Influence of Environmental Impact Assessment on decision making for Hazardous Waste Management in Mexico

Maria Teresa Gomez Osorio

A thesis submitted for the Degree of

Doctor of Philosophy

University of East Anglia

School of Environmental Sciences

April, 2010

ABSTRACT

It has been acknowledged in Mexico that there is a need to increase the infrastructure for the adequate management of hazardous wastes, and therefore hazardous waste management decision-making needs to be improved. Environmental Impact Assessment (EIA) is a component for granting permission for, and the licensing of, waste treatment and disposal facilities in many countries. In Mexico, EIA is considered an important instrument of environmental policy; however, its practice and effectiveness in decision making has been questioned. Studies about the influence of EIA in decision making have analysed effects of EIA on decisions prior to formal application and during the EIA process concluding that EIA has limited or weak influence in decision making. EIA was founded on the rational model of decision making, which assumes that EIA is a process for generating, organising, and communicating information. However, it has been advanced that environmental assessment based on the rational model of decision making is inadequate to determine EIA's influence. Thus, research regarding the different models of EIA and its influence could provide guidance to increase the effect of EIA on decision making. Therefore, the objective of this thesis is to critically evaluate the influence of EIA on the decision-making process for Hazardous Waste Management Facilities (HWMF) in Mexico. A case study research design and a qualitative research strategy (semi-structured interviews and documents) were used. During the different stages of decision making for HWMF different theoretical models of EIA and potential outcomes were identified. The theoretical models of EIA identified include the information processing, participation, institutional, political economy, and symbolic politics. The findings in this research indicate that the rational decision making model was limited at explaining how decision making occurred. Rather, decision making for HWMF was similar to the bounded rationality, incrementalism, and mixed-scanning theoretical model. Thus, recommendations are made for increasing the opportunity for EIA to influence decision making and for improving the Mexican EIA system.

List of Tables

List of Boxes

List of Figures

Appendixes:

List of acronyms and abbreviations

EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EWC	European Waste Catalogue
FS	Final Statement
hw	Hazardous waste
HWMF	Hazardous Waste Management Facilities
II	Incinerator of industrial waste
LC	Landfill for containment
LGEEPA	General law on ecological equilibrium and environmental protection (Ley General del Equilibrio Ecológico y Protección al Ambiente)
MI	Incinerator of Medical waste
Min of Env	Ministry of Environment officer
NGO	Non-governmental organisation
NOM	Official Mexican Standard (Norma Oficial Mexicana)
RR	Recycling and reuse facility
SEC	State Ecology Councils
SEMARNAT	Ministry of Environment (Secretaría de Medio Ambiente y Recursos Naturales)
T	Treatment facility
TS	Temporary storage facility

ACKNOWLEDGEMENTS

I would like to express my gratitude to my supervisors Dr. Dick Cobb and Dr. Alan Bond for their valuable advice, encouragement and support throughout this research and writing up process. This research would not have been possible without you.

I am grateful for the scholarship awarded by Consejo Nacional de Ciencia y Tecnología (CONACyT) in Mexico to undertake this research.

I would like to thank the Secretaria de Medio Ambiente y Recursos Naturales (SEMARNAT) in Mexico for helping and contributing in this research. In addition, I would like to thank Dr. Ulises Ruiz and Dr. Wini Schmidt from Deutsche Geselischaft für Technische Zusammenarbeit (GTZ) for their support and information provided.

I am thankful to all the interviewees (consultants, developers, Ministry of Environment officers, municipal authorities, members of the community and NGOs) for participating in this research and for sharing your perceptions and experiences.

Citlalli Becerril and Marilu Astudillo thanks a lot for participating in the review of the quality of Environmental Impact Statements and for providing interesting feedback.

I am deeply grateful to my mother Maria Teresa Osorio Reyes. Thanks for your love and encouragement. I dedicate this achievement to you.

At last, but not least, I would like to thank my extended family (Mary, Lupita, Luz, Gilberto, Brenda, Lucero, Gisela) and friends in Mexico and in Norwich for encouraging me and for sharing with me the PhD process. Friends in Mexico: Edaena, Maritza, Ivonne †, Cecilia, Bruno, Daniel, Omar and Leonardo. Friends in Norwich: Roberto, Helene, Denisa, Carla, Irena, Clare, Hyo Bong, Tiziana, Carlo, Andrea, Michal, Belina and Joss, Fabiola, Karla, Carlos, Elizabeth, Alejandra Rougon, Alejandra Trejo, Adriana, Adrian, Allison, Eugenia, Kayleigh, Sian, Simon, Jacquie, and Saffron.

Chapter 1

Introduction and overview

1.1 Objective and aims of the thesis

It has been acknowledged that there is a need to increase the infrastructure for the adequate management of hazardous wastes in Mexico (Presidencia de la Republica, 2007), and therefore hazardous waste management decision-making and planning need to be improved. EIA is a component for granting permission for, and the licensing of, waste treatment and disposal facilities in many countries (Petts and Eduljee, 1994) such as Mexico.

Environmental Impact Assessment (EIA) is defined as a systematic and integrative process to determine, to examine, and to evaluate the potential effects on the environment from development proposals prior to their approval to proceed (Petts and Eduljee, 1994; Sadler, 1996; Glasson *et al.*, 1999; Wood, 2003b). In Mexico, EIA is considered an instrument of environmental policy as it helps to propose projects that are compatible with the preservation of the environment and natural resources, and offers public certainty about the viability of the development proposals and prevention and mitigation of environmental impacts (INE, 2000). However, its practice and effectiveness in decision making has been questioned; see for example Bojórquez-Tapia and García (1998) and Palerm and Aceves (2004).

Studies around the world about the influence of EIA in decision making have analysed effects of EIA on decisions prior to the formal application and during the EIA process concluding that EIA has limited or weak influence in decision making. The relatively minor influence of EIA on decision making has been explained by the limited consideration of the socio-political and institutional context of decision-

making (Bartlett and Kurian, 1999) and the narrow perception of EIA as a tool for passive provision of information (Cashmore *et al.*, 2004).

EIA was founded on the rational model of decision making, which assumes that it is a process for generating, organising, and communicating information. However, it has been advanced that environmental assessment based on the rational model of decision making is inadequate to determine EIA's influence. Thus, research regarding the different models of EIA and its influence could provide evidence to illustrate more accurately the effect of EIA on decision making (Kørnøv and Thissen, 2000). Therefore, the objective of this thesis is to critically evaluate the influence of Environmental Impact Assessment (EIA) in decision-making process for Hazardous Waste Management Facilities (HWMF) in Mexico.

Since decision making for HWMF encompasses different stages of decision making with different stakeholders (e.g. planning and design by developers and consultants; environmental permit by Ministry of Environment's officers; and building permit by municipal authorities), the aims of this research are to:

- determine the influence of EIA on decisions regarding the planning and design of HWMF, the environmental permit, and building permit;
- determine the influence of EIA on decision-making for HWMF from stakeholders' perspectives (developers, consultants, Ministry of Environment officers, municipal authorities, members of the community and NGOs), and
- critically examine the processes and practice in HWMF decision making process in Mexico against the theoretical models of EIA suggested in literature.

1.2 Thesis outline

To evaluate the influence of EIA in decision-making process for HWMF in Mexico it is necessary to understand hazardous waste management, environmental impacts, and decision making. As well as the different theoretical models of decision making and of EIA suggested in literature. Thus, Chapter 2 describes hazardous waste definition,

environmental impacts, and management; followed by a description of hazardous waste management, environmental impacts from hazardous waste management facilities, and hazardous waste management in developing countries. Then, it describes hazardous wastes in Mexico; definition, generation, and hazardous waste management.

Chapter 3 explains hazardous waste management decision making; the relevance of EIA; as well as the steps of EIA for waste management facilities. The Chapter then focuses on EIA and HWMF decision making in Mexico. It provides an overview of the EIA system followed by a description of the EIA system for HWMF decision making.

Chapter 4 presents the empirical influence of EIA in design and consent decisions; how the limited influence of EIA on decision making has been linked to the poor development of EIA theory, and how development of EIA theory-building has been suggested to improve the effectiveness and practice of EIA. The Chapter then describes the framework to understand the role of EIA in decision making based on decision making models, planning theories, implicit models and outcomes of EIA identified in literature.

Chapter 5 explains the research design used in this research. Different research designs are discussed and an explanation is given of why a case study approach was adopted. The Chapter then describes the data collection method used (documents and semi-structured interviews), the sampling of project applications for HWMF, and the analysis of the data collected. In addition, it indicates how the quality of EISs was reviewed, and how the evaluation of the EIA system for HWMF was undertaken.

Chapter 6 presents the result of the research, examining the practical influence of EIA on decision making for HWMF in Mexico in the different stages of decision making. First, it describes the quality of EISs for HWMF and the evaluation of the EIA system for HWMF in Mexico. The Chapter then presents the findings about the different models of EIA identified in the stages.

Chapter 7, the conclusions, presents a synthesis of the results of this investigation. First, it describes the theoretical models of decision making and how these relate to project selection and design of HWMF. The Chapter then focuses on the environmental permit and building permit decision making in relation to the models. The Chapter finally reflects on the influence of EIA on decision making and makes recommendations.

Chapter 2

Hazardous wastes, hazardous waste management, and hazardous wastes in Mexico

2.1 Introduction

Environmental Impact Assessment (EIA) is considered in Mexico an instrument for environmental policy and it is part of Hazardous Waste Management Facilities (HWMF) decision making. However, its practice has been considered as poor and its effectiveness and therefore its influence has been questioned. Thus, this chapter sets the context for the investigation of the influence of EIA on decision making for HWMF in Mexico. First, it defines hazardous waste (hw) generally, and describes the environmental impacts, and management of hw. Then, it reviews hazardous waste management in developing countries. Finally, it describes hazardous wastes in Mexico; definition, generation, and management.

2.2 Hazardous wastes

Hazardous wastes are defined as wastes that, because of the substances contained, may bear any of the following characteristics: corrosive, toxic, reactive, carcinogenic, infectious, and irritant or harmful (Williams, 2005). Due to these characteristics they may be harmful to human health and toxic to the environment. However, hazardous wastes are difficult to define with precision because not only does chemical composition make a waste “hazardous”, but also the quantity of the waste, its physical state, the way it is handled, and the receiving target (Rushbrook and Finnecy, 1988). Some characteristics are difficult to assess (e.g. toxicity and

corrosivity) since hazardous wastes are generally a mixture of different substances, each with specific properties, which makes the determination of the hazard complicated (Parfitt *et al.*, 1993).

The Basel Convention on the Control of Transboundary movements of Hazardous Wastes and their disposal, adopted in 1989, defined hazardous waste according to wastes streams (e.g., clinical wastes from medical care in hospitals; wastes from the preparation of pharmaceutical products; wastes from heat treatment and tempering operations containing cyanides), and according to hazardous characteristics (e.g., explosive, flammable, oxidizing) (United Nations Environment Programme, 2000). However, the characteristics or terms used to define these types of wastes vary between countries and regulations (See Table 2.1). Using Mexico as an example of a developing country, it can be observed that its legislation considers less hazardous characteristics compared to the Basel Convention and to the European Council Directive (See Table 2.1) (Commission of the European Communities, 1991; United Nations Environment Programme, 2000; SEMARNAT, 2006a).

At an international level various efforts have been made to create a common hazardous waste classification system but with limited success. For example in Europe, the European Waste Catalogue (EWC) and the Hazardous Waste List (HWL) have been developed and are reviewed constantly to increase the compatibility of classification of wastes between the European countries (Brodersen *et al.*, 2002). However; their implementation has been slow and for the majority of countries in Europe, neither HWL nor the EWC is applied for their own hazardous waste classification. Indeed, some countries report their hazardous wastes according to their own national classifications, some according to the Basel classification and others according to the HWL (Brodersen *et al.*, 2002). In addition, certain wastes are considered as hazardous in one country but not in another, and some countries have special waste streams which could be defined as hazardous but these are not included in the HWL (Brodersen *et al.*, 2002).

Hazardous wastes are diverse and may take the form of solids, liquids, contained gases or sludges (Baker *et al.*, 2004; Williams, 2005). Examples of hazardous wastes are waste oils, halogenated solvents, unused pesticides, acids, heavy metals, mercury,

clinical wastes, soils contaminated with heavy metals, and wood preservatives (Batstone *et al.*, 1989; Commission of the European Communities, 1991; Williams, 2005). Other categories of hazardous wastes are clinical wastes or healthcare wastes, and household hazardous wastes. Clinical wastes include wastes generated in hospitals and healthcare facilities such as blood or other body fluids, excretions, drugs, syringes, needles or sharp instruments. Some examples of household hazardous wastes are garden pesticides and herbicides, paints, medicines, oils, batteries, and solvents (Williams, 2005).

Many industries use chemicals in their processes that are hazardous to health or may pose a physical hazard. For example, toxic chemicals include xylene, phenol, and propylene oxide; while carcinogenic chemicals include aldrin, formaldehyde, and dioxins. All these hazardous chemicals may be generated as part of various industries' waste streams (Williams, 2005). Around the world, hazardous wastes are generated from a wide diversity of industries such as manufacturing, quarrying, electricity and construction (Williams, 2005). In some countries in Europe, the main source of hazardous waste is manufacturing industry. For example, in Germany, Finland and Norway more than 75% of the hazardous wastes are generated in the manufacturing sector (e.g. manufacture of refined petroleum products, manufacture and processing of basic metals) (Brodersen *et al.*, 2002; Williams, 2005).

