA | 30 December 2003 | Male Male | 55-60; 55-60 | Aboriginal |
| Mr. Huang | Lan Yu Anti-Nuclear Waste Campaigner | 3 January 2004 | Male | 40-45 | Aboriginal |
| Mr. Kuo | Lan Yu Anti-Nuclear Waste Campaigner | 3 January 2004 | Male | 40-45 | Aboriginal |
| Mr.Chang | Lan Yu Anti-Nuclear Waste Campaigner | 4 January 2004 | Male | 50-55 | Aboriginal |
| Ms. Lin | Lan Yu | 4 January | | 35-40 | Aboriginal |

| | | | | | |
|-------------------|---|-------------------|------|-------|------------|
| | Anti-Nuclear Waste Campaigner | 2004 | | | |
| L 1 ⁴⁶ | Lan Yu Anti-Nuclear Waste Campaigner | 5 January 2004 | Male | 50-55 | Aboriginal |
| L2 | Lan Yu Anti-Nuclear Waste Campaigner | 5 January 2004 | Male | 30-35 | Aboriginal |

B. Interviewee List in 2009

List of interviewees in Da-Ren and Taitung

| Interviewee | Interview Date | Gender | Age Group | Ethnicity/ other remarks |
|-------------|-------------------|--------|--------------|--------------------------|
| D1 | 11 September 2009 | Male | 40-45 | |
| D2 | 15 September 2009 | Male | 60-65 | |
| D3 | 15 September 2009 | Female | 40-45 | |
| D4 | 16 September 2009 | Male | 30-35 | |
| D5 | 16 September 2009 | Male | 55-60 | Aboriginal |
| D6 | 17 September 2009 | Male | 60-65 | |
| D7 | 18 September 2009 | Male | 55-60 | |
| D8 | 22 September 2009 | Female | 35-40 | |
| D9 | 22 September 2009 | Male | 60-65 | |
| D10 | 23 September 2009 | Male | 40-45 | |
| D11 | 24 September 2009 | Male | 55-60 | |

⁴⁶ Interviewee L1 and L1 chose not to reveal their names.

| | | | | |
|-----|-------------------|--------|-------|-------------|
| D12 | 24 September 2009 | Male | 60-65 | Aboriginal |
| D13 | 25 September 2009 | Female | 35-40 | Aboriginal |
| D14 | 25 September 2009 | Male | 60-65 | Aboriginal |
| D15 | 29 September 2009 | Male | 40-45 | Aboriginal |
| D16 | 29 September 2009 | Male | 55-60 | Aboriginal |
| D17 | 30 September 2009 | Male | 30-35 | Aboriginal |
| D18 | 1 October 2009 | Female | 45-50 | |
| D19 | 1 October 2009 | Male | 55-60 | Aboriginals |
| D20 | 1 October 2009 | Female | 35-40 | Aboriginals |
| D21 | 2 October 2009 | Male | 60-65 | Aboriginals |
| D22 | 5 October 2009 | Female | 50-55 | Aboriginals |
| D23 | 6 October 2009 | Female | 45-50 | |
| D24 | 6 October 2009 | Male | 45-50 | |
| D25 | 7 October 2009 | Female | 40-43 | Aboriginal |

List of interviewees in Wang-An, Penghu

| | Interview Date | Gender | Age group | Ethnicity/ other remarks |
|----|----------------------|--------|-----------|-----------------------------|
| W1 | 10 September 2009 | Male | 60-65 | |
| W2 | 15 September 2009 | Male | 40-45 | |
| W3 | 22 September 2009 | Male | 55-60 | |
| W4 | 1 October 2009 | Male | 40-45 | |
| W5 | 8 October 2009 | Male | 30-35 | |

Other interviewees

| | Date | Gender | Age group | Ethnicity/ other remarks |
|----|----------------------|--------|-----------|-----------------------------|
| N1 | 16 September 2009 | Male | 55-60 | |
| N2 | 22 September 2009 | Male | 40-45 | |

Bibliography

Agyeman, J. (2002) "Constructing Environmental (in) Justice: Transatlantic Tales,"
Environmental Politics, 11(3), 31-53.

American Institute in Taiwan (AIT) Taiwan Relations Act.

<http://www.ait.org.tw/en/taiwan-relations-act.html> (Accessed: 10 May 2011).

Amnesty International (1992) Taiwan: Amendment of Article 100 of Criminal Code, 31
March 1992. <http://www.amnesty.org/en/library/info/ASA38/003/1992/en>
(Accessed: 11 May 2011).

Apple Daily (2009) "County/ City Election Results", 6 December 2009.

http://tw.nextmedia.com/applenews/article/art_id/32141480/IssueID/20091206,
(Accessed: 17 May 2011).

Atomic Energy Council, AEC (2006a) Radioactive Waste Management in Taiwan: Low
Level radioactive Waste Final Disposal. <http://www.aec.gov.tw/english/>
(Accessed: 22 January 2007).

Atomic Energy Council, AEC (2006b) Radioactive Waste Management in Taiwan: Low
Level radioactive Waste Final Disposal. AEC website:
<http://www.aec.gov.tw/english/> (Accessed: 22 January 2007).

Average Income of Townships in Taiwan. <http://gaan.com/deepdish?p=84198> (Accessed:
20 May 2010)

Barthe, Y. (2009) "Framing Nuclear Waste as a Political Issue in France," Journal of Risk Research 12 (7), 941 — 954.

Barry, B. (1999). "Sustainability and Intergenerational Justice", in A. Dobson, ed., Fairness and Futurity: Essays on Environmental Sustainability and Social Justice, Oxford: Oxford University Press, pp 93-117.

Bayliss, C., and Langley, K. (2003) Nuclear Decommissioning, Waste Management, and Environmental Site Remediation, London: Elsevier.

BBC Country Profile: Marshall Islands.
http://news.bbc.co.uk/1/hi/world/asia-pacific/country_profiles/1167854.stm
(Accessed: 17 October 2006).

BBC News (1999) Radiation Link with Stillbirth, 22 October.
<http://news.bbc.co.uk/1/hi/health/481875.stm> (Accessed: 20 May 2006).

BBC News (2002) "Taiwan Sorry for Nuclear Waste Failure", 5 May,
<http://news.bbc.co.uk/1/hi/world/asia-pacific/1968993.stm> (Accessed: 20 May 2006).

BBC News (2011) "Villages Reject Northamptonshire Radioactive Waste Plan", 8 April.
<http://www.bbc.co.uk/news/uk-england-northamptonshire-13011093>,
(Accessed: 11 July 2011).

Bell, D. (2002) "How can Political Liberals be Environmentalist?," Political Studies 50(4), 703-724.

- Bell, D. (2004) "Environmental Justice and Rawls' Difference Principle,"
Environmental Ethics 26(3), 287-306.
- Bih, H. D.; and Kou, I. C. (1999) "An Explosion of the Myth of Modern Technology:
A Case Study of Socio-Psychological Impacts of the Radioactive
Contamination at Min-Seng-Bie-Shu," Taiwan: A Radical Quarterly in Social
Studies 35, 203-254. (in Mandarin)
- Blowers, A., and Elliot, D.,(2003) "Power in the Land: Conflicts over Energy and the
Environment," in N. Bingham, A. Blowers, and C. Belshaw eds., Contested
Environments, Chichester: John Wiley and Sons/ The Open University,
pp104-125.
- Blowers, A., Lowry, D., and Solomon, B (1991) International Politics of Nuclear Waste,
London: Macmillan.
- Blowers, A. (2003) "Inequality and Community and the Challenge to Modernization:
Evidence from the Nuclear Oases," J. Agyeman, R. Bullard, and B. Evans, B
eds, Just Sustainabilities: Development in an Unequal World, Cambridge, MA:
MIT Press, 64-80.
- Brown, L. and Tandon, R. (1983) "Ideology and Political Economy in Inquiry: Action
Research and Participatory Research," The Journal of Applied Behavioral
Science 19, 277-94.
- Brown, M. (2004) Is Taiwan Chinese? The Impact of Culture, Power, and Migration on
Changing Identities, CA: University of California Press.