The amounts of hazardous wastes generated around the world appear to be increasing (Baker *et al.*, 2004). According to the Basel Convention Secretariat, the amount of hazardous wastes reported by countries around the world to the Basel Convention in 2001 was around 108 million tonnes; however, accurate amounts of waste being generated on a global scale are difficult to calculate due to the lack of reporting in many countries, and, as noted previously, the variability in definitions and survey methods employed in different countries (See Table 2.1) (Baker *et al.*, 2004).

Table 2.1 Hazardous characteristics used to define hazardous wastes in different regulations

Basel Convention for the Control of Transboundary movements of Hazardous Wastes (United Nations Environment Programme, 2000)	**Council Directive on Hazardous Waste 91/689/EEC** (Commission of the European Communities, 1991)	**NOM – 052 – SEMARNAT – 2005 Official Mexican Standard which establishes the characteristics, procedure for the identification, classification, and list of hazardous wastes** (SEMARNAT, 2006a)
Explosive	✓	✓
Flammable liquids or solids	✓	✓
Substances or wastes liable to spontaneous combustion		✓
Substances or wastes which, in contact with water emit flammable gases		✓
Oxidizing	✓	
Organic Peroxides		
Poisonous (Acute)		
Infectious substances	✓	✓
Corrosive	✓	✓
Liberation of toxic gases in contact with air or water	✓	
Toxic (delayed or chronic)	✓	✓
Ecotoxic	✓	
	Irritant Harmful Carcinogenic Teratogenic Mutagenic	

2.2.1 Hazardous wastes management and environmental impacts

Hazardous wastes can have short and long-term effects on public health as well as on the environment. Short term effects on human health include acute poisoning by inhalation, ingestion, or skin absorption; and damage to skin and eyes (Batstone *et al.*, 1989). Human health can also be affected by clinical wastes if handled inappropriately such as contaminated hypodermic needles which can potentially transmit and spread blood-borne diseases such as HIV and Hepatitis (Holliday, 2004). Long term effects on human health range from asthma to lung cancer (Batstone *et al.*, 1989).

The effects on the environment from hazardous wastes are related mainly to toxic contamination of soil, water and air. The percolation of hazardous wastes leachate can change water chemistry affecting all levels of an ecosystem (Baker *et al.*, 2004). In this case, hazardous wastes affect lower food chain organisms and therefore the availability of food through the food chain. Hazardous wastes can also be accumulated in the food chain and be ingested by higher organisms like humans (Baker *et al.*, 2004). The damage due to the contamination of surface or ground waters can be irreversible and could persist for a long period of time (Chivers, 1983; Orloff and Falk, 2003). Ingesting, inhaling, or touching contaminated soil, as well as eating plants or animals that have accumulated soil contaminants can adversely impact the health of humans and animals (Baker *et al.*, 2004). Air pollution can cause respiratory problems and other adverse health effects as contaminants are absorbed from the lungs into other parts of the body; certain air contaminants can also harm animals and humans when they are in contact with the skin (Baker *et al.*, 2004).

Since hazardous wastes can have significant impacts on the environment and human health, the inadequate management is significantly important. Agenda 21, which is an action plan to be taken by members of the United Nations, considered environmentally sound management of hazardous wastes of paramount importance for proper health, environmental protection and natural resource management, and

sustainable development (United Nations Division for Sustainable Development, 1992).

Hazardous waste management includes generation, storage, treatment, recycling, reuse, transport, recovery and disposal (Petts and Eduljee, 1994). According to guidelines for the environmentally sound management of hazardous wastes (UNEP, 2009), the following hierarchy is advised: waste avoidance/minimization, recovery, and disposal. Waste avoidance and minimization incorporates measures such as the introduction of new technologies and methods to reduce or avoid the generation of wastes. In addition, changes in operating conditions may reduce the quantity or improve the nature of wastes, and segregation of waste streams may render them recoverable when the mixture was not. When waste avoidance is not possible, re-use, recycling and recovery becomes a preferable alternative to final disposal (UNEP, 2009). Waste treatment process options can be categorised into four types: physical, chemical, thermal (including incineration), and biological; landfill is considered the only disposal method (Petts and Eduljee, 1994). The same classification of waste treatment option has been extended for hazardous wastes for this research, and a brief description of the processes is shown in Table 2.2.

At each stage of waste management, potential direct and indirect impacts on the environment can be caused. Waste treatment is no different from other forms of processing and manufacture in terms of its potential to cause environmental pollution (UNEP, 2009). Waste handling and transportation produce impacts such as noise, dust, contamination, and traffic. Physicochemical treatment of hazardous wastes can result in gas emissions, spillages and uncontrolled reactions, which can affect air quality, soil, groundwater and, consequently, cause adverse health effects (Petts and Eduljee, 1994). Treatment and disposal methods generate controlled emissions, liquid discharges, and residues which are released to the environment; also, emissions and discharges can occur accidentally (Petts and Eduljee, 1994).

Table 2.2. Description of the treatment and disposal options for hazardous wastes.

Treatment option	Process
Recovery processes	Are considered as part of the physical treatment of wastes (Petts and Eduljee, 1994). Recovery consists of the separation of recoverable materials through different methods such as distillation, ion exchange, membrane separation and catalytic extraction. The recovered materials can be recycled which reduces the use of raw materials and the costs of waste disposal (Williams, 2005).
Physical treatments	Employ the physical properties of the hazardous wastes (e.g. boiling point of organic compounds and gravity). Physical treatments include carbon adsorption, fractional distillation, solvent extraction and sedimentation. Activated carbon adsorbs the organic material from solution or waste water components. Fractional distillation, relying on the different boiling points of organic material, separates the different compounds present. Solvent extraction is realised through the evaporation of volatile compounds. During sedimentation, hazardous suspended fine solid materials are separated from a solution employing the effects of gravity (Williams, 2005)
Chemical treatments	Include a variety of methods such as neutralisation of acidic or alkaline wastes to produce a neutral solution, application of ion exchange resins which remove inorganic materials (e.g. heavy metals), oxidation/reduction reactions to produce less hazardous components (Williams, 2005). These treatments reduce the toxicity of hazardous wastes (Petts and Eduljee, 1994; Williams, 2005)
Biological treatments	Biological treatments are classified as aerobic and anaerobic. In the aerobic system, microbiological organisms convert the organic components of hazardous wastes into carbon dioxide and water; in the anaerobic system, wastes are converted into methane and carbon dioxide. Some compounds are easy to break down such as alkenes, alcohols and aldehydes; while other components like those containing halogenated compounds are difficult to degrade (Williams, 2005).
Thermal treatment	Involves the combustion of the wastes as well as their derived gaseous products in incinerators such as rotary kilns, fluidised bed and vortex incinerators (Williams, 2005). Incineration can be a safe and effective method for destroying hazardous waste if it is adequately applied. It helps to reduce the volume of the wastes by up to 90 percent and the weight by 60 to 70 percent. The energy released can be used to generate electricity or heat (Orloff and Falk, 2003). Incinerators generate flue gas emissions which require extensive clean-up to remove potentially highly toxic pollutants. In addition, the flue gas treatment systems are expensive (Williams, 2005).
Disposal option	**Process**
Landfill	Is a disposal facility where hazardous wastes are placed and stored in the soil (Visvanathan, 1996). High-technology landfills for hazardous wastes are designed with natural and synthetic polymer barriers that contain the waste and prevent leachate moving beyond the site. The interaction between the barriers and the waste is minimal and the leachate is contained by liner systems which are separated by impermeable synthetic barriers (Williams, 2005). Not all hazardous wastes can be landfilled because some of them can damage the natural and synthetic liners (e.g. flammable and industrial solvents) (Orloff and Falk, 2003).

Potential sources of impact from a treatment or disposal facility are grouped, according to Petts and Eduljee (1994), into three categories: impacts due to land-take, impacts from plant operation, and impacts from plant emissions and discharges. Impacts due to land-take include changes to the landscape of an area, loss or displacement of flora and fauna from the site, noise emissions, dust, traffic, as well as impacts on the geology and hydrogeology of the site, changes to the land-use and socio-economic characteristics of the area. Impacts from plant operations involve noise emissions from plant and equipment, and traffic generated by the operation (Petts and Eduljee, 1994).

The impacts from HWMF are reflected in recommendations made by UNEP and in regulations such as those in the European communities. According to UNEP (2009), treatment and disposal sites should be designed to prevent releases to the environment; for example, they should consider the collection and treatment of spillages, and the run-off of contaminated rainwater. Decommissioning should incorporate cleaning of the facility (i.e. equipment and hard standing areas) which should minimize the likelihood of future contamination. Post closure supervision of hazardous waste management facilities should be undertaken, especially in landfill facilities. In landfill sites decommissioning also involves periodical analysis of leachate or borehole abstracts located near the site to investigate the presence of contaminants or specific hazardous constituents (UNEP, 2009).

In the regulations of the European communities on landfills for wastes (Council Directive 1999/31/EC) it is stated that landfills must be situated and designed so as to meet the necessary conditions for preventing pollution of the soil, groundwater or surface water and ensuring efficient collection of leachate (European Commission, 1999). Protection of soil, groundwater and surface water is to be achieved by the combination of a geological barrier and a bottom liner. Measures shall be taken to minimise nuisances and hazards arising from landfill (emissions of odours and dust; wind-blown materials; noise and traffic; birds, vermin and insects; formation and aerosols; and fires).

Since during landfilling emissions of gases and discharge of leachate can increase contaminant air concentrations and increase the risk of explosion, and adverse health and vegetation effects (Petts and Eduljee, 1994), landfill designs are highly engineered with natural and synthetic polymer barriers to contain the waste and prevent leachate moving beyond the site boundary (Williams, 2005). A double or multiple liner containment system would be typical. Containment systems require that there is minimal interaction of the barriers with the waste which would deteriorate the barrier system. The liner systems use a leachate drainage system, separated by impermeable synthetic barriers (Williams, 2005).

In relation to health effects from hazardous waste landfills, the results from different studies vary in their conclusions and more studies are still being developed. For example, a study concluded that people living within a three kilometre radius from a hazardous waste landfill have a small but statistically significant higher risk of non-chromosomal congenital anomalies such as neural-tube defects, malformation of the cardiac septa, and malformations of the great arteries and veins (Dolk *et al.*, 1998). However, another study that investigated the cancer risks in populations living near landfill sites (including hazardous wastes landfills) in Great Britain found no excess risks of bladder, brain or hepatobiliary cancer, or leukaemia (Jarup *et al.*, 2002). Mari *et al.* (2009) assessed human health risks derived from environmental exposure to heavy metals and polychlorinated dibenzo-*p*-dioxins and dibenzofurans (PCDD/Fs) around a hazardous waste landfill in Spain. It concluded that it is highly unlikely that there are any additional non-carcinogenic and carcinogenic risks for the population living near the hazardous waste landfill.

Regarding hazardous waste incinerators, they generate acid gases, carbon dioxide, metals, etc. which increase the concentration of contaminants in the air (Petts and Eduljee, 1994) and the chance of exposing people and the environment to air contaminants in areas where unfavourable weather conditions exist (i.e. no air circulation). Hazardous waste facilities may cause unacceptable contamination in areas with no air circulation. In particular the young, the elderly, and people suffering with respiratory ailments are more susceptible to exposures to air contaminants (Environmental Protection Agency, 1997). Therefore, flue gas emissions from the incinerators require extensive clean-up using a variety of systems

such as electrostatic precipitators, scrubbers and bag filters to remove potentially highly toxic pollutants (Williams, 2005).

Waste incineration regulation in the European community (Directive 2000/76/EC) aims to prevent or reduce negative effects on the environment caused by this type of facility (European Commission, 2000). Regulation focuses on reducing pollution by emissions into the air, soil, surface water and groundwater. It establishes operational conditions, technical requirements and emission limit values such as dust, nitrogen oxides (NOx), sulphur dioxide (SO_2), hydrogen chloride (HCl), hydrogen fluoride (HF), heavy metals and dioxins and furans. In addition, it sets controls on releases to water in order to reduce pollution on marine and fresh water ecosystems.

Research has been undertaken to determine the effects of hazardous waste incinerators (HWI) in public health. For example, Schuhmacher *et al.* (2004) studied the levels of polychlorinated dibenzo-*p*-dioxins (PCDD) and dibenzofurans (PCDF) accumulated in adipose tissue of subjects living in the area under potential impact of a hazardous waste incinerator. Results indicate that there is not any additional significant exposure to PCDD/FS for the population living in the vicinity of the HWI.

2.2.2 Hazardous waste management in developing countries

In developing countries, landfilling is the most popular means of hazardous waste disposal because it is the least expensive option and needs low technical operating requirements; nevertheless in developed countries it is regarded as the last resort for hazardous management (Orloff and Falk, 2003). Landfilling may be considered as a safe and cost effective method of waste disposal when the practices are adequate (Orloff and Falk, 2003; Williams, 2005). However, the construction of high-technology landfills is expensive, especially for developing countries, and consequently the disposal of hazardous waste is often realised through unregulated landfills (Orloff and Falk, 2003).

Hazardous waste management in developing countries represents a significant problem because often there are no appropriate facilities, and policies and regulations are not well established. In China, for example, a sound management of hazardous wastes has not been established; the strategy, policies, regulations, and guidelines at the national level are still in preparation, and the experience with hazardous waste management is limited at the local level (Li *et al.*, 2002). In Brazil, clinical waste management is inadequate; healthcare facilities do not comply with the regulations and clinical wastes are poorly segregated, resulting in the mixing of clinical wastes with municipal solid waste which therefore, represents a hazard for the workers and the general public (Da-Silva *et al.*, 2005).

In most Latin American countries, waste disposal facilities are unregulated or partially controlled and it is a common practice to dispose of hazardous wastes in unregulated landfills, especially sanitary landfills (Orloff and Falk, 2003). This practice is likely to continue as the construction of high-technology landfills with multiple synthetic liners, extensive monitoring devices, and gas collection systems may be beyond the resources of the countries (Orloff and Falk, 2003).

2.3 Hazardous wastes in Mexico

2.3.1 Definition and generation

In Mexico, hazardous wastes are described as ‘dangerous wastes’ which exhibit any of the following characteristics: corrosive, reactive, explosive, toxic, flammable, and infectious; and due to these characteristics may pose a danger for the ecological balance and the environment (Congreso General de los Estados Unidos Mexicanos, 2003; SEMARNAT, 2006a). Hazardous medical wastes are defined as those generated during human or animal health care activities in health centres, clinic or research laboratories, teaching or research centres; that again, due to its characteristics may pose risks to health and the environment (e.g. blood, needles) (SEMARNAT, 2003).

The classification of a waste as "hazardous" is established in Official Mexican Standards (NOMs) which describe the methods to determine the characteristics of wastes, as well as the list of hazardous wastes and the concentration limits of the substances contained. Specifically, the Official Mexican Standard (NOM-052-SEMARNAT-2005) defines hazardous wastes according to the process that generated them and the properties displayed (SEMARNAT, 2006a). The properties are determined based on criteria that consider the concentration, physical and chemical properties. For example, a criterion to define a corrosive waste is the pH. If a liquid or in solution waste has a $pH \leq 2$ or $pH \geq 12.5$ it is considered as corrosive.

According to the Ministry of Environment, the estimated generation of industrial hazardous wastes in Mexico reported between 2004 and 2007 was 7,813,504.9 tonnes (DGGIMAR, 2009a). A precise figure of hazardous medical wastes generated is not available, one estimate indicates that 191,553 kilograms are generated per day; however, this figure does not consider the medical wastes generated in facilities such as laboratories and small health centres (DGGIMAR, 2009a). In 2008, the generation of hazardous wastes was concentrated in Mexico City and its surrounding areas (31% of the total volume generated), followed by Chihuahua (17%) in the north part of the country (See Fig. 2.1) (SEMARNAT, 2008b). Regarding the generation per types of hazardous wastes, thirty percent of hazardous wastes generated were used oils; twenty percent were solid wastes which included asbestos, wastes from the industrial sector, and heavy metals; and sixteen percent were medical wastes (SEMARNAT, 2008b).

Household hazardous waste is also an escalating problem in Mexico (Buenrostro Delgado *et al.*, 2008). According to Buenrostro Delgado *et al.* (2008), municipal solid waste is mixed with hazardous wastes generated from medium businesses such as physicians, dental practices, automotive repair service shops, and photography centres. This practice is related to public unawareness of the health and environmental risks, and gaps in norms and legislation (Buenrostro Delgado *et al.*, 2008). Consequently, household hazardous wastes are mixed and deposited at sites destined for municipal wastes; the mixture of both waste types increases the risk, of public health and environmental impacts (Buenrostro Delgado *et al.*, 2008).

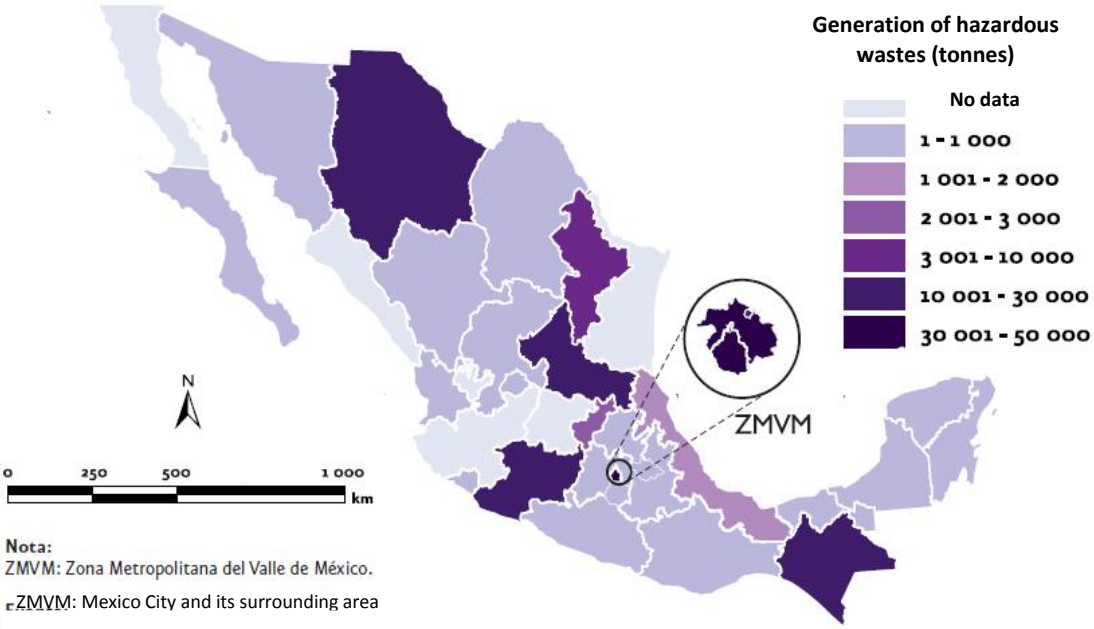

Fig. 2.1 Volume of hazardous wastes generated in Mexico based on the information reported from industries registered in the database of hazardous wastes generators. Source: SEMARNAT (2008b).

A precise figure of household hazardous waste in Mexico has not been reported and studies about its generation are scarce. However, Buenrostro Delgado *et al*. (2008) undertook an analysis of the household hazardous solid waste generated in an urban settlement in Mexico and determined that 1.6% of solid waste generated in households was hazardous waste. Household hazardous waste encompassed 85 different components such as batteries, paints, home cleaning products, and syringes.

2.3.2 Hazardous waste management in Mexico

Mexican legislation defines hazardous waste management as activities that include the temporary storage, collection, transport, re-use, treatment, recycling, incineration, and landfill for containment (Presidencia de la República, 2006). However, legislation for hazardous waste management in Mexico is considered incomplete and limited (Cortinas and Mosler, 2002). For example, the Official Mexican Standards (NOMs) regulate landfills for containment and incineration activities for hazardous

waste management, but no such regulation exists for the recovery, treatment, and recycling activities (Cortinas and Mosler, 2002). In addition, there is no regulation for hazardous wastes such as batteries, fluorescent lamps, and used containers of pesticides (Cortinas and Mosler, 2002).

Examples of industrial hazardous wastes recycled in Mexico are accumulators, solvents, used oils, heavy metals, resins, and hazardous waste containers (drums) (Cortinas and Mosler, 2002; DGGIMAR, 2009b). Industrial hazardous wastes treated include oils and materials contaminated with biphenyl polychloride, soils contaminated with hydrocarbons, flammable liquids, and solutions contaminated with heavy metals (DGGIMAR, 2009b). Examples of wastes which are incinerated are those contaminated with oils and solvents, expired drugs, medical wastes, solvents, sludge and contaminated soils (DGGIMAR, 2009b).

Landfills for containment of hazardous wastes are called "controlled confinements" in Mexico and are designed for the final disposal and isolation of hazardous wastes (Presidencia de la República, 2006). Mexican legislation states that this type of facility should only accept wastes that cannot be recycled or treated (Comisión Ambiental Metropolitana *et al.*, 2002). Examples of wastes placed in current facilities are sludge from industrial waste water treatment, materials and products from the chemical and pharmaceutical industry, slag, asbestos, and contaminated soil (DGGIMAR, 2009b).

The development of installations for hazardous waste management started in 1988, after the General Law of Ecological Balance and Environmental Protection came into force (Comisión Ambiental Metropolitana *et al.*, 2002). Regarding the hazardous waste management facilities (HWMF) installed, between 1999 and 2008, 399 HWMF with a capacity of 14.7 million tonnes were registered (SEMARNAT, 2008b). More than half of HWMF are dedicated to treatment followed by recycling (See Fig. 2.2) (SEMARNAT, 2008b). Between 2000 and 2008, 78.2% of the capacity for hazardous waste management was located in five states: Nuevo León (29.2%), Tabasco (17.2%), Estado de México (13.6%), Tamaulipas (11.2%) and Veracruz (7%) (See Fig. 2.3) (SEMARNAT, 2008b).

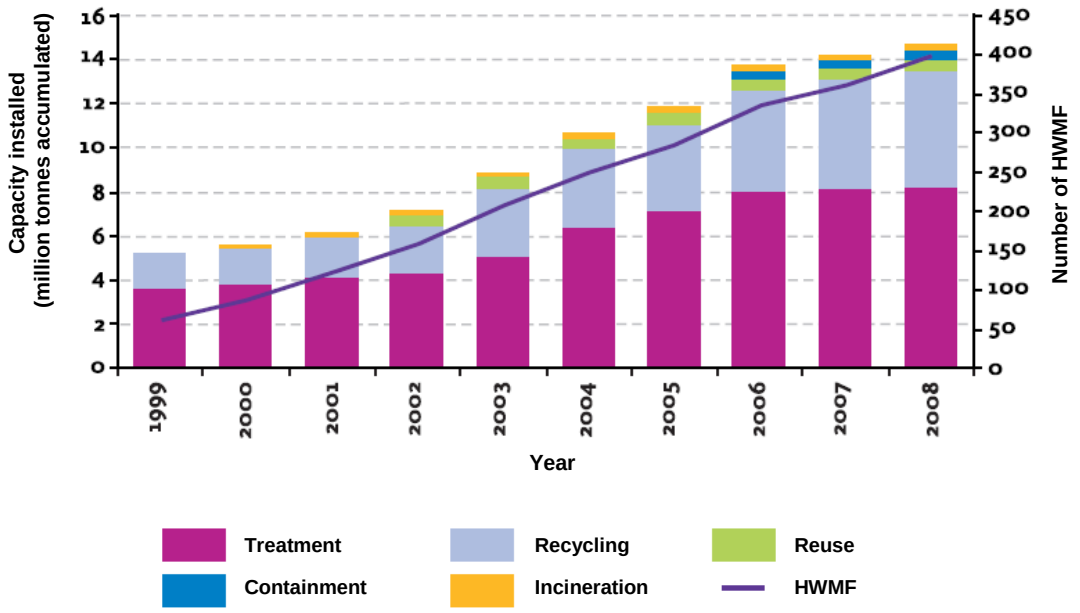

Fig 2.2 Capacity installed of HWMF in Mexico between 1999 and 2008. Source SEMARNAT (2008b).

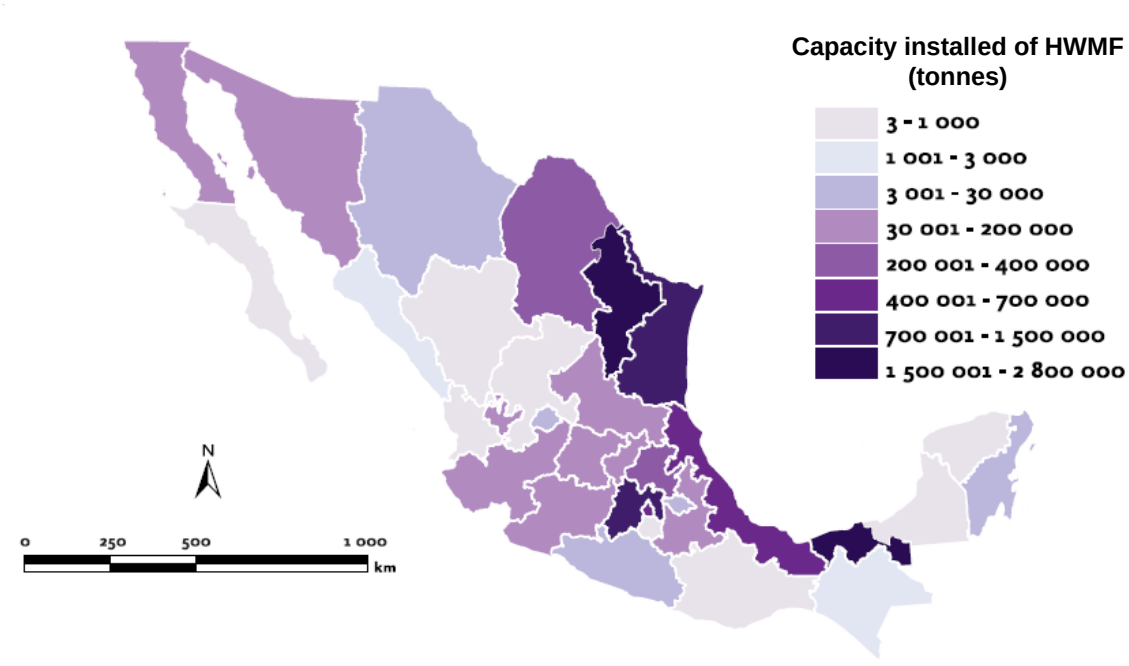

Fig. 2.3 Distribution of capacity installed of HWMF. Source: SEMARNAT (2008b)

It is acknowledged that hazardous waste management in Mexico is problematic due to inefficient regulations and planning; and that whilst the infrastructure for hazardous wastes has developed significantly, the geographical distribution is not adequate and does not satisfy the requirements to handle all waste streams (Cortinas and Mosler, 2002; Presidencia de la Republica, 2007). In addition, it has been estimated that only 10 per cent of hazardous wastes are adequately managed due to the lack of authorized installations and obsolete infrastructure that does not satisfy the technological requirements and demands (Cortinas, 2001; Cortinas and Mosler, 2002).