- Brown, P. (1992) "Popular Epidemiology and Toxic Waste Contamination: Lay and Professional Ways of Knowing," Journal of Health and Social Behavior 33, 261-281.
- Bryant, B. (1995) "Issues and Potential Policies and Solutions for Environmental Justice: An Overview", in B. Bryant ed., Environmental Justice: Issues, Policies, and Solutions. Covelo, California/ Washington DC: Island Press, 8-34.
- Bullard, R. (2000) Dumping in Dixie: Race, Class, and Environmental Quality, 3rd edition, Boulder, Colorado: Westview Press.
- Burningham, K., Barnett, J., and Thrush, D. (2007) The limitation of the NIMBY Concept for understanding public Engagement with Renewable Energy Technology: A literature Review, Manchester: Manchester Architecture Research Centre, University of Manchester.
- California State Auditor (2008)Low Level Waste: The State Has Limited Information that Hampers its Ability to Assess the Need for a Disposal Facilities and Must Improve its Oversight to Protect the Public. June 2008, Report 2007-114. Sacramento CA: Bureau of State Audits.
<http://www.bsa.ca.gov/pdfs/reports/2007-114.pdf> (Accessed: 31 August 2011).
- Casimir, M. (2008) (ed) Culture and the Changing Environment : Uncertainty, Cognition and Risk Management in Cross-Cultural Perspective, New York : Berghahn Books.

- Carter, A. (2001) "Can We Harm Future People?," Environmental Values 10(4), 429-54.
- Chen, H. (2009) "60% People in Da-Ren Agreed to Host Radioactive Waste" Liberty Times, 24 July, 9. (in Mandarin)
- Central Election Commission. Database of Election in Republic of China, Taipei: Ministry of Interior Affairs. (in Mandarin)
- Central News Agency (2003a) "Taipower Have Not Decided the Final Disposal Site" 30 April. (in Mandarin)
- Central News Agency (2003b) "Taitung County Council: Do Not Establish Nuclear Dump in Taitung" 30 April. (in Mandarin)
- Central News Agency (2006) "Legislative Yuan passed the Law on Site Selection for Low Level Radioactive Waste Final Disposal" 28 April.
<http://epochtimes.com/b5/6/4/28/n1301689.htm>(Accessed: 9 September 2006).
(in Mandarin)
- Central News Agency (2009) "Penghu Residents Nix Idea of Opening Casinos in Their County, 26 September.
http://www.etaiwannews.com/etn/news_content.php?id=1067290&lang=eng_news (Accessed: 7 April 2012)
- Chan, S. (2005) "Taiwan in 2004: Electoral Contests and Political Stasis," Asian Survey 45(1), 54-58.

- Chan, S. (2006) "Taiwan in 2005: Strategic Interaction in Two- Level Games," Asian Survey 46(1) 63-68.
- Chang, H. K. (1997) The Construction of "The fear to be exterminated": the Grassroot Organization and News Media Construct the Meaning of The Orchid Island Anti-Nuclear-Waste Movement, Master Dissertation, National Chung Cheng University. (in Mandarin)
- Chen, S. (2002) "The Anger of Lan Yu" Liberty Times 2 May, 5. (in Mandarin)
- Chen, S (2011) "Refixing Work at Orchid Island Repository Finishes in October," Liberty Times 11 April, 6. (in Mandarin)
- Cheng, T. (1989) "Democratizing the Quasi-Leninist Regime in Taiwan," World Politics Vol.41 (4), 471-499.
- Cheng, W., and Wu, R. (2003) Current Status of Radiowaste Administration in Taiwan, Taipei: Fuel Circle Management Administration, Atomic Energy Council. (in Mandarin)
- Chi, C. (1997) "Environmental Colonialism: the Rights of Taiwan Indigenous people on Resources and Land in the expansion of capitalism," in Essays on Culture and Land for Indigenous people in Taiwan, Taipei: Chinese Society of Land Economics, pp8-23. (in Mandarin)
- Chi, G. (2004) "Taipower: Repository in North Korean Should Comply with International Standard," Central News Agency, 10 March. (in Mandarin)

China Evening Times (2000a) “Korea Summit Taipower Could Export Radioactive Waste to North Korea?” 12 June, 5. (in Mandarin)

China Evening Times (2000b) “TEPU: Taipower’s Radioactive Waste will Transfer to Russia” 19 August, 5. (in Mandarin)

China Evening Times (2000c) “Here Comes Again the Radioactive Waste” 17 November, 5. (in Mandarin)

China Evening Times (2001a) “Political Consideration is the Key Issues in Wuciou Disposal Site EIA” 18 July, 5. (in Mandarin)

China Evening Times (2001b) “Political Consideration is the Key Issues in Wuciou Disposal Site EIA” 18 July, 5. (in Mandarin)

China Times (1997) “Taipower Export Nuclear Waste is Nearly a Halt” 19 December, 8. (in Mandarin)

China Times (1998a) “There are at least 4,000 Barrels of Rusty Radioactive Wastes” 7 February, 9. (in Mandarin)

China Times (1998b) “Wuciou is the First Priority of Final Disposal Site for Radioactive Wastes” 27 February, 8. (in Mandarin)

China Times (1998c) “Seven Reasons for Taipower to Choose Wuciou as the Final Disposal Site of Radioactive Waste” 28 February, 8. (in Mandarin)

China Times (1998d) “Wuciou People Roar to Reject Nuclear Wastes,” 28 February, 8.
(in Mandarin)

China Times (1998e) “Wuciou Do Not Need Money but DO Not Want Nuclear Waste”
3 March, 8. (in Mandarin)

China Times (1998f) “Taipower Spread Money to Corrupt People” 3 March 8.
(in Mandarin)

China Times (1998g) “Anti Nuclear Waste-Wuciou People Shouted: Protest until We
Die” 6 March, 8. (in Mandarin)

China Times (1998h) “Wuciou Protest to Refuse Nuclear Wastes” 7 March, 8. (in
Mandarin)

China Times (1998i) “AEC: Wuciou People Cannot Say NO!” 7 March, 8. (in
Mandarin)

China Times (1998j) “Taipower’s Headache: Wuciou Say No to Radioactive Waste
Disposal Site” 11 October, 8. (in Mandarin)

China Times (1998k) “Taipower is willing to Give Money for Storing Radioactive in
Wu-Chiu” 17 December, 8. (in Mandarin)

China Times (1999) “Wuciou is Still the First Priority for Radioactive Waste Final
Disposal Site” 7 June, 8. (in Mandarin)

China Times (2000) “Situation Changes When Taipower Submits EIA to the Ministry Economic Affairs” 6 November, 8. (in Mandarin)

China Times (2000) “Yami blocked Lan-Yu Harbour to Stop Radioactive Waste” 8 November, 8. (in Mandarin)

China Times (2001a) “Taiwan on the List of Russian Environmental Protest” 21 February, 4. (in Mandarin)

China Times (2001b) “Transfer Radioactive Waste to Russia halted” 30 March, 4. (in Mandarin)

China Times (2001c) “Political Consideration Dominated the EIA of Little Ciou Yu” 19 July, 5. (in Mandarin)

China Times (2003a) “Final Disposal Site in Da-Wu?” 18 April, 8. (in Mandarin)

China Times (2003b) “Final Disposal Site of Radioactive Wastes will be in Da-Wu” 19 April, 8. (in Mandarin)

China Times (2003c) “County Council would not agree to Move Radioactive Wastes from Lan-Yu to Da-Wu” 19 April, 8. (in Mandarin)

China Times (2003d) “Da-Wu Anti Nuclear Waste Groups Established” 24 April, 8.