The need to improve and enhance the infrastructure for the management of hazardous wastes has been stated in the National Plan for Development 2007 – 2012 (Presidencia de la Republica, 2007). The current infrastructure does not comply with the technological requirements for the management of wastes; neither does it satisfy the existing demand from the producers of wastes (Comisión Ambiental Metropolitana et al., 2002; Presidencia de la Republica, 2007). According to the National Plan, one of the strategies to reduce the environmental impact of wastes in Mexico is to promote the development of adequate infrastructure for hazardous waste management (Strategy 12.2) (Presidencia de la Republica, 2007). Therefore, hazardous waste management decision-making and planning need to be improved in Mexico (Comisión Ambiental Metropolitana *et al.*, 2002). Environmental Impact Assessment (EIA) is part of Hazardous Waste Management Facilities (HWMF) decision making. However, EIA's practice, effectiveness and influence has been questioned. Thus, as the following chapters will describe, this study examines the influence of EIA on decision making for HWMF in Mexico.

Chapter 3

EIA and HWMF decision making in Mexico

3.1 Introduction

Environmental Impact Assessment (EIA) is an appropriate tool to be applied during decision making for Hazardous Waste Management Facilities (HWMF). This Chapter explains hazardous waste management decision making; the relevance of EIA; as well as the EIA process for waste management facilities. The Chapter then focuses on EIA and HWMF decision making in Mexico. It provides an overview of the EIA system, followed by a description of the EIA system for HWMF decision making.

3.2 Hazardous waste management decision making

Participants in environmental management include the private sector, public or civil society, and the government (Randolph, 2004). In the case of hazardous waste management, participants include the firms that generate the hazardous wastes; the firms that recycle, store, treat, transport and dispose of such wastes (developers); the state, federal, and local government; and the general population (Gottinger, 1993). Each of these will be considered in turn.

3.2.1 Private sector

Hazardous waste generators

Each firm or generator of hazardous wastes chooses a treatment and disposal technology or technologies (e.g. incineration, landfill), and options to manage its wastes (e.g. on-site or off-site). The options to choose are also subject to laws and regulations, types and amount of wastes, transportation distance, safety of the hazardous waste management option, and the environment where the technology is located. From an economic model perspective, the decision of the generators of hazardous wastes also considers the private costs and expected payment for any damage costs to the environment (Gottinger, 1993).

Developer of hazardous waste facilities

The decision of the developer to build a new facility depends on many factors such as market demand for the technology or technologies, institutional factors (e.g. state, federal and local government regulations, taxation and subsidization), distance from waste generator, and the level of safety of the facility. According to the economic model, the developer's decision is also subject to capital investment costs, operation and maintenance costs, closure and post-closure costs, transportation costs, damage costs to human health and the environment (Gottinger, 1993), as well as gate fees payable for waste.

Technical and non-technical factors should be considered when siting a new hazardous waste management facility. For example, according to the Environmental Protection Agency, technical factors include geology and soils, surface and ground water, flora and fauna, air quality and weather conditions (See Table 3.1) (Environmental Protection Agency, 1997). Non-technical factors to be considered are the people living and working around the facility, number of people, their ages and their health (Environmental Protection Agency, 2000).

Table 3.1 US Environmental Protection Agency recommendations for siting HWMF (Environmental Protection Agency, 1997).

Recommendation	Description
Should not be located over high-value groundwater or areas where the underground conditions are not well understood	The complexity and importance of the groundwater for drinking supplies, the direction of groundwater flow, and the ability of the groundwater to be replenished should be determined. Also, the design of hazardous waste management facilities should consider steps to avoid leaks or spills, such as adding more spill containment systems, and increase frequency of sampling for the detection of spills.
Should not be built in areas with earthquake activity	Earthquakes can damage structures that hold wastes and result in accidental releases to groundwater, surface water, soil and air. Therefore, safety measures should be taken, such as design structures that resist maximum horizontal acceleration and build structure containment systems to prevent spills.
Should not be built in floodplains	Flood waters can float waste storage tanks off their foundation, and flow into waste ponds and carry hazardous contents downstream. In addition, high flow rates can erode waste piles, landfills, and other waste management structures.
Should not be located in wetlands	Wetlands are ecologically important as one of the most productive ecosystems in the world. Hazardous waste spilled can spread faster in this ecosystem and destroy fish and wildlife habitats.
Should avoid being built in areas where the weather conditions are unfavourable	The siting and design of hazardous waste management facilities should consider the land features and wind patterns of the area, pollutant mixing in the air, seasonal effects on wind patterns and dispersion of air contaminants.
Should avoid being located near sensitive populations or in densely populated areas	They should not be built near schools, nursing homes, day care centres and hospitals.
Should not be located in karst areas	Karst areas consist of rock that slowly dissolves when water passes through it. Dissolving rock leaves tunnels and caves that could increase the risk of hazardous waste spills from hazardous waste facilities and contaminate the groundwater.

Environmental siting criteria can be used together with technical criteria or performance standards (Petts and Eduljee, 1994). Internationally, site-selection criteria for hazardous waste facilities address issues such as: the proximity of the site to residential areas; the likelihood of contaminants reaching underground water, soil permeability and other geological factors, possibility of flood and/or earthquake, safety of transport routes, protection of environmentally sensitive land, safety issues, and the availability of services (i.e. access) (Petts and Eduljee, 1994). For example, the US Environmental Protection Agency has several recommendations regarding the siting of hazardous waste management facilities (See Table 3.1) (Environmental Protection Agency, 1997).

3.2.2 Public

Household hazardous wastes include leftover household products that contain corrosive, toxic, ignitable, or reactive ingredients. Wastes such as paints, cleaners, oils, batteries, and pesticides contain potentially hazardous ingredients which require special care when they are disposed of (Environmental Protection Agency, 2008).

The public has a significant part to play in household hazardous waste generation and management. For example, consumers of batteries shape the market through their buying practices and therefore shape the battery waste stream (Bio intelligence service and European Commission, 2008). Therefore, the European community is increasing the awareness of recycling possibilities and the capacity for choosing the right battery for a device to help to reduce the amount of battery waste (Bio intelligence service and European Commission, 2008).

Improper disposal of household hazardous wastes such as pouring them down the drain, on the ground, into storm sewers, or putting them into the household waste can pollute the environment and pose a threat to human health (Environmental Protection Agency, 2008). Effective household hazardous waste management, on the other hand, helps to conserve resources and energy that would be expended in the production of more products; helps to save money and reduce the need for generating hazardous substances; and helps to prevent pollution that could endanger human

health and the environment (Environmental Protection Agency, 2008). The USA, for example, has collection points in municipalities and local governments which facilitate reuse, recycling and proper disposal of household hazardous wastes (Environmental Protection Agency, 2008).

When a HWMF is to be built, local residents are frequently concerned about the exposure to hazardous substances through air, water, soil and food; the likelihood of exposure to accidental environmental releases; decrease of outdoor activities; devaluation of surrounding land and personal property; and the displacement of people from existing jobs (Environmental Protection Agency, 2000). These concerns generate a public opposition to waste management facilities, (generally called the "Not In My Back Yard" (NIMBY) syndrome (Sager, 2001)), resulting in conflict, delays and permit challenges from the community (Environmental Protection Agency, 2000).

Studies about public opposition to HWMF have related the NIMBY syndrome to the perceived risk factors, lack of public trust in the developer in managing hazardous waste facilities, lack of public confidence in the state agency or regulator, and lack of public involvement in the facility siting process (Petts and Eduljee, 1994; Ibitayo, 2002). The lack of public trust has been explained by previous negative experience with government institutions and industry, the non-admission of previous mistakes, withholding of information from the public, and a perceived supportive relationship between the developer and the regulatory agency (Ibitayo, 2002).

To improve the success of siting HWMF, early involvement of the general public is necessary (especially the population of the host communities), as well as environmental or public interest groups, in the siting process (Ibitayo and Pijawka, 1999; Environmental Protection Agency, 2000). Several recommendations have been made regarding the siting of hazardous wastes facilities; for example, citizen concerns should be incorporated into risk mitigation plans (Ibitayo and Pijawka, 1999); the developer should identify the community's existing socioeconomic characteristics and values in advance; and permit authorities should contact communities, hold hearings, and promote dialogue before the site selection and technical design decisions are made (Environmental Protection Agency, 2000).

Though it has been recognized that extensive public involvement does not guarantee public support, public participation and dialogue improves the success of the siting process and potentially reduces distrust of the developers and permitting agencies in the eyes of the local community (Environmental Protection Agency, 2000; Ibitayo, 2002).

3.2.3 Government

Government (either local or national) has an important role in hazardous waste management decision-making as they have to approve the environmental permit (Randolph, 2004). The environmental authority through different mechanisms such as regulations, taxation, and subsidies influences the choices of generators of hazardous wastes. It restricts or forbids the use of some technologies for certain or all hazardous wastes, requires that technical and location standards be met by HWMF, and influences their number, size and location (Gottinger, 1993).

The government, as an environmental planner, is responsible for regional hazardous waste management. Decision making about hazardous waste management is complex and several factors should be considered, from environmental and health effects, to technical, policy and financial considerations (Granados and Peterson, 1999). For example, technical factors that increase the complexity of the decisions are the multiple sources of hazardous wastes, the different characteristics which require different handling protocols and different treatment options, the amounts of various categories generated, and compatibility of wastes (Gottinger, 1993; Nema and Gupta, 1999).

For analyzing various management options for hazardous waste management in a region, both economic (Gottinger, 1993) and mathematical (Nema and Gupta, 1999) models have been suggested. These models consider practical variables such as the amount of hazardous waste, the characteristics of hazardous wastes, their compatibility, residues, technology to be used, the method of treatment and disposal, the risk and cost of the options.

Risk involves the identification of factors leading to an accident, its probability, the assessment of the probable outcomes of the accident, and the quantification of the consequences (Gottinger, 1993; Nema and Gupta, 1999). Risk is dependant on the characteristics of the wastes being managed, the waste management technologies used, and the environmental settings in which the wastes are treated and disposed (Gottinger, 1993). According to the mathematical model, the consequences of an accident can be estimated based on the physical and chemical properties of the hazardous waste released, its quantity and the sensitivity of the exposed environment (Nema and Gupta, 1999). However, it has been acknowledged that the risks to human health and the environment are difficult to quantify, and that the study of the relationship between hazardous substances in the environment and their effects on human health needs more development (Granados and Peterson, 1999).

Cost includes the capital investment costs, the operation and maintenance costs, closure and post/closure costs, transportation costs, and damage costs to human health and the environment. Damage cost to human health and the environment is categorized under the economical model as social costs; however these costs are difficult to determine and uncertain (Gottinger, 1993). The evaluation of alternatives for hazardous waste management using economic models (Gottinger, 1993) can be related to Cost-benefit Analysis. However; Cost-Benefit Analysis is still limited because the cost (value) of damages to human health and the environment are difficult to translate into monetary values (Petts, 1999).

Hazardous waste management seeks to minimize the total cost and total risk. However, the mathematical model for hazardous waste management shows these objectives to frequently have an inverse relationship and therefore are conflicting (Nema and Gupta, 1999), which makes environmental planning for hazardous waste management more complex.

Environmental plans (programmes and policies), which are outcomes of environmental planning deliberations, are used by the environmental authority for guiding decision-making (Faludi, 1987). For waste management planning, the planning authority applies national plans or strategies which set the decision-making framework and the objectives of waste management. In the case of the EU for

example, the waste strategy applies guiding principles such as the "proximity principle" and the "regional sufficiency principle"; as well as the hierarchy of waste management which encourages waste reduction, re-use and recovery, and disposal as the least desirable option (Williams, 2005).

A generic environmental planning process begins with scoping which is used to identify stakeholders and develop a work plan, followed by the identification of key issues and objectives, analysis of the planning situation, formulation of alternatives, assessment of impacts, and concludes with the implementation and monitoring (Randolph, 2004). It is in the assessment of impacts where the application of impact assessment tools such as Environmental Impact Assessment (EIA) become relevant for environmental planning (Randolph, 2004), and therefore for hazardous waste management decision making.