China Times (2005) “Delay to Announce the Final Disposal Site for Radioactive Waste” 31 January, 8. (in Mandarin)

- Chiu, Y. T. (2001) "Radioactive Rebar Linked to Cancer" Taipei Times 29 April, 2.
- Chiu, Y. T. (2003) "AEC urged to Complete Radioactive-Rebar Probe" Taipei Times 9 September, 2.
- Clark, C. (2007) "Taiwan Enters Troubles Waters: The Elective Presidencies of Lee Teng- Hui and Chen Shui-Bian" in M. Rubinstein, ed., Taiwan: A New History, Expanded edition, New York: M.E Sharpe, pp496-535.
- Chu, Y. (2007) "Taiwan in 2006: A Year in Political Turmoil", Asian Survey, 47(1), 44-51.
- Chu, Y. (2008) "Taiwan in 2007: The Waiting Game," Asian Survey, 48(1), 124-132.
- Committee to Review New York State's Siting and Methodology Selection for Low-Level Radioactive Waste Disposal (1996) Review of New York State Low-Level Radioactive Waste Siting Process, Eashingtonn DC: National Academy Press.
- Corburn, J. (2002) "Environmental Justice, Local Knowledge, and Risk: The Discourse of a Community –Based Cumilative Exposure Assessment," Environmental Management 29 (4), 451-66.
- Concerned Citizens for Nuclear Safety News Release on 5 April 2001: Russian Minister of Atomic Power Fired by Russian President, 5 April 2001, <http://www.nuclearactive.org/news/040501.html>, (Accessed: 18, March 2003).

Control Yuan (2008) Report on Investigation on Taipower's Expenditure on Wuciou Level Radioactive Waste Potential Sites, Taipei: Control Yuan.(in Mandarin)

Copper, J. (1999) Taiwan: Nation State or Province?, 3rd edition, Boulder, CO: Westview.

Copper, J. (2003) Taiwan: Nation State or Province?, 4th edition, Boulder, CO: Westview.

Council for Indigenous People, Yami People. Tapei: Executive Yuan.

<http://www.apc.gov.tw/portal/docList.html?CID=03AB0AFF23E53149>

(Accessed: 10 June 2010) (in Mandarin)

Council for Indigenous People. Tapei: Executive Yuan.

http://www.apc.gov.tw/main/docDetail/detail_ethnic.jsp?cateID=A000199&linkParent=101&linkSelf=145&linkRoot=101, (Accessed: 20 May 2010).

Council of indigenous People (2005) The Indigenous People Basic Law Taipei:

Executive Yuan. (in Mandarin)

http://www.apc.gov.tw/main/docDetail/detail_official.jsp?isSearch=&docid=P A000000001795&linkSelf=231&linkRoot=231&linkParent=231&url=

(Accessed: 08 September 2007).

Craft, A., Parker, L., Openshow, S., Charlton, M., Newell, J., Birch, J., and Blair, V.

(1993) "Cancer In Young People in the North of England 1968-1985: Analysis by Census Wards, Eidsmoil," Common Health, 47, 109-115.

Cyberbees News (2003) "Taitung Anti Nuclear Coalition", 4 July,

<http://cyberbees.org/blog/archives/000596.html>, (Accesses: 10 June 2004). (in Mandarin)

Danafu, C (1989) "The Ecology of Orchid Island, " Taiwan Church Communiqué 1865, 203 (in Mandarin)

Department of Energy, DOE. Radiation Assistance Centre, Guidance for Radiation Accident Management. Available at:

<http://www.orau.gov/reacts/beta.htm> (Accessed: 20 May 2007).

Department of Household Registration Affairs. Statistics of Indigenous People Population. Taipei: Ministry of Interior Affairs.

<http://sowf.moi.gov.tw/stat/month/m1-04.xls> (Accessed: 17 January 2011).

Dependency Ratio

<http://www.economicshelp.org/dictionary/d/dependency-ratio.html> (Accessed: 20 May 2010).

Devine-Wright, P. (2008) "Rethinking Nimbyism: The Role of Place Attachment and place Identity in Explaining Place-protective Action," Journal of Community and Applied Social Psychology, 19, 426-441.

Digital Museum of Taiwan Indigenous People. Paiwan,

<http://www.dmtip.gov.tw/Eng/Paiwan.htm> (Accessed: 10 June 2010).

Directorate General of Budget, Accounting and Statistics. National Statistic Database.

Taipei: Executive Yuan. (in Mandarin)

<http://eng.stat.gov.tw/mp.asp?mp=5> (Accessed: 07 December 2010).

Directorate-General of Budget, Accounting and Statistics (2007) The Industry, Commerce and Service Census (ICS) in 2006, Taipei: Executive Yuan. (in Mandarin)

<http://win.dgbas.gov.tw/dgbas04/bc2/ics95/GENERAL/EN/ZG1.txt>

(Accessed: 20 May 2010).

Directorate-General of Budget, Accounting and Statistics (2010a) Report on the Survey of Family Income and Expenditure 2009, Taipei: Executive Yuan.

Directorate-General of Budget, Accounting and Statistics (2010b) Population of Taiwan.

Taipei: Executive Yuan.

Dobson, A. (1998) Justice and the Environment: Conceptions of Environmental Sustainability and Dimensions of Social justice, Oxford: Oxford University Press.

Dobson, A. (2003) "Social Justice and Environmental Sustainability", in J. Agyeman, R. Bullard, and B. Evans eds., Just Sustainabilities: Development in an Unequal World, Cambridge, MA: MIT Press, 64-80.

Douglas, M. and Wildavsky, A. (1982) (eds) Risk and Culture : An essay on the Selection of Technological and Environmental Dangers, Berkeley : University of California Press.

Dowie, M. (1995) Losing Ground: American Environmentalism at the Close of the

Twentieth Century, Cambridge, MA: MIT Press.

Durant (2007) “Burying Globally, Acting Locally: Control and Co-operation in Nuclear Waste Management,” Science and Public Policy 34(7), 515–528.

Durant, D. (2009) “Radwaste in Canada: a Political Economy of Uncertainty,” Journal of Risk Research 12: 7, 897 — 919.

Easterling, D., and Kunreuther, H. (1995) The Dilemma of Siting a High-Level Nuclear Waste Repository, Boston: Kluwer.

ECODENFENCE (2002) “Radioactive Waste from Taiwan to be Illegally Dumped on Russian’s Far East”, 26 March.

Energy Bureau (2010) Report on Prediction of total Electricity Capacity from 2010 -2019, Taipei: Ministry of Economic Affairs, Executive Yuan. (in Mandarin)

Edwards, B. (1995) “With Liberty and Environmental Justice for All: The emergence and Challenge of Grassroots Environmentalism in the United States,” in B. Taylor ed., Ecological Resistance Movements: The Global Emergence of Radical and Popular Environmentalism, Albany: State University of New York Press, 35-55.

Environmental Protection Agency, EPA Office of Environmental Justice, (2000) F.A.Q. (2000) What Is Environmental Justice
<http://www.es.epa.gov/oeca/main/ej/faq.html> (Accessed: 3 March, 2003)

Eureka County Yucca Mountain Information Office Timeline — The Nuclear Waste Policy Dilemma.

<http://www.yuccamountain.org/time.htm> (Accessed at: 10 July 2011).

European Commission (2002) Eurobarometer 56.2: Europeans and Radioactive Waste,
Brussels: European Commission.

European Parliament (2001) Possible Toxic Effect from the Nuclear Reprocessing Plants at Sellafield (UK) and Cap De La Hague (France), Luxemburg:
European Parliament.