3.3 EIA and hazardous waste management decision making

Environmental Impact Assessment (EIA) is defined as a systematic and integrative process to determine, to examine, and to evaluate the potential effects on the environment from development proposals (e.g. crude oil refineries, nuclear power stations, waste disposal installations) prior to their approval to proceed (Petts and Eduljee, 1994; Sadler, 1996; Glasson *et al.*, 1999; Wood, 2003b).

EIA originated in the USA with the National Environmental Policy Act in 1969 and since then it has been institutionalized as a formal process in many other countries and international organizations (Sadler, 1996; Glasson *et al.*, 1999). Under legal arrangements (e.g. laws, regulations, procedures and guidelines) which establish the rules and steps for undertaking EIA, it is applied during the decision making process on the authorization of development proposals that can potentially have significant effects on the environment, and in theory, establishes terms and conditions for mitigating these effects (Sadler, 1996).

Environmental Impact Assessment (EIA) is a component of granting permission for, and the licensing of, waste treatment and disposal facilities in many countries (e.g. USA, Belgium, and the United Kingdom) (Petts and Eduljee, 1994). EIA is considered as adequate for the identification of options for hazardous waste management, and for ensuring that the planned site for the hazardous waste management facility is the most suitable location with minimum impact on the environment and health (United Nations Division for Sustainable Development, 1992; Petts and Eduljee, 1994; Williams, 2005).

The EIA process comprises a series of iterative steps which may vary between EIA systems (Glasson *et al.*, 1999; Morris and Therivel, 2001). Based on Petts (1999), these steps can be grouped in four main stages: activity definition, detailed assessment and EIA report preparation, decision-making, and implementation (See Table 3.2. and Fig. 3.1).

In the case of waste management projects, the integration of EIA into project selection, siting and design in theory helps to analyse the alternatives for the project according to the waste arisings; to choose preferred sites, processes and technologies; and to consider management and mitigation measures for the residual anticipated impacts (Petts and Eduljee, 1994).

During the scoping stage of the EIA process for waste management projects, the identification of impacts should consider key stakeholders, resources and land uses, activities, policies, geographic boundaries, and timing and duration of the activities (Petts and Eduljee, 1994). Depending on the jurisdiction, the EIA process for waste management facilities, is likely to consider impacts on flora and fauna, on geology and soils, on ground and surface water, on air quality and climate, on public health, on landscape and visual amenity, on transport, on land-use and heritage, social and economic impacts, and, impacts from noise and vibration (Petts and Eduljee, 1994; Williams, 2005).

Table 3.2 Typical Environmental Impact Assessment steps (Petts, 1999)

Activity definition
The *consideration of alternatives* includes the consideration of feasible approaches, alternative project locations, processes, operating conditions and the 'no action' option.
Project screening, to decide whether the application of EIA is necessary. This decision may be based partly on EIA regulations.
Scoping is undertaken to identify, at an early stage, possible key impacts and receptors, significant issues, and methods and levels of study needed.
Detailed assessment and EIA report preparation
The *description of the project*, the purpose of the project, its characteristics, stages of development, location, and processes are described.
The *description of the environmental baseline* where the present and future state of the environment is established. Describing the current situation and the predicted situation as a result from natural events and human activities, without the development.
The *identification of the main impacts* ensures that potential significant adverse and beneficial impacts are taken into account.
The *prediction of impacts* is undertaken to identify the magnitude of likely impacts. It is necessary to consider changes in the baseline conditions of the environment prior to the initiation of the development and during its lifetime. The standard techniques to aid impact prediction are checklists, matrices, flowcharts and networks, mathematical/statistical models, and maps and Geographical Information Systems.
The *evaluation of impacts' significance* is based on the magnitude and extent in space and time of the impact, together with the value, sensitivity, and recoverability of the receptors in order to focus on the main impacts.
Mitigation measures seek to avoid, reduce, remedy or compensate the significant adverse impacts.
Presentation of Environmental Impact Statement (EIS) or report for review and comment of interested parties. EIS is an integrated document which should describe the findings of the above mentioned steps and be transparent in relation to uncertainties and limitations.
Decision-making
Review involves a systematic appraisal of the quality of the EIS.
Decision-making for the project, of approval or rejection, involves a consideration by the relevant authority of the EIS (including consultation responses) together with other material considerations.
Implementation
Post-decision monitoring involves the assessment of outcomes of the development proposals once they have been approved. Monitoring in EIA can include baseline monitoring, compliance monitoring, and impact and mitigation monitoring. Baseline monitoring is undertaken to quantify natural variations and rates of change. Compliance monitoring is used to check that the conditions for the development proposals are met. And finally, impact and mitigation monitoring, also called *Auditing*, is used to compare predicted with actual impacts to assess the quality of predictions and determine the effectiveness of mitigation measures.
Consultation and participation with public and statutory consultees is useful to most stages of the EIA process; for example in determining the scope of an EIA and in evaluating the significance of the likely impacts. It helps to ensure the comprehensiveness of EIA and consideration of various' groups views in the decision-making process.

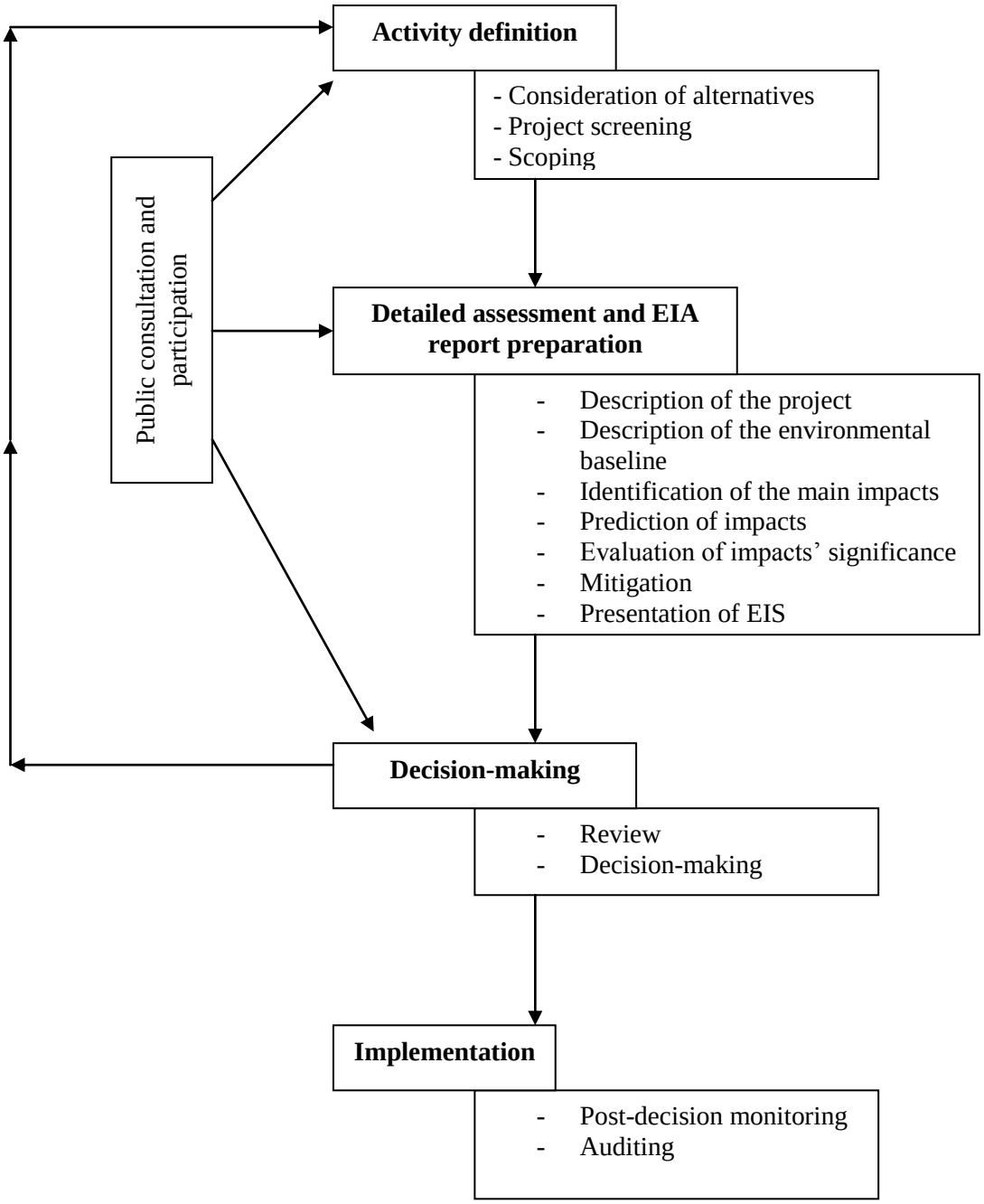

Fig. 3.1 Typical steps in the EIA process [Adapted from Glasson *et al*. (1999) and Petts (1999)].

The information generated by the EIA process is used in licensing, consent and planning decisions made by the planning authorities. For example, the Environmental Impact Statement (EIS) may have an impact on planning committee's decisions about modifications to be made on the project, and on the authorization decision (Petts, 1999). Also, the EIA process may affect developer's decisions about the design of the project, its location and environmental issues to consider (Petts, 1999). Therefore, the substantive immediate purpose of EIA is to aid decision making, both the primary decision which refers to the consent or refusal of the implementation of a development proposal, and decisions made constantly throughout the EIA process - from the inception of development proposals to the potential effects of decommissioning (Sadler, 1996; Weston, 1997; Glasson *et al.*, 1999; Petts, 1999).

3.4 EIA and HWMF decision making in Mexico

3.4.1 Overview of the EIA system in Mexico

In Mexico, EIA is considered as an instrument for environmental policy as it helps to propose projects that are compatible with the preservation of the environment and natural resources, offers public certainty about the viability of the development proposals and prevention and mitigation of environmental impacts (INE, 2000). EIA was incorporated in Mexican legislation in the Federal Law of Environmental Protection of 1982. But it was not until 1988 that EIA was considered as an assessment tool in the new environmental legislation (Palerm and Aceves, 2004).

The EIA procedure in Mexico starts with the presentation of an Environmental Impact Statement (EIS) by the developer. The EIS is submitted together with a permit application to the Ministry of Environment (SEMARNAT) who evaluates it and makes the decision whether to approve, deny, or conditionally approve the project (Palerm and Aceves, 2004). The EIS submitted should meet the requirements established by the Ministry of Environment (SEMARNAT) in "guides" or formats

which are specifically designed for different types of activities or development which are subject to the EIA process (Palerm and Aceves, 2004).

EIA is only required at the project level and two modalities of EISs are defined in regulations: 'regional' and 'particular' (SEMARNAT, 2000; Palerm and Aceves, 2004). 'Regional' EISs are those listed in Article 5 of the EIA regulations that have potential regional impacts and are screened according to the criteria defined in Article 11. All other Article 5 projects will require a 'particular' EIS and the analysis to be undertaken will be less extensive (Palerm and Aceves, 2004).

Regulations establish the general contents that EISs must present (SEMARNAT, 2000). In addition, EISs must be presented in the format and following the requirements established by the Ministry of Environment (Palerm and Aceves, 2004). The quality of EISs is assessed by the Ministry of Environment during the decision-making process but there are no external monitoring mechanisms (Palerm and Aceves, 2004). According to Palerm and Aceves (2004), Mexican EIA is a closed procedure as the projects for which EIA is mandatory are pre-defined and the contents of the EIS are strictly regulated; consequently, the process is inherently inflexible.

Once the EIS has been submitted to the Ministry of Environment, they must publish, in the Ministry of Environment's journal (*Gaceta Ecológica* which is available at the Ministry of Environment website), a list of all the projects being assessed in a certain period. According to regulations, the list must include the name of the applicant, date of filing, title and general characteristics of the project, the modality of EIS presented, and the specific location where the project will be located (SEMARNAT, 2000).

The Ministry of Environment may decide to undertake public consultation if a written request by an individual party is submitted to the Ministry within the period established in regulations (ten days after the project has been published in *Gaceta Ecológica)* (SEMARNAT, 2000; Palerm and Aceves, 2004). If the Ministry of Environment decides to conduct the public consultation, it may notify the developer,

who then has an obligation to publish the EIS summary in a local newspaper in order to announce a public meeting (Palerm and Aceves, 2004).

The Ministry of Environment is responsible for undertaking any public consultation and may or may not reflect the comments and observations made as a result in the final resolution (Final Statement) (Palerm and Aceves, 2004). The complete EIA evaluation procedure should take no more than 60 working days, but it can be extended by the Ministry of Environment to an additional 60 working days (Palerm and Aceves, 2004). The resolution made by the Ministry of Environment may be challenged by the developer, either by requesting a review by a higher authority or an appeal before a federal administrative court (Palerm and Aceves, 2004).

3.4.2 EIA system for HWMF decision making in Mexico

Mexico has a federal system which encompasses different levels of government: federal government, federal states (Entidades Federativas), and municipalities (Municipios) (Carbonell, 2003). The federal system acknowledges that each federal state is able to create its own local legislation (Carbonell, 2003). Thus, there are federal laws (leyes federales), state laws (leyes estatales), federal regulations (reglamentos federales) and state regulations (reglamentos estatales). However, for the protection of the environment, legislative authority is not devolved to the federal states and the federal government (through the Congress) creates relevant federal laws which all federal states apply through regional and local administration (Carbonell, 2003).

The federal law for the protection of the environment is the General Law on Ecological Equilibrium and Environmental Protection (LGEEPA) (Ley General del Equilibrio Ecológico y la Protección al Ambiente) (DOF, 1988a). This law defines EIA and lists the activities that are subject to this process at the federal level and at the state level. The EIA process at the federal and state level is established in the regulation derived from LGEEPA regarding environmental impact assessment (Reglamento de la Ley General del Equilibrio Ecológico y la Protección al Ambiente en material de Evaluación de Impacto Ambiental) (DOF, 1988b).

According to LGEEPA, the federal government regulates and controls hazardous waste management facilities (DOF, 1988a). Thus, the federal government through the Ministry of Environment (SEMARNAT) (Secretaría de Medio Ambiente y Recursos Naturales) is in charge of assessing the environmental impacts of hazardous waste management facilities and therefore of granting the environmental permit (DOF, 1988a).

Therefore, the regulation and policy implementation of hazardous wastes in Mexico falls exclusively under the jurisdiction of the federal government (Cortinas and Mosler, 2002; Organisation for Economic Co-operation and Development, 2003). One of the policy instruments for the management of hazardous wastes is the Environmental Impact Assessment (EIA) (Cortinas and Mosler, 2002) which is used to evaluate facilities for hazardous waste management including treatment, reuse, recycling and confinement or final disposal (SEMARNAT, 2000). Table 3.3a-b lists HWMF regulations and Official Mexican Standards relevant for the planning and design of the HWMF as well as for the HWMF decision-making process in Mexico. Specific Official Mexican Standards (NOM) for the planning and design of Landfill for containment and Incineration exist only (Table 3.3b).

Decision-making process

Hazardous Waste Management Facilities (HWMF) that require the authorization of the Ministry of Environment are the facilities for the temporary storage, reuse, treatment, recycling, incineration, and landfill for containment (DOF, 1988a; DOF, 1988b; DOF, 2003a).

Table 3.3a Regulations relevant for HWMF in Mexico

Laws	Ley General del Equilibrio Ecológico y la Protección al Ambiente (DOF, 1988a)	General law on ecological equilibrium and environmental protection
	Ley General para la prevención y gestión integral de los residuos (DOF, 2003a)	General law on prevention and management of wastes
Regulations	Reglamento de la Ley General para la prevención y gestión integral de los residuos (SEMARNAT, 2006b)	Regulation derived from the general law on the prevention and management of wastes
	Reglamento de la Ley General del Equilibrio Ecológico y la Protección al ambiente en materia de evaluación de impacto ambiental (SEMARNAT, 2000)	Regulation derived from the general law on ecological equilibrium and protection of the environment regarding environmental impact assessment
Official Mexican Standards (NOM) on hazardous waste	NOM-052-SEMARNAT-2005 (SEMARNAT, 2006a) Que establece las características, el procedimiento de identificación, clasificación y los listados de los residuos peligrosos.	Official Mexican Standard that establishes the characteristics, the procedure for the identification, classification and hazardous waste lists
	NOM-053-ECOL-1993 (Secretaria de Desarrollo Social, 1993a) Procedimiento para llevar a cabo la prueba d extracción para determinar los constituyentes que hacen a un residuo peligroso por su toxicidad al ambiente	Official Mexican Standard that establishes the procedure to determine if a waste is toxic due to its components
	NOM-054-ECOL-1993 (Secretaria de Desarrollo Social, 1993b) Procedimiento para determinar la incompatibilidad entre dos o más residuos considerados como peligrosos por la Norma Oficial Mexicana NOM-052-ECOL-1993	Official Mexican Standard that establishes the procedure to determine the incompatibility between two or more wastes classified as hazardous by the Directive NOM-052-ECOL-1993
	NOM-087-SEMARNAT-SSA1-2002 (SEMARNAT, 2003) Protección ambiental-salud ambiental- residuos peligrosos biológico – infecciosos – clasificación y especificaciones de manejo.	Official Mexican Standard regarding the environmental protection, environmental health, medical waste, classification and management
	NOM-133-ECOL-2000 (SEMARNAT, 2001) Protección ambiental – Bifenilos policlorados (BPCs) Especificaciones de manejo	Official Mexican Standard regarding the environmental protection - polychlorinated biphenyls (PCB). Conditions for management.

Table 3.3b Regulations relevant for HWMF in Mexico (Cont.)

Official Mexican Standards for Landfill for containment	NOM-055-SEMARNAT-2003 (SEMARNAT, 2004a) Que establece los requisitos que deben reunir los sitios destinados al confinamiento controlado de residuos peligrosos excepto de los radioactivos.	Official Mexican Standard that establishes the requirements that should be met by landfill for containment sites for hazardous wastes
	NOM-056-ECOL-1993 (Secretaria de Desarrollo Social, 1993c) Requisitos para el diseño y construcción de las obras complementarias de un confinamiento controlado de residuos peligrosos	Official Mexican Standard that establishes the requirements for the design and construction of complementary facilities of landfills for containment
	NOM-057-ECOL-1993 (Secretaria de Desarrollo Social, 1993d) Requisitos que deben observarse en el diseño, construcción y operación de celdas de un confinamiento controlado para residuos peligrosos	Official Mexican Standard that establishes the requirements that should be observed in the design, construction, and operation of containment cells for hazardous wastes
	NOM-058-ECOL-1993 (Secretaria de Desarrollo Social, 1993e) Requisitos para la operación de un confinamiento controlado de residuos peligrosos	Official Mexican Standards regarding the requirements for the operation of a landfill for containment for hazardous wastes
	NOM-145-SEMARNAT-2003 (SEMARNAT, 2004c) Confinamiento de residuos en cavidades construidas por disolución en domos salinos geológicamente estables.	Official Mexican Standard that describes the landfill for containment of hazardous wastes in caves built through the dissolution of geologically stable salt domes.
Official Mexican Standard for Incineration	NOM-098-SEMARNAT-2002 (SEMARNAT, 2004b) Protección ambiental – incineración de residuos, especificaciones de operación y límites de emisión de contaminantes	Official Mexican Standards regarding the environmental protection – incineration of wastes, conditions for the operation and pollutant emission limits.

The General Law of Ecological Equilibrium and Protection of the Environment (DOF, 1988a) states that EIA is the procedure through which the Ministry of Environment at the federal level awards the environmental permit and establishes the conditions that will have to be complied with by facilities for the treatment, containment or destruction of hazardous wastes. Thus, any person who wants to develop HWMF has to first obtain an authorization (environmental permit) from the Ministry of Environment regarding the Environmental Impact Assessment (EIA), and then obtain the authorization (building permit) from the relevant local authority. To obtain the authorization from the Ministry of Environment, the developer should submit an Environmental Impact Statement (EIS) to the Ministry of Environment.

The specific HWMF projects or activities that require the authorization from the Ministry of Environment at the federal level are (SEMARNAT, 2000):

a) Construction and operation of facilities for the containment (landfill for containment) of hazardous wastes
b) Construction and operation of facilities for the treatment, reuse, recycling or destruction of hazardous wastes. Except those facilities which are located inside the premises of the generator of hazardous wastes.
c) Construction and operation of facilities for the treatment or destruction of medical wastes. Except those facilities located inside hospitals, laboratories or mobile facilities.

The developer must submit the Environmental Impact Statement (EIS) and its summary to the Ministry of Environment (SEMARNAT, 2000). The Ministry of Environment undertakes the review of the EIS, checks that the project application meets the requirements established by regulations and creates the case file within the first ten days after the EIS was submitted (DOF, 1988a; SEMARNAT, 2000). If the EIS does not meet all the requirements, the Ministry of Environment may request that the developer provide more information regarding the content of the EIS within the following forty days (SEMARNAT, 2000).

The Ministry of Environment can consult experts, if needed, during the decision-making process in order to access more specific information for the decision making regarding the environmental permit (SEMARNAT, 2000). In this case, the Ministry

of Environment notifies the developer about the consultation and provides him with a copy of the results of the consultations (SEMARNAT, 2000).

The Ministry of Environment notifies the government of the State and the municipal authority about the project, where the facility is going to be located, and about the EIS of the project so that the local authorities can give their opinion to the Ministry of Environment (DOF, 1988a; SEMARNAT, 2000).

According to the Law (DOF, 1988a) and Regulation (SEMARNAT, 2000), once the Ministry of Environment receives the EIS and creates the case file, the EIS must be available for any member of the public to consult. The Ministry of Environment must publish the application made by the developer in its weekly journal ('*Gaceta Ecológica*').

Within ten days from the publication of the project application in the Ministry of Environment's journal, any member of the public can request to the Ministry of Environment to make the EIS available in the State where the facility will be located (DOF, 1988a; SEMARNAT, 2000).

Any member of the public can consult the EIS at the Ministry of Environment's offices at the federal level or at the state level (SEMARNAT, 2000). In addition, any member of the community can request a public consultation regarding the project (SEMARNAT, 2000). To request a public consultation, a written request should be submitted to the Ministry of Environment within the first ten days after the project was published in the Ministry of Environment's journal '*Gaceta Ecológica'*. The request should include the name of the project, reasons for the request, name of the person requesting the public consultation, and any other comment. During the following five days, the Ministry of Environment will notify to the member of the community whether the public consultation will be undertaken or not (SEMARNAT, 2000).

If the Ministry of Environment decides to undertake public consultation regarding the project, it notifies the developer about the public consultation and asks him to publish a summary of the project in a well read newspaper in the State where the

facility will be located. The information published should contain the name of the developer; a summary of the project or activity; location of the project; existing ecosystems and their conditions; main environmental impacts; and mitigation measures (SEMARNAT, 2000).

Any person can make comments about the project and propose preventive and mitigation measures within the first twenty days after the EIS is available to the public (DOF, 1988a; SEMARNAT, 2000). If requested, the Ministry of Environment undertakes the public consultation process (SEMARNAT, 2000). Helped by the local authorities, the Ministry of Environment organizes an explanatory meeting in which the developer explains the technical aspects of the project, the environmental impacts and mitigation measures, and answers questions from the public (DOF, 1988a; SEMARNAT, 2000). At the end of the explanatory meeting, the names and addresses of the participants that made comments and arguments about the project are registered as well as the answers given by the developer (SEMARNAT, 2000).

The Ministry of Environment adds to the case file the comments made by the public (DOF, 1988a; SEMARNAT, 2000). In addition, the Ministry of Environment includes in the Final Statement (FS) the public consultation undertaken, and the results from the comments and proposals (DOF, 1988a).

For the authorization of the environmental permit, the Ministry of Environment must take into account the Urban Development Programs (Programas de Desarrollo Urbano), Land Zoning / Ecological Ordinance (Ordenamiento Ecológico del Territorio), Protected Areas (Areas Naturales Protegidas), and other applicable regulations (DOF, 1988a). Also, the decision made by the Ministry of Environment should consider the effects of the projects on the ecosystems, the use of natural resources, and the mitigation measures suggested by the developer (SEMARNAT, 2000).

After reviewing the EIS, the Ministry of Environment makes the decision regarding the environmental permit and produces the Final Statement (FS) which can (DOF, 1988a; SEMARNAT, 2000):

1. grant the environmental permit to the project as it is;

2. grant the environmental permit to the project with specific conditions to decrease or compensate the environmental impacts;
3. refuse the environmental permit when:
    a) the project application does not comply with Laws, Regulations and Directives; or
    b) the project can cause one or more species to be endangered; or
    c) the information provided by the developer regarding the impacts of the project is false.

The FS made by the Ministry of Environment will be based only on the environmental aspects of the project application (DOF, 1988a; SEMARNAT, 2000) and should be delivered to the developer no longer than sixty days after the EIS was submitted to the Ministry of Environment (SEMARNAT, 2000). This period can be extended if the Ministry of Environment requires it due to the complexity and dimension of the project (SEMARNAT, 2000).

Even if the Ministry of Environment awards the authorization, the local authorities are not obliged to award the building permit (DOF, 1988a; SEMARNAT, 2000).

Within the Ministry of Environment, the Department in charge of the review of the EIS and decision making is the Department of Environmental Impact and Risk (Dirección General de Impacto y Riesgo Ambiental). This department has the following duties regarding the decision making (DOF, 2003b):

- Review the EIS of projects which are a federal responsibility and authorize or refuse the environmental permits
- Modify, stop, or cancel the environmental permits regarding the EIA
- Supervise the public consultation process and coordinate it with other administrative units within the Ministry of Environment
- Let the EIS be consulted by the public, and publish relevant information about the project application in the Ministry of Environment's journal (*Gaceta Ecológica*).
- Request safety insurance and guarantees for compliance with the conditions established by the environmental permit.

- Give its opinion regarding Accident-Prevention Programmes
- Establish the general technical and administrative guidelines for the review of documents related to the EIS
- Establish adequate mechanisms for verifying that the EISs include the best existing technical methodologies, as well as effective preventive and mitigation measures.