Executive Yuan (1968) Atomic Energy Act, Taipei: Executive Yuan. (in Mandarin)

Executive Yuan (2006) Act on Sites for Establishment of Low Level Radioactive Waste Final Disposal Facility, Taipei: Executive Yuan. (in Mandarin)

Fan, M. (2006a) “Environmental Justice and Nuclear Waste Conflicts in Taiwan,”
Environmental Politics 15(3): 417–434.

Fan, M.(2006b) “Nuclear Waste Facilities on Tribal Land: The Yami’s Struggles for
Environmental Justice,” Local Environment 11: 433–44.

Fan, M. (2009) “Public Perceptions and the Nuclear Waste Repository on Orchid Island,
Taiwan,” Public Understanding of Science 18: 167-176.

Fan. Y. (2004) “Taiwan: No Civil Society, No Democracy,” In M. Alagappa ed., Civil Society and Political Change in Asia, Stanford, CA: Stanford University Press.

pp164-90.

Faure, D. (2001) In Search of the Hunters and Their Tribes, Taipei: Shung Ye Museum of Formosan Aborigines Publishing.

Fell, D (2005) "Political and Media Liberalization and Political Corruption in Taiwan," China Quarterly 184, 875-93

Fell, D (2011) Government and Politics in Taiwan. London: Routledge.

Fell, D., Klöter, H., and Chang Bi-Yu (2006) "What has Changed: Taiwan Before and After the Change in Ruling Parties," Wiesbaden: Harrasowitz.

Fischhoff, B. (1990) "Understanding Long-term Environmental Risks," Journal of Risk and Uncertainty 3, 315-333.

Fleming, N.(2008) "Nuclear Power 'Increases Child Leukaemia Risks'", The Telegraph, 10 January 2008.

<http://www.telegraph.co.uk/science/science-news/3321239/Nuclear-power-increases-child-leukaemia-risk.html>, (Accessed at 30 August 2011).

Flüeler, T. (2001) "Options in Radioactive Waste Management Revisited: A Proposed Framework for Decision Making," Risk Analysis 21 (4), 787-99.

Frankfurt, H. (1988) "Equality as a Moral Ideal' in H, Frankfurt ed., The Importance of What We Care About, Cambridge: Cambridge University, 134-158.

Freedom House (2008) Freedom House Calls for Inquiry into Taiwan Clashes, 20 November.

<http://www.freedomhouse.org/template.cfm?page=70&release=725>,

(Accessed: 20 January 2011).

Freudenberg, N., and Steinsapir, C. (1992) "Not in My Back Yard : the Grassroots Environmental Movement," in R. Dunlap, and A. Mertig eds., American Environmentalism: The U.S. Environmental Movement 1970-1990, Washington DC: Taylor and Francis, 27-38.

Friends of the Earth (1999) Pollution Injustice and the Geographic Relation between Household Income and Polluting Factories. London: Friends of the Earth.

http://www.foe.co.uk/resource/reports/income_pollution.html, (Accessed: 31

August 2011).

Friends of the Earth (2001) Pollution and Poverty: Breaking the Link. London: Friend of the Earth, London.

http://www.foe.co.uk/resource/briefings/pollution_and_poverty.pdf (Accessed:

31 August 2011).

Friends of the Earth (2004) Incinerators and Deprivation. Brief. London: Friends of the Earth.

http://www.foe.co.uk/resource/briefings/incineration_deprivation.pdf,

(Accessed: 31 August 2011).

Fu, C. J (1997) Stop! Views of Environmental Groups in South Korea towards Taiwan's Exportation Nuclear Wastes to North Korea, Taipei: Environment. Taipei.

<http://www.taiwanwatch.org.tw/mouth/15-6.htm>, (Accessed: 19 January 2008). (in Mandarin)

Fuel Circle and Material Administration, FAMA.

http://gamma1.aec.gov.tw/fcma/national_quantity.asp (Accessed: 20 June 2011).

Fuel Circle and Material Administration FCMA (2002) Report of Radioactive Substance Management 2002, Taipei: Atomic Energy Council. (in Mandarin)

Fuel Circle and Material Administration, FCMA (2003) Report of Fuel Circle and Material Administration for the Year 2002. Taipei: Atomic Energy Council. (in Mandarin)

Fuel Circle and Material Administration (2010) “Index of Environmental Sustainability” Taipei: Atomic Energy Council. (in Mandarin)

http://gamma1.aec.gov.tw/fcma/environment_lasting_number.asp (Accessed: July 20 2011).

Gardner, M., Snee, M., Hall, A., Powell, C., Downes, S., and Terrell, J. (1990) “Result of Case-Control Study of Leukemia and Lymphoma Among Young People near Sellafield Nuclear Plant in West Cumbria,” British Medical Journal 300, 423-429.

Gaventa, J. (1991) Power and Powerless: Quiescence and Rebellion in an Appalachian Valley, Chicago: University of Illinois Press.

Glasgow, J. (2002) "Not in Anybody's Backyard? The Non-Distribution Problem with Environmental Justice," Buffalo Environmental Law Journal 13, 70-122.

Gold, T. (2009) "Taiwan in 2008: My kingdom for A Horse," Asian Survey Vol 49(1), 87-97.

Gold, T (2010) "Taiwan in 2009: Eroding Landslide," Asian Survey, 50(1), 65-75.

Government Information Office. The Story of Taiwan: Economy, Taipei: Government Information Office.

<http://www.gio.gov.tw/info/taiwan-story/economy/edown/3-2.htm> Accessed: 10 May 2011).

Government Information Office (2009) The Republic of China Year Book 2008, Taipei: Government Information Office.

<http://www.gio.gov.tw/taiwan-website/5-gp/yearbook/ch1.html>, Accessed: 10 April 2010).

Government Information Office (2010) "Government of Taiwan" in Taiwan Year Book 2009, Taipei: Government information Office.

<http://www.gio.gov.tw/taiwan-website/5-gp/yearbook/ch04.html>, (Accessed: 10 July 2010).

Government Information Office (2011) "People and Language" in The Republic of China Year Book 2010, Taipei: Government Information Office.

<http://www.gio.gov.tw/taiwan-website/5-gp/yearbook/02People&Language.pdf> (Accessed: 08 January 2011).

Green Party Taiwan (1997) In opposition to Exportation of Nuclear Wastes to North Korea.

http://gptaiwan.yam.org.tw/english_vision/state_nk.html (Accessed: 19 January 2008). (in Mandarin)

Greenpeace (1997a) Greenpeace Statement Against Taiwan's Plan to Dump Nuclear Waste in North Korea, 30 January.

<http://archive.greenpeace.org/comms/no.nukes/waste02.html>, (Accessed: 17 March 2010).

Greenpeace (1997b) Public Interest Groups Join Together At Taiwan Mission to Protest Taiwan's Plan to Dump Nuclear waste in Korea.

<http://archive.greenpeace.org/comms/no.nukes/p970214.html>, (Accessed: 17 March 2010).

Great Britain. Department of Trade and Industry DTI. Department of Trade and Industry website <http://www.dti.gov.uk> (Accessed: 7 May 2005).

Great Britain. Department for Environment, Food and Rural Affairs, DEFRA (2001) Managing Radioactive Waste Safely: proposals for developing a policy for managing solid radioactive waste in the UK (MRWS). London: DEFRA.

Great Britain. Department for Environment, Food, and Rural Affairs, DEFRA (2002) "the Secretary of the State's letter to MPs on Managing Radioactive Waste Safely," 29 July.

http://www.defra.gov.uk/environment/radioactivity/waste/pdf/radwaste_sofs-letter.pdf, (Accessed: 17 July, 2010).

- Hartley, T. (1995) "Environmental Justice: An Environmental Civil Right Value Acceptable to All World Views," Environmental Ethics 17, 277-289.
- Hayward, T. (2000) "Constitutional Environmental Rights and Liberal Democracy", in J. Barry and M Wissenburg eds., Sustaining Liberal Democracy: Ecological Challenges and Opportunities, Basingstoke: Palgrave Macmillan, 117-134.
- Hayward, T. (2005) Constitutional Environmental Rights. Oxford: Oxford University Press.
- Hebert, H. (2009) "Nuclear Waste Won't Be Going to Nevada's Yucca Mountain, Obama Officials Says" Chicago Tribune. 6 March.
- Henwood, K., Pidgeon, N., Sarre, S., Simmons, P., and Smith, N. (2008) Risk, Framing and Everyday Life: Epistemological and Methodological reflections from three Sociocultural Projects, Health, Risk & Society, 10(5), 421-438.
- Hinchliffe, S., and Blowers, A (2003) "Environmental Responses: Radioactive Risks and Uncertainty", in A. Blowers, and S. Hinchliffe eds., Environmental Responses, Chichester: John Wiley and Sons/ The Open University.
- Ho, M. S. (2003) "The Politics of Anti-Nuclear Movement in Taiwan: Case of Party Dependent Movement (1998-2000)," Modern Asian Studies 37 (3), 683-708.
- Ho, M. S. (2004) "When a Taiwan's Social Movement Meets the New Social Movement Theory: The Case of Anti-Nuclear Movement," Journal of Education and Society 7, 66-97.(in Mandarin)

- Ho, M. S. (2005) “Weakened State and Social Movement: The Paradox of the Taiwanese Environmental Movement after the Power Transfer,” Journal of Contemporary China 14 (43), 339-52
- Ho, M. S. (2006a) “Challenge State Corporatism: The Politics of Taiwan’s Labor Federation Movement,” The China Journal 56, 107-27.
- Ho, M. S. (2006b) Green Democracy: The study on Taiwan Environmental Movement, Taipei: Chung Shui Publishing Co. Ltd. (in Mandarin)
- Ho, M. S. (2007) “The Rise and Fall of Leninist Control in Taiwan’s Industry,” The China Quarterly 189, 162-179.
- Ho, M. S. (2010) “Understanding the Trajectory of Social Movements in Taiwan (1980-2010),” Journal of Current Chinese Affairs Vol.39 (3), 3-22.
- Hoffman, S. (2001) “Negotiating Eternity: Energy Policy, Environmental Justice, and the Politics of Nuclear Waste,” Bulletin of Science, Technology & Society, Vol. 21, No. 6, December 2001, 456-472.
- Hofrichter, R. (1993) “Environmental Justice for All” in R. Hofrichter ed., Toxic Struggles: The Theory and Practice of Environmental Justice, Philadelphia, PA: New Society Publishers, pp 3-22.
- Hocke, P., and Renn, O. (2009) “Concerned Public and the Paralysis of Decision-Making: Nuclear Waste Management Policy in Germany,” Journal of Risk Research 12: 7, 921 — 940.

- Honneth, A. (1995) "Integrity and Disrespect': Principles of Morality Based on the Theory of Recognition," Political Theory, 20, 187-201.
- Hsiao (1994) "Characterises and Change of Taiwan's Grassroots Environmental," in Taiwan Research Foundation ed., Environmental Protection and Industrial Policy, Taipei: Ch'ien-Wei. (in Mandarin)
- Hsiao, M. (2006) "Civil Society and Democratisation in Taiwan: 1980-2005," in M. Hsiao, ed., Asian New Democracies: The Philippines, South Korea, and Taiwan Compared, Taipei: Taiwan Foundation for Democracy, pp 207-230.
- Hsiao, H, Stone, R, and Chi, C. (2001) Taiwan Environmental Consciousness: Indicators of Collective Mind Toward Sustainable Development. Programme for Southeast Asian Area Studies (PROSEA), Taipei: Academia Sinica. <http://www.sarcs.org/new/capacity/sdi2001/chi%20paper.pdf> (Accessed: 6 May 2007).
- Huang, C. L. (2004) Nuclear Waste Policy in Taiwan: Public Participation and Environmental Justice. Paper presented at Central and Northern England (CANE) Postgraduate Conference, University of Manchester.
- Huang, M. (2003) "Capturing the Image of Justice between Generations: A Preliminary Report on Four Confrontational Situations in Environmental Dispute," Soochow Journal of Political Science ,16: 1-25.
- Hung, H.C., and Wang, T. W. (2011) "Determinants and Mapping of Collective Perceptions of Technological Risk: the Case of the Second Nuclear Power

Plant in Taiwan,” Risk Analysis, 31 (4), 668-683.

Hunt, J. (2001) “Framing the Problem of Radioactive Waste: Public and Institutional Perspectives” in Proceedings VALDOR 2001 - The 2nd VALDOR Symposium Addressing Transparency in Risk Assessment and Decision-Making, K.Anderson (ed.), 10-14 June, Stockholm, Sweden, 2001: 222-229.

International Atomic Energy Agency, IAEA. IAEA Managing Radioactive Waste Fact Sheet.

<http://www.iaea.org/Publications/Factsheets/English/manradwa.html>

(Accessed: 10 June 2011).

International Atomic Energy Agency, IAEA (1995) The Principles of Radioactive Waste Management, IAEA Vienna.

http://www-pub.iaea.org/MTCD/publications/PDF/Pub989e_scr.pdf

(Accesses: 10 May 2009).

International Atomic Energy Agency, IAEA (1996) International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources. IAEA Vienna.

http://www-pub.iaea.org/MTCD/publications/PDF/SS-115-Web/Pub996_web-1a.pdf (Accessed: 10 May 2009).

International Atomic Energy Agency IAEA (1998) Choosing The Nuclear Power Option: Factors To Be Considered. Vienna: IAEA.

Institution of Engineers and Technology (2005) Nuclear Waste Disposal and Transportation of Spent Fuel. London: Institution of Engineers and Technology.

<http://www.iee.org/Policy/Areas/EnvEnergy/nucwaste.pdf> (Accessed 10 May 2009)

Intel Corporation, SouthWest Organizing Project, and Electronics Industry Good Neighbor Campaign (1995) Intel Inside New Mexico: A Case Study of Environmental and Economic Injustice, Albuquerque, NM: SouthWest Organizing Project.

Ishiyama, N. (2003) "Environmental Justice and American Indian Tribal Sovereignty: Case Study of a Land: Use Conflict in Skull Valley, Utah," Antipode Vol. 35(1), 119-139.

Japan. National Diet Library of Japan. The Birth of Constitution of Japan, 1-1 Cairo Communiqué, December 1, 1943.

http://www.ndl.go.jp/constitution/e/shiryo/01/002_46shoshi.html (Accessed: 12 April 2011).

Jasanoff, S. (1998) "The Political Science of Risk Perception," Reliability Engineering and System Safety 59, 91-9.

Johnson, L. (2003) "Future Generations and Contemporary Ethics," Environmental Values, 12(4), 471-88.

Kaatsch, P., Spix, C., Schulze-Rath, R., Schmiedel, S., and Blettner, M (2008)

“Leukaemia in Young Children Living in the Vicinity of German Nuclear Power Plants”, *International Journal of Cancer*, Vol. 122 (4), 721-726.
<http://onlinelibrary.wiley.com/doi/10.1002/ijc.23330/full> (Accessed: 30 August 2011).

Kao, C. Y. (2000) “Problems of Nuclear Energy Policy and the Anti-Nuclear Movement in Taiwan”, Institute of Policy Research Home Page.
<http://www.inpr.org.tw/publish/pdf/recent/event1310.pdf> (Accessed: 19 June 2006).