The generalised model of the decision-making process and stakeholders for HWMF in Mexico is as follows (See Fig. 3.2): developer and consultant undertake the planning and design of the HWMF. During the planning and design of the facility, members of the community and Non Governmental Organisations (NGOs) may be consulted. The consultant prepares the EIS to be submitted at the Ministry of Environment (at the federal level) to apply for the environmental permit. The Ministry of Environment decides on whether to grant or refuse the environmental permit to the developer. During this process, the Ministry of Environment consults the municipal authority and the Government of the State where the facility will be located. The documentary outcome of this decision is the Final Statement. During the review of the EIS and decision making, the Ministry of Environment may organise a public consultation regarding the project application. Once the developer obtains the environmental permit from the Ministry of Environment, then an application can be submitted to obtain the building permit from the Municipal authority.

Based on the internal documents provided by the Department of Environmental Impact and Risk (See Table 3.4), a generalised diagram of the review of the EIS and decision-making process regarding the environmental permit was determined (See Fig 3.3a-c). Within the Department of Environmental Impact and Risk, the area in charge of the decision-making process for HWMF is the industrial sector and the decision makers are the official for the sector and case officers.

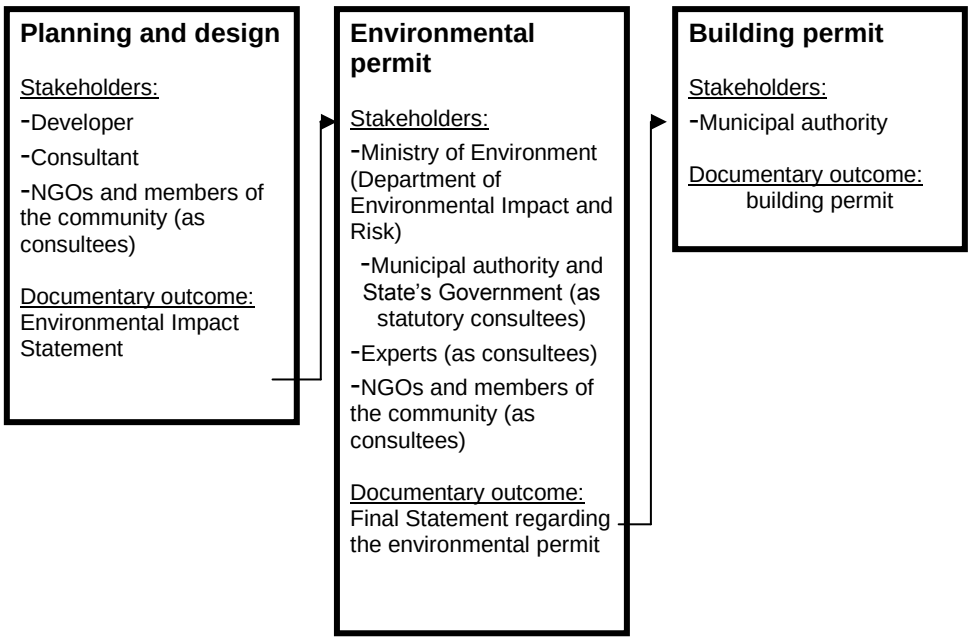

Fig. 3.2 HWMF decision-making processes in Mexico and stakeholders involved

Table 3.4 List of internal documents obtained

Name of internal documents
"Environmental Impact Statement review procedure". (Procedimiento de Evaluación de la Manifestación de Impacto Ambiental).
"Technical instructions for the review of Environmental Impact Statement". (Instrucciones técnicas para realizar la evaluación de la Manifestación de Impacto Ambiental).
"Technical report of the Review". (Reporte técnico de evaluación).
"Annexes of the procedure and technical instructions which include the criteria for technical opinion, public consultation, Final Statement, and criteria for the assessment of the EIS". (Anexos del procedimiento e instructivo técnico: Criterios de opinión técnica, consulta pública, oficio resolutivo, y criterios de calificación de la Manifestación de Impacto Ambiental).

The Ministry of Environment receives the application and assigns a case officer (environmental planning officer) (Fig. 3.3a). The case officer reviews the EIS and determines whether the EIS meets the requirements. If the EIS does not meet the requirements, the environment permit is refused and a Final Statement is produced by the official for the sector and case officer. If the EIS meets the requirements, a case file is created. Then, the case officer undertakes the technical analysis of the project and verifies whether consultation with experts and governmental bodies regarding their opinion is needed (Fig. 3.3a). If consultation with governmental bodies or experts is needed the case officer makes the formal application and gathers the consultation responses. In addition, the case officer and official for the sector decide if a site visit is needed (Fig. 3.3b).

The case officer determines whether further investigation or information from the developer about the project is required (Fig. 3.3b). If so, a formal request is made to the developer; however, if the information provided is not sufficient, a formal statement is made and the review process stopped. If the information provided is sufficient, the case officer continues the technical analysis of the project and produces a technical statement on the evaluation of the EIS. During the technical analysis, the case officer and official for the sector may inform the developer that more time is needed to undertake the analysis of the project due to the dimension and complexity of the project. Once the case officer produces the technical statement on the evaluation of the EIS, the official for the sector reviews the statement. The Final Statement (together with justification and explanation) is then produced by the case officer. The official for the sector receives the EIS of the project and checks that the Final Statement meets the technical and normative requirements (Fig. 3.3b).

The Final Statement is then reviewed by the co-ordinator of normative instruments, by the Department of Integrated Evaluation, and by the Director of the Department of Environmental Impact and Risk. The Final Statement is given to the Management Control within the department who registers the statement and notifies the developer (Fig. 3.3c).

The decision regarding the building permit is made by municipal authorities. Each municipal authority in the country has its own regulations regarding the building permit application and authorization. In general, applications to obtain the building permit requests: developer's data, landownership statement, permit for water consumption, land use permit, blueprints of the project, and the environmental permit granted by the Ministry of Environment [See for example, Ayuntamiento Ramos Arizpe (2009) and Ayuntamiento de Puebla (2008)].

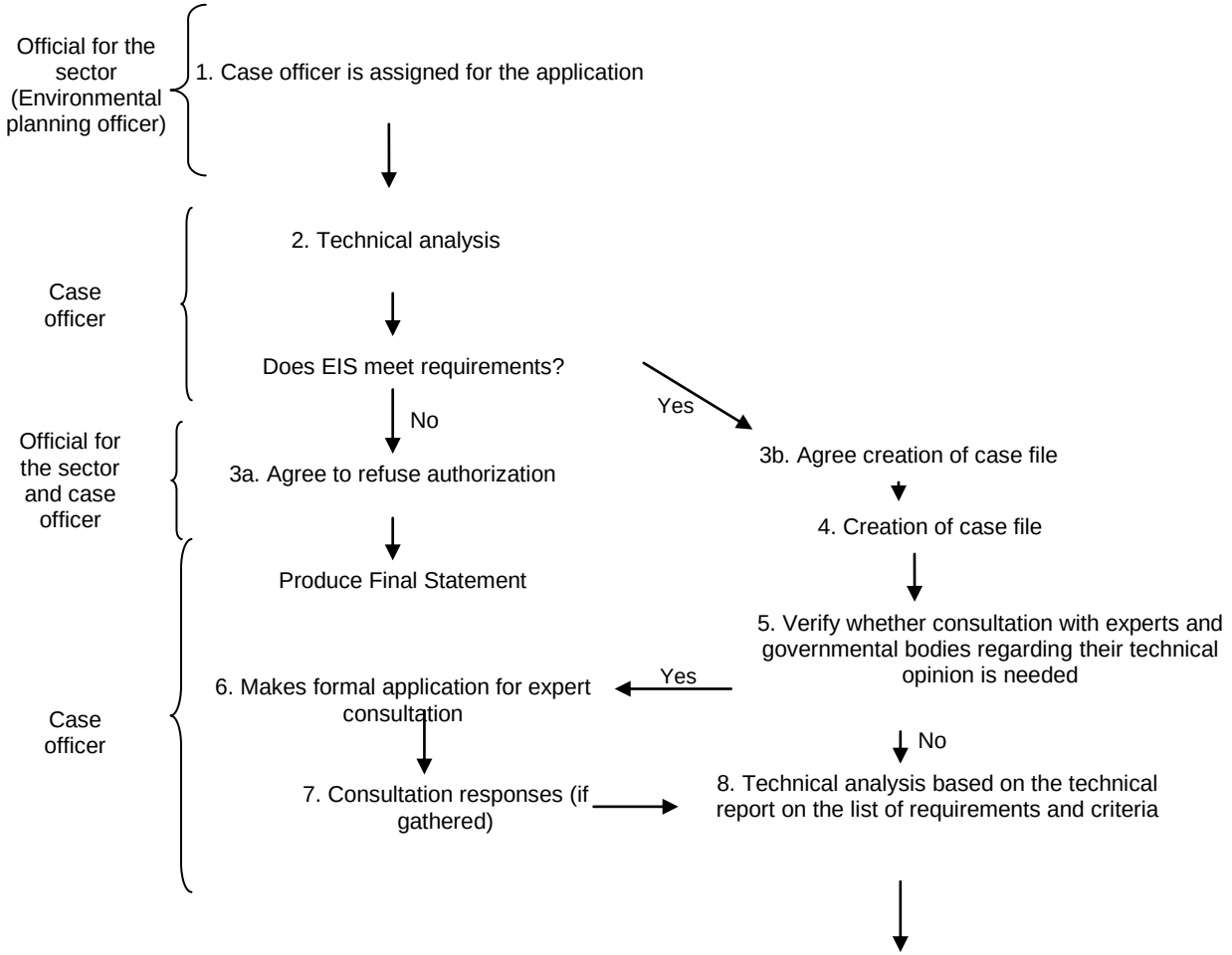

Fig 3.3a Procedure for the Review of EIS and decision making within the Department for Environmental Impact and Risk

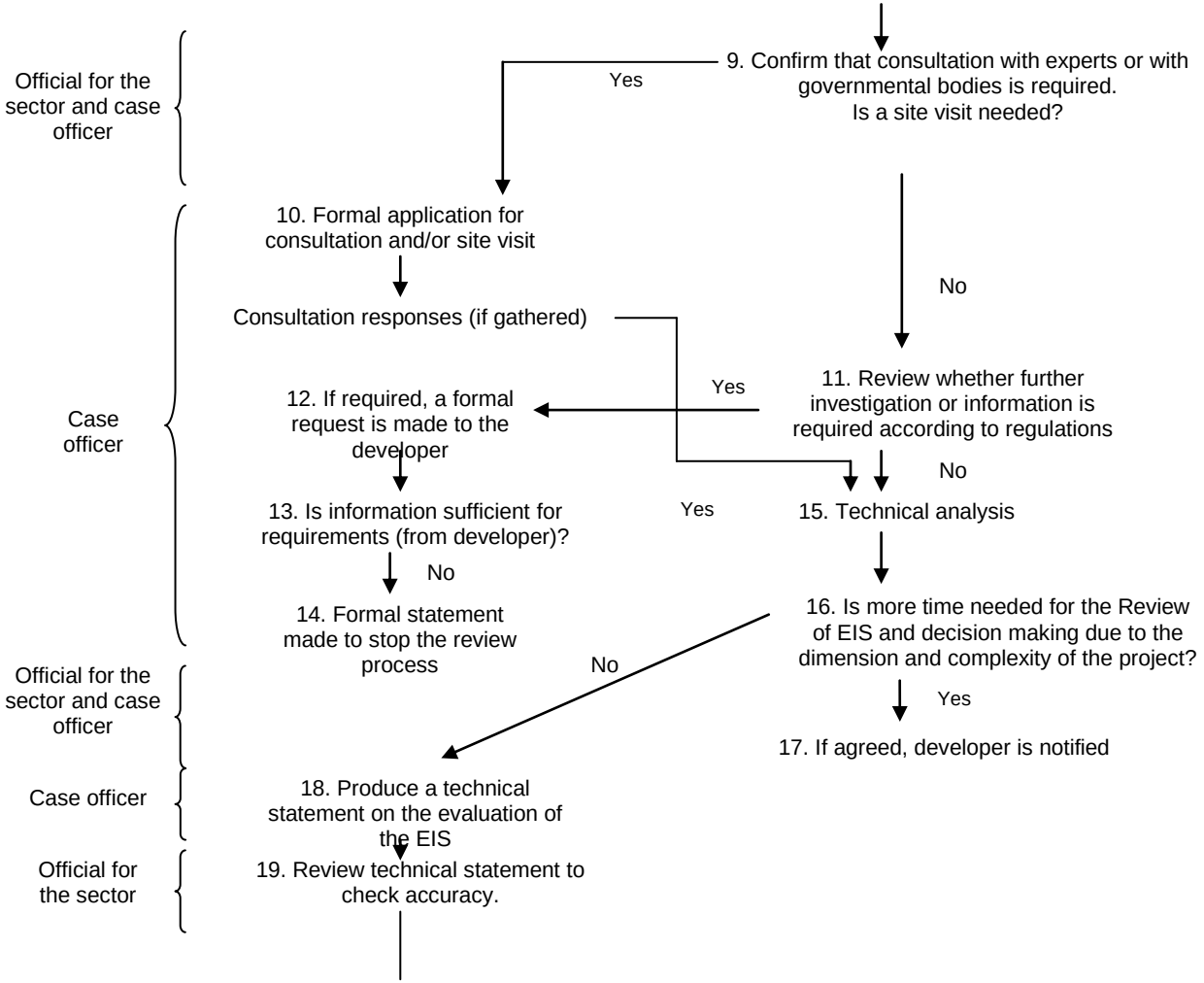

Fig 3.3b Procedure for the Review of EIS and decision making within the Department for Environmental Impact and Risk (Cont.)