Kao, M. (2009a) “Mayor of Penghu: Taipower Misleading Local People” Central News Agency 2 March, 8. (in Mandarin)

Kao, M. (2009b) “Penghu Mayor opposed the decision Radioactive Waste Potential Site”, Central News Agency 17 March, 5. (in Mandarin)

Kao, M. (2009c) “Radioactive Waste Potential Site Penghu Mayor Opposed the Decision” Central News Agency 17 March, 5. (in Mandarin)

Ke, Y. H.; Liu, Y. H, Tseng, W. C. and Su, Y. Y. (2009) “Short of 2962 Vote! Penghu Casino Referendum Did Not Pass” Liberty Times 27 September.
<http://www.libertytimes.com.tw/2009/new/sep/27/today-life1.htm> (Accessed 7 April 2012)

Kinmen County Government “Project for Townships Development”. (in Mandarin)
<http://gisapsrv01.cpami.gov.tw/cpis/cprpts/kinman/web> 檔/第四篇%20 第六

章%20烏坵鄉發展計畫.htm (10 July 2011).

Kou, S. (2008) “Taipower: Radioactive Waste in Taiwan would Export to Other Countries after 40 Years”, Central News Agency 08 August. (in Mandarin)

Kraft (2000) “Policy Design and the Acceptability of Environmental Risks: Nuclear Waste Disposal in Canada and the United States,” Policy Studies Journal, Vol. 28, No. I, 2000, 206-218. (in Mandarin)

Kuan, S. J. (1987) “How Many National Secrets were buried in Lan Yu,” Ren-Chien Magazine 27, 86-101. (in Mandarin)

Kuan, S. J. (1991) “Edge of the Territory Orchid Island”, Ren Chien Magazine 36, 268-279. (in Mandarin)

Lash, T. (1979) “Radioactive Waste: Nuclear Energy’s Dilemma”, Amicus, Vol.1(2), 24-34.

Lee, S. (1998) Analysis the 228 Incident, Taipei: Yu-Shan Publication Co. Ltd. (in Mandarin)

Levine, A. (1982) Love Canal: Science, Politics and People, Massachusetts: Lexington Books.

Li, T. (1998) “Wuciou Do Not need Money but DO Not Want Nuclear Waste” China Times, 03 March, 8. (in Mandarin)

- Li, Y. (2006) "TSU Poll: Chen's Approval Rate only 5.8%" China Times 16 May, 2. (in Mandarin)
- Liberty Times (2001a) "Russia Denied the Contract with Taiwan" 8 June, 4. (in Mandarin)
- Liberty Times (2001b) "Taipower Renegotiated with North Korea" 10 August, 5. (in Mandarin)
- Lidskog, R., and Sundqvist, G.(2004) "On the Right Track? Technology, Geology, and Society in Swedish Nuclear Waste Management," Journal of Risk Research 7(2), 251-268.
- Lin, C., Lin, P., and Liu, H. (1993) "The Yami Stand Vigil" in C. Lin, P. Lin, and H. Liu eds., Nuclear Report From Taiwan, Taipei: Asian Ecological Society and the Anti-Nuclear Coalition for Taiwan.
- Lin, C., Lin, P., and H. Liu, H. (eds) (1993) Nuclear Report From Taiwan, Taipei: Asian Ecological Society and the Anti-Nuclear Coalition for Taiwan.
- Lin, G. (2001) The Influence of Stopping Construction of No.4 Nuclear Power Plant to the Stock Exchange Market in Taiwan. National Policy Foundation. 19 January. (in Mandarin)
<http://old.npf.org.tw/Symposium/report/900119-FM-2.htm> (Accessed: 30 August 2011).
- Lin P. (1994) "Taiwan's Anti-nuclear Movement" in H. Cheng ed., The Policy Process

of the Fourth Nuclear Power Plant and Radiation Harm, Taipei: Chien-wei Publication.

Lin, P. (1995) “Taipower Shall Stop the Expansion of Lan Yu Radioactive Waste Repository” Independent Morning Daily 20 June, 7. (in Mandarin)

Lin, X.Y. (2012) The Development of the Environmental Movement and Its Intellectual Background: A Historical Study of the Environmental Discourse in Taiwan between 1970s and 1990s, Master Dissertation, Tung-Hai University.(in Mandarin)

Liu, D. and Wu, R. (2001) Spent Fuel Management and Regulation in Taiwan, Taipei: Fuel Circle Management Administration, Atomic Energy Council. (in Mandarin)

Liu, K C., Yeh, C, C. Chou, K S. (1990) “The History of Lan Yu Project,” AEC Report 18(2), 6 -22. (in Mandarin)

Liu, Y., Tzeng, H., and Huang, Y. (2009) “No Referendum in Penghu?” Liberty Times 24 July, 9. (in Mandarin)

Lonely Planet, Map of Taiwan.

<http://www.lonelyplanet.com/maps/asia/taiwan/> (Accessed: 10 June 2010).

Lu, T (2006) “8000 Barrels of Radioactive Waste Have Been Fixed at Lan Yu”, Central News Agency. 28 April.

<http://www.epochtimes.com/b5/6/4/28/n1301833.htm>, (Accessed: 10

September 2007). (in Mandarin).

Marshall Islands

<http://www.freegk.com/worldatlas/marshallislands.php> (Accessed 17 March 2006)

Maples, W. (2003) "Environmental Justice and the Environmental Justice Movement", in N. Bingham, A. Blowers, and C. Belshaw eds., Contested Environment, Chichester: John Wiley and Sons/ The Open University, pp 213-250.

Marshall, A. (2005) "The Social and Ethical Aspect of Nuclear Waste", Electronical Green Journal, 21.

<http://egj.lib.uidaho.edu/egj21/marshall1.html> (Accessed: 17 May 2008).

McGurty, E. (2000) "Warren County, NC, and the Emergence of the Environmental Justice Movement: Unlikely Coalition and Shared Meanings in Local Collective Action," Society and Natural Resources 13(4), 373-388.

Mclaren, D. (2003) "Environmental Space, Equality and the Ecological Debt", in J. Agyeman, R. Bullard, and B. Evans eds., Just Sustainabilities: Development in an Unequal World, Cambridge, MA: MIT Press, 64-80.

Michael J. Casimir, M. (2008) (ed) Culture and the Changing Environment : Uncertainty, Cognition and Risk Management in Cross-Cultural Perspective, New York : Berghahn Books.

Miller, D. (1999) 'Social Justice and Environmental Goods' in A. Dobson ed., Fairness

and Futurity: Essays on Environmental Sustainability and Social Justice.
Oxford: Oxford University Press, pp. 151-172.

Ministry of Economic Affairs, MOEA (2009) Report on Potential Sites Selection for Low Level Radioactive Waste, Taipei: MOEA. Selection Report. (in Mandarin)

Mohai, P., and Saha, R. (2006) "Reassessing Racial and Socioeconomic Disparities in Environmental Justice Research," *Demography* 43 (2), 383-99.

Morton, A., Airoidi, M., and Phillips, L. (2009) "Nuclear Risk Management on Stage: A Decision Analysis Perspective on the UK's Committee on Radioactive Waste Management," *Risk Analysis* 29(5) ,764-779.

National Safety Council (2002) A Guide to the US Department of Energy's Low Level Radioactive Waste. Washington DC: National Safety Council.
<http://downloads.nsc.org/PDF/lowleve.pdf> (Accessed: 27 May 2006).

O'Hare, M (2011) "Nuclear Waste Facility Siting and Local Opposition,, Report Commissioned by the Blue Ribbon Commission on America's Nuclear Future, January, 2011.
http://brc.gov/sites/default/files/documents/nuclear_waste_c.pdf. (Accessed: 10 July 2011).

Ojovan, M., and Lee, M. (2005) An Introduction to Nuclear Waste Immobilisation, London: Elsevier.

- O'Neill, C. (2003) "Risk Avoidance, Cultural Discrimination, and Environmental Justice for Indigenous Peoples," Ecology Law Quarterly 30 (1), 2-57.
- Oon, P.S. (2001) Taiwan's Nuclear History, Taipei: Atomic Energy Council. (in Mandarin)
- Openshaw, S., Carver, S., Fernis J. (1989) Britain's Nuclear Waste: Safety and Siting, London: Belhaven.
- Openshaw, S., Carver, S., Fernis J. (1989) Britain's Nuclear Waste: Safety and Siting, London: Belhaven.
- Overseas Compatriot Affairs Commission. Overseas Global Chinese Language and Culture Centre .An Introduction to Paiwan,
http://edu.ocac.gov.tw/local/tour_aboriginal/english/a/07.htm, (Accessed: 10 June 2010)
- Ou, S. (2003) "Foreign Radioactive Waste Repository all Stopped" Central News Agency 12 September. (in Mandarin)
- Pan, H.L. (2007) Examining Anti-4th-Nuclear-Power-Plant Movement in Taiwan, Master Dissertation, National Taiwan University. (in Mandarin)
- Parfit, D. (1998) "Equality and Priority" in A. Mason ed., Ideals of Equality, Oxford: Blackwell, 1-20.
- Peng-Hu County Government. Statistics Office. (in Mandarin)

<http://www.penghu.gov.tw/10auditing/11job/page.asp?fid=91&offset=0>

(Accessed: 17 July 2010).

Radioactive Waste Management

[http:// www.uic.com.au/waste/ht](http://www.uic.com.au/waste/ht) (Accessed: 10 January 2007)

Rajeev Gowda, M., and Easterling, D. (1998) "Nuclear Waste and Native America: The MRS Siting Exercise,," Risk: Health, Safety and Environment 9, 229- 258.

Ramana, M. (2011) "Nuclear Power and the Public," Bulletin of Atomic Scientists 67 (4), 43-51.

Renn, O. (2004) "Perception of Risks," Toxicology Letters 149, 405-413.

Rigger, S. (2003) "Taiwan in 2002: Another Year of Political Droughts and Typhoons," Asian Survey 43(1), 41-48.

Rigger, S. (2004) "Taiwan in 2003: Plenty of Clouds, Few Silver Linings," Asian Survey 44(1), 182-187.

Rosenberg, A, (1995) "Equality, Sufficiency, and Opportunity in the Just Society," in E. Paul, F. Miller, and J. Paul eds., The Just Society, Cambridge: Cambridge University Press, 54-71.

Rubinstein, M (2006) "The Presbyterian Church in the Formation of Taiwan's Democratic Society" in Cheng Tun-jun and Deborah Brown (eds). Religious Organizations and Democratization: Case Studies from Contemporary Asia,

Armonk, NY: Sharp, pp109-35.

Rubinstein, M. (2007a) "Taiwan's Socioeconomic Modernisation 1971-1996", M. Rubinstein ed., Taiwan: A New History. Expanded edition. New York: M.E Sharpe, pp 366-402.

Rubinstein, M. (2007b) " Political Taiwanization and Pragmatic Diplomacy: The Eras of Chiang Ching-Kuo and Lee Teng-Hui 1971-1994" in M. Rubinstein ed., Taiwan: A New History. Expanded edition. New York: M.E Sharpe, pp436-495.

Russian National Tourist Office Map of Russia

<http://www.russia-travel.com/map.htm> (Accessed 17 March 2006)

Sandweiss, S. (1998) "the Social Construction of Environmental Justice" in D. Camacho ed., Environmental Injustice, and Political Struggle: Race, Class, and the Environment, Durham, NC: Duke University Press, 31-58.

Schlosberg, D. (1999) Environmental Justice and the New Pluralism. Oxford: Oxford University Press.

Schlosberg, D. (2003) "The Justice of Environmental Justice: Reconciling, Equality, Recognition, and Participation in a Political Movement" in A. Light and A. De-Shalit, eds., Moral and Political Reasoning in Environmental Practice, Cambridge, MA: MIT Press, 77-106.

Schlosberg, D. (2004) "Reconceiving Environmental Justice: Global Movements and

Political Theories,” Environmental Politics 13 (3): 517-40.

Shieh, M. (1996) Nuclear Fuel Cycle Policy and Nuclear Development in Taiwan, Taipei: Institute of Nuclear Energy Research, Atomic Energy Council.

Shin, C. (2001) “Taipower: Lan Yu Radioactive Wastes Could not Remove by 2002” China Times 16 February, 8. (in Mandarin)

Shin, C. (2002) “Yami People Protest against Radioactive Waste” China Times 5 May, 8. (in Mandarin)

Sjöberg (2004) “Local Acceptance of a High-Level Nuclear Waste Repository”, Risk Analysis 24(3), 737-749.

Solomon, B. (2009) “High-level Radioactive Waste Management in the USA”, Journal of Risk Research 12, 7–8, 1009–1024.

University of South Carolina. US-China Institute. “Chen Shui-bian, Taiwan Stands Up: Presidential Inauguration Address,” May 20, 2000”, University of South Carolina, US-China Institute.
[http://china.usc.edu/\(S\(vp0nss55wvfm1kbu11v2nn45\)A\(XPh4dsNYywEkAAANzc1NGRINTAtNzE2Zi00YTkxLTIIOGItMWNhZWU4YTBiYmI0vqBWeZoAa63-uP5Lxnm06vqMVHg1\)\)/ShowArticle.aspx?articleID=1302&AspxAutoDetectCookieSupport=1](http://china.usc.edu/(S(vp0nss55wvfm1kbu11v2nn45)A(XPh4dsNYywEkAAANzc1NGRINTAtNzE2Zi00YTkxLTIIOGItMWNhZWU4YTBiYmI0vqBWeZoAa63-uP5Lxnm06vqMVHg1))/ShowArticle.aspx?articleID=1302&AspxAutoDetectCookieSupport=1), (Accessed: 10 May 2011).

Shrader-Frechette, K. (2002) Environmental Justice: Creating Equality and Reclaiming Democracy, Oxford: Oxford University Press.

Slovic, P., James, F., and Layman, M. (1991) "Perceived Risk, Trust, and the Politics of Nuclear Waste," Science 254, 1603-1607.

Su, C. (2002) The History of the "One China with Varying Definition Consensus", National Policy Foundation, November 04. (in Mandarin)
<http://old.npf.org.tw/PUBLICATION/NS/091/NS-B-091-023.htm> (Accessed: 10 May 2011).

Szasz, A. (1994) Ecopolitism: Toxic Waste and the Movement for Environmental Justice, Minneapolis: University of Minnesota Press.

Temkin, L (2003) "Equality, Priority or What?," Economic and Philosophy 19, 61-87.

Taipei Times (2000) "Russia lined up for Nuke Waste Deal" 6 July, 6.

Taitung County Government. Statistics office. Population of Daren Township. (in Madarin)
<http://www.taitung.gov.tw/statistics/m1/1415.htm> (Accessed: 17 July 2010).

Taiwan Indigenous People's Culture Park. Paiwan Tribe.
[http://www.tacp.gov.tw/tacpeng/home02_3.aspx?ID=\\$3081&IDK=2&EXEC=L](http://www.tacp.gov.tw/tacpeng/home02_3.aspx?ID=$3081&IDK=2&EXEC=L), (Accessed: 10 June 2010)

Taiwan Indigenous TV Station News (2011) "Radioactive Waste in Lan Yu but Local People Have not Benefit Yet from Compensation" 22 March. (in Mandarin)
<http://lanyutao.pixnet.net/blog/post/28195400-%E6%A0%B8%E5%BB%A2%E6%94%BE%E8%98%AD%E5%B6%BC-%E5%8F%B0%E9%9B%BB%>

E5%9B%9E%E9%A5%8B%E9%87%91%E9%9B%A3%E5%8F%96%E5%BE%97 (Accessed: 30 August 2011).

Taiwan Power Company, Taipower (2005) Report on Plan for Low Level Radioactive Waste Final Disposal. (in Mandarin)
<http://www.aec.gov.tw/www/control/file/lowradio0103.pdf> (Accessed: 19 September 2008).

Taiwan Power Company, Taipower (2009) Nuclear Backend Fund. (in Mandarin)
http://nplbudget.ly.gov.tw/budget_ly_97/txt/document/97pnb4_2_10.doc
(Accessed: 30 January 2009).

Tang, C.P. (2003) "Democratizing Urban Politics and Civic Environmentalism in Taiwan," The China Quarterly 176, 1029-1051.

Tang, C. P. and Tang, S.Y. (1997) "Democratization and Environmental Politics in Taiwan," Asian Survey 57(3), 281-294.

Taylor, D (2000) "The Rise of the Environmental Justice Paradigm," the American Behavioural Scientists 43 (4), 508-580.

Tien, C. Y. (2010) Taiwan Aboriginal Social Movement in Taiwan, Taipei: Taiwan bookstore. (in Mandarin)

Tierney, K (1999) "Towards a Critical Sociology of Risk," Sociology Forum 14 (2), 215-42.

Travelpod

http://www.travelpod.com/cache/city_maps/penghu-taiwan.gif (Accessed 03 May 2006).

Tsui, S. H. (2005) Gongliao, How Are You? [Documentary], Taipei: Full Shot Foundation (全景傳播基金會)

Tzeng, H. (2009) “Radioactive waste Site within Taiwan is the Priority” Central News Agency 10 April. (in Mandarin)

United Daily (2000) “Lower House of Russian Parliament agreed to host Taiwan Nuclear Waste” 22 December, 5. (in Mandarin)

United Daily (2001a) “Demonstration in Russia” 20 February, 5. (in Mandarin)

United Daily (2001b) “Taipower Asks 5 Year Extension10 August” 10 August, 7. (in Mandarin)

United Daily (2006) “Our Island –Waves of Radioactive Waste in Lan Yu”, 16 June.

(in Mandarin)

http://udn.com/NASApp/rightprt/prtnews?_newsid=3361050 (Accessed: 20 June 2006).

United States of America USA. American Institute in Taiwan (AIT) Taiwan Relations Act.

<http://www.ait.org.tw/en/taiwan-relations-act.html> (Accessed: 10 May2011).

United State of America, USA. Environmental Protection Agency, EPA Office of Environmental Justice, (2000) F.A.Q. (2000) What Is Environmental Justice <http://www.es.epa.gov/oeca/main/ej/faq.html> (Accessed: 3 March, 2003)

United States of America, USA, National Safety Council (2002) A Guide to the US Department of Energy's Low Level Radioactive Waste. Washington DC: National Safety Council.
<http://downloads.nsc.org/PDF/lowleve.pdf> (Accessed: 27 May 2006).

United States of America, USA. Department of Energy, DOE. Radiation Assistance Centre, Guidance for Radiation Accident Management. Available at:
<http://www.ornl.gov/reacts/beta.htm> (Accessed: 20 May 2007).

United States of America, USA. California State Auditor (2008)Low Level Waste: The State Has Limited Information that Hampers its Ability to Assess the Need for a Disposal Facilities and Must Improve its Oversight to Protect the Public. June 2008, Report 2007-114. Sacramento CA: Bureau of State Audits.
<http://www.bsa.ca.gov/pdfs/reports/2007-114.pdf> (Accessed: 31 August 2011).

Vari, A. (1996) "Public Perceptions about Equity & Fairness: Siting Low-Level Radioactive Waste Disposal Facilities in the U.S. and Hungary," Risk: Health, Safety, and Environment 7:181-196.

Vogel, D. (2001) "The New Politics of Risk Regulation in Europe," Centre for Analysis of Risk and Regulation, London: London School of Economics and Political Science.

<http://eprints.lse.ac.uk/35984/> (Accessed: 1 February 2012)

Wang, Y. L. (1995) Radioactive Formosa, Taipei: Taiwan Environmental Protection Union.

Warren, K. (1999) "Environmental Justice: Some Ecofeminist Worries about a Distributive Model," *Environmental Ethics* 21(2), 151-162.

Walker, G., Fairburn, J., and Smith G. (2007) *Addressing Environmental Inequalities: Waste Management*, Bristol, United Kingdom. Environmental Agency.
<http://publications.environment-agency.gov.uk/PDF/SCHO0507BMRV-E-E.pdf> (Accessed: 31 August, 2011).

Wei, T (1997) The Report on Taiwan's Human Right 1949-1995, Taipei: Wen Yi Publish Co. Ltd. (in Mandarin)

Wekimedia. File:Taiwan ROC Political Division Map Taitung County

http://commons.wikimedia.org/wiki/File:Taiwan_ROC_political_division_map_Taitung_County.svg Accessed: 18 March 2006).

Wekimedia

<http://upload.wikimedia.org/wikipedia/commons/1/11/Kinmen,Matsu,Wuciou.png> (Accessed: 18 May 2011).

Wikipedia. 1992 Consensus

http://en.wikipedia.org/wiki/1992_Consensus (Accessed: 10 May 2011)

Wenz, P. (1998) Environmental Justice, Albany: State University of New York Press. see also

Wilson, L. (2000) Nuclear Waste: Exploring the Ethical Dilemmas, Toronto, Ontario: United Church Publishing House.

Wimaxian,

http://www.wimaxian.com/wp-content/uploads/2009/04/taiwan_map.jpg

(Accessed: 10 March 2007).

WISE News Communiqué (1997) “Taiwan: Radwaste to North Korea”, 24 January, <http://www.klimaatkeuze.nl/wise/monitor/465/4622> (Accessed: 20 January 2010).

Whitten, D. (2009) “Obama Rejects Nuclear Waste Site After 20-Year Fight (Update1)”, Bloomberg, 26 February .
<http://www.bloomberg.com/apps/news?sid=a8vjuGJCg4ao&pid=newsarchive>,
(Accessed: 20 August 2011).

World Atlas .com. Asia.

<http://www.worldatlas.com/webimage/countrys/asia/tw.htm> (Accessed: 10 March 2006)

World Atlas.com. Oceania.

<http://www.worldatlas.com/webimage/countrys/oceania/mh.htm> (Accessed: 10 March 2006)

The World Bank. World Development Indicators (WDI) and Globe Development Finance (GDF), Work Databank, Washington D.C.: The World Bank. <http://databank.worldbank.org/ddp/home.do> (Accessed:10 May 2011).

Wang-An Township. <http://www.wangan.gov.tw/tw/default.aspx> (Accessed: 17 July 2010).

World Tibet Network (1993) “Taiwan May Store Nuclear waste in China, Russia”, 10 November.,
http://www.tibet.ca/en/newsroom/wtn/archive/old?y=1993&m=11&p=10_3,
(Accessed: 10 March 2007)

Wu, Y. (2001) “Taiwan in 2000: Managing the Aftershocks from Power Transfer,”
Asian Survey Vol.41, No.1, 40-48.

Wu, Y. (2002) “Taiwan 2001: Stalemated on All Fronts,” Asian Survey, Vol. 42 (1),
29-28.

Wu, C. (2003) “Local Factions and the Kuomintang in Taiwan’s Electoral Politics,”
International Relations of the Asia-Pacific, Vol. 3, 89–111.

Yamamoto, E.K., and Jen-L W. Lyman. (2001) “Racializing Environmental Justice,”
University of Colorado Law Review, 72, 311-360.

Yim, M., and Vaganov, P A. (2003) “Effects of Education on Nuclear Risk Perception and Attitude: Theory,” Progress in Nuclear Energy 42 (2), 221-35.

Yamamoto, E. and Lyman J. (2001) "Racializing Environmental Justice," University of Colorado Law Review 72, 311-59.

Young, I. (1990) Justice and the politics of difference, London: Routledge.