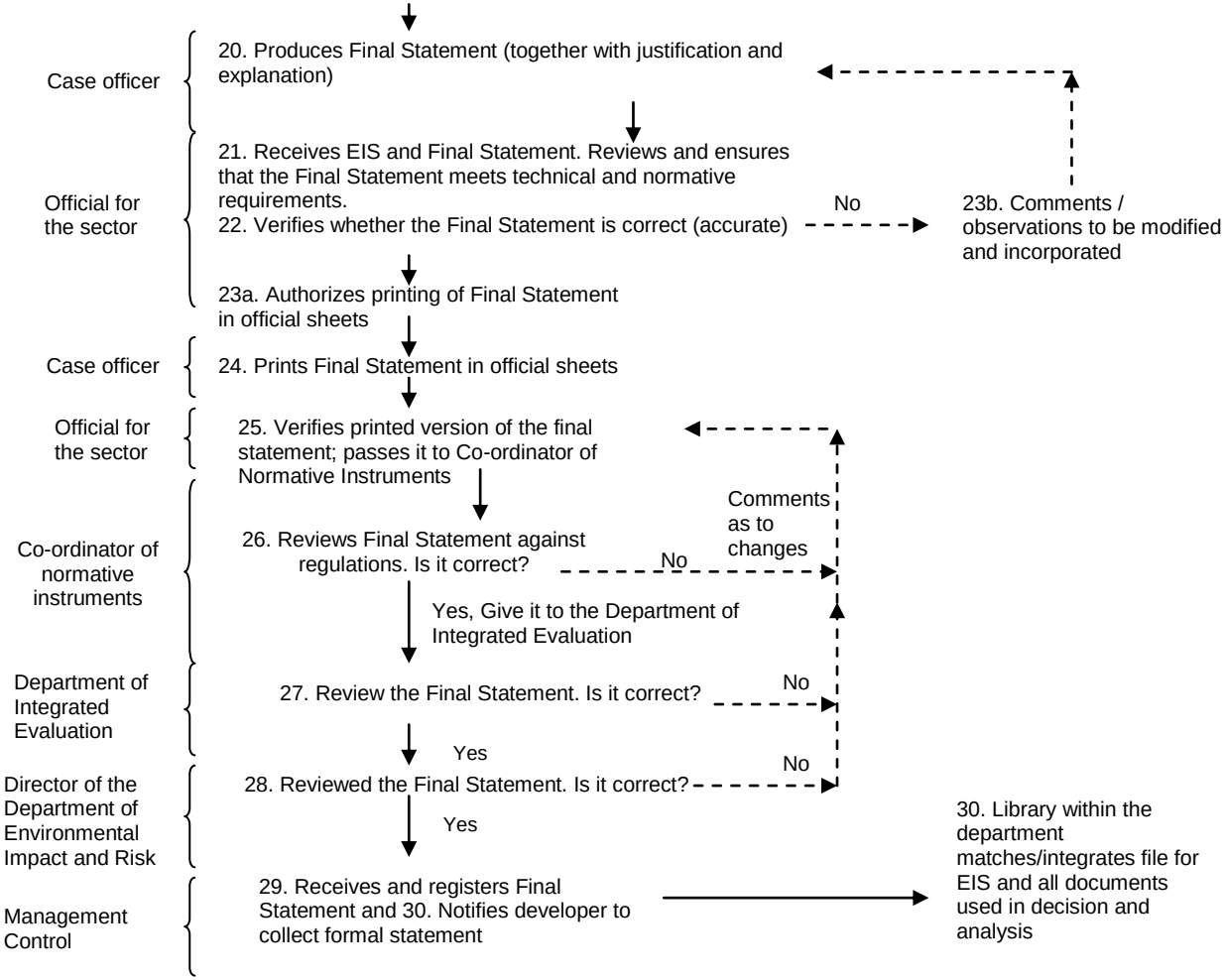

Fig 3.3c Procedure for the Review of EIS and decision making within the Department for Environmental Impact and Risk (Cont.)

Even though EIA is an important part of decision making in Mexico, its practice has been considered as poor and its effectiveness has been questioned. Bojórquez-Tapia and García (1998) after studying the technical and analytical merits of EISs in Mexico, stated that, in general, the data and information provided in the EIS in Mexico were insufficient and of poor quality for making relevant decisions. For example, they determined that EISs were descriptive, inconsistent and unsystematic, as well as ineffective at providing support for a final resolution about projects. This conclusion coincides with another study that analyzed the similarities and differences between Canadian and Mexican legislation regarding reporting cumulative effects for protected areas and the consideration of cumulative effects in EISs (Mendoza-Durán, 2004). It concluded that EISs contained no evaluation of residual effects and mitigation measures focused on the direct impacts of the projects. The EISs' quality was poor especially in regard to the use of scientific information for determining the significance of impacts, the appropriateness of mitigation measures, and the usefulness of the reports in identifying management needs (Mendoza-Durán, 2004).

Palerm and Aceves (2004) analysed the EIA system in Mexico from the perspectives of participatory and pluricultural democracy. They concluded that the opportunities for participation in Mexico are very limited; legislation does not define criteria to guide the reasoning for the Ministry of Environment to justify the denial of a public consultation; remote communities do not have access to the Ministry of Environment's journal where projects are published; there is no obligation to notify specific stakeholders of an EIA application or to involve them in the process; consultation occurs in one single day; consultation procedure does not define any effective means to guarantee participation; and the Ministry of Environment is not obliged to follow-up the opinions expressed in the consultation.

This Chapter has described how hazardous waste management decision making occurs and how EIA is part of hazardous waste management decision making in Mexico. However, in Mexico as well as in other countries, as the following Chapter will explain, its practice and influence has been considered limited.

Chapter 4

Influence of EIA in decision making

4.1 Introduction

Studies around the world about the impact of EIA on decisions have concluded that EIA is having a positive impact on decisions but in many contexts this is limited. This Chapter describes the empirical influence of EIA in design and consent decisions; how the limited influence of EIA on decision making has been linked to the poor development of EIA theory; and how development of EIA theory-building has been suggested to improve the effectiveness and practice of EIA. The Chapter then states the objective of this research and the framework to understand the influence of EIA in decision making based on decision making models, planning theories, theoretical models of EIA and outcomes.

4.2 Empirical influence of EIA in design and consent decisions

Research about the influence of EIA in decision making has analysed the effects of EIA on decisions prior to the formal application and during the EIA process concluding that EIA has a limited or weak influence in decision making. Regarding the influence of EIA prior to formal application, research in the UK and the Netherlands has historically determined that developers frequently commenced environmental assessment at a late stage in the planning and design of their projects (Kobus and Lee, 1993); and that EIA was poorly synchronized with the technical design of projects (Breda and Dijkema, 1998). This has also been reported in

developing countries, where there is integration of EIA into decision-making very late in the planning and process cycle (Wood, 2003a).

Cashmore *et al*. (2004), who analysed the findings of empirical research regarding the contribution of EIA to decision making, determined that the analyses of environmental effects did not play an instrumental role in design decisions; and that EIA, rather than promoting consideration of a wide range of alternatives, assisted decision-makers superficially to reduce the negative consequences of development and maximise the benefits.

According to Wood (2003b), who analysed seven EIA systems, EIA brings modifications to project design prior to formal application but these changes are generally minor. This coincides with Cashmore *et al*. (2004) and Christensen *et al*. (2005) who stated that EIA may result in modifications of projects but those modifications are relatively minor. For example, in Denmark changes take place such as changes in the proposed project site and minor environmental improvements (Christensen *et al.*, 2005).

Regarding the influence of EIA during the EIA process, research in the UK and in Denmark has reported that projects are modified due to EIA but those changes are regarded as minor (Kobus and Lee, 1993; Wood and Jones, 1997; Christensen *et al.*, 2005). A different view was indicated by an international study about the effectiveness of EIA where Sadler (1996) determined that the majority of respondents perceived EIA to be ‘very’ or ‘moderately’ influential in redesign of proposals.

In relation to consent decisions, it has been advanced in the UK and in Norway that the contents of the EIS and the consultations based upon it are important to the planning authority when making a decision on the planning application; however, the consultation rather than the EIS contents is more influential (Kobus and Lee, 1993; Wood and Jones, 1997; Leknes, 2001; Cashmore *et al.*, 2008). In the UK, the influence of EIA on decisions made by local planning authorities and planning inspectors is weak (Wood and Jones, 1997; Weston, 2002); and the policy context remains the most important issue for decision makers (Weston, 2002). Similarly, in

Norway EIA has a minor role in decision-making processes, which are dominated by the authorities' interpretation of the application in relation to legal regulations; and in political matters, where there are conflicting objectives, the influence of EIA is diminished (Leknes, 2001).

In addition, in both countries, it was determined that environmental assessment provided an indication of the conditions or requirements that would be placed on the projects by the authorities (Leknes, 2001; Cashmore *et al.*, 2004). Thus, EIA was used to establish the parameters within which a development could operate. In addition, EIA enhanced the provision of information about the environmental consequences of projects to decision makers (Wood and Jones, 1997) and therefore affected stakeholders' perceptions (Cashmore *et al.*, 2004).

According to Wood (2003b), EIA exerts some influence on development decisions, but is marginalised in favour of other considerations such as non-environmental objectives and political factors. In developing countries, decision making may be influenced not only by economic and social factors but also by corruption; EIA reports have little or no effect on decisions; and EIA is used to justify decisions that have already been made (Wood, 2003a).

Cashmore *et al*. (2008), who analysed three cases in the UK, determined that the analyses of environmental effects did not play an instrumental role in consent decisions. Case officers and decision-makers acknowledged they did not have time to read, or, in some instances the expertise to understand, all of the environmental assessment documentation (Cashmore *et al.*, 2008). For statutory consultees or advisory bodies, the information provided by EA did not appear to influence the comments made (Cashmore *et al.*, 2008). In addition, local politicians who were involved as decision-makers emphasized the importance of public opinion rather than technical information provided by EA (Cashmore *et al.*, 2008).

The limited effectiveness of EIA and its influence on decision making has been linked to the poor development of EIA theory (Lawrence, 1997; Cashmore *et al.*, 2004). According to Lawrence (1997), EIA theory-building is needed to improve decision making and practice. Theory building priorities include nature, role, and

types of theories to be formulated within the domain of EIA (Lawrence, 1997). Research should observe the use of environmental assessment in, and their impacts on, decision-making (Kørnøv and Thissen, 2000). To improve the contribution of EIA to the decision dimension, greater consideration to decision-oriented theory must be given (Cashmore *et al.*, 2004).

The relatively minor influence of EIA on decision making has also been explained by the limited consideration of the socio-political and institutional context of decision-making (Bartlett and Kurian, 1999), and by the narrow perception of EIA as a tool for passive provision of information (Cashmore *et al.*, 2004). As the following section will explain, EIA was founded on the rational model of decision making, which assumes that EIA is a process for generating, organising, and communicating information. However, it has been advanced that environmental assessment based on the rational model of decision making is inadequate. As Lawrence (1997) stated, no single theory or model of EIA will be adequate for all contexts and perspectives. Research regarding the different models of EIA will provide guidance to increase the effect of EIA on decision making (Kørnøv and Thissen, 2000). Thus, to understand the different theories and models of EIA, decision making models, planning theories and the implications for EIA should be considered.

4.3 Decision making models and implications for EIA

The decision making models that have been related to EIA in literature are the "rational", "bounded rationality", "incrementalism", and "mixed scanning". Each of these theoretical models was connected in this research to different planning theories and to different theoretical models of EIA. For illustrative purposes, theoretical decision making models are represented in a spectrum which runs from the rational model at one end to the incrementalism model on the other extreme (See Fig. 4.1). The figure also shows the planning theories, theoretical models of EIA, and the outcomes of EIA related to the theoretical decision making models.

The theoretical models of EIA in the spectrum represent the diverse perceptions of the influence of EIA identified in literature; however, they are neither exhaustive nor mutually exclusive. Agreeing with Cashmore (2004 p. 406), "*it is more relevant and accurate to represent the reality of extant EIA theory and practice as a series of somewhat nebulous models operating along a broad spectrum of philosophical beliefs and values".*

The following sections describe the theoretical decision making models of decision making and the theoretical models of EIA connected. The theoretical models of EIA identified in literature that were related to theoretical decision making models include the "information processing" model (Bartlett and Kurian, 1999), the "institutionalist" model (Bartlett and Kurian, 1999), the "information provision model" (Cashmore, 2004), the "organisational politics" model (Bartlett and Kurian, 1999), the "political economy" model (Bartlett and Kurian, 1999), the "pluralist politics" model (Bartlett and Kurian, 1999), the "participation" model (Cashmore, 2004), the "environmental governance" model (Cashmore, 2004), and the "symbolic politics" model (Bartlett and Kurian, 1999) (See Fig. 4.1).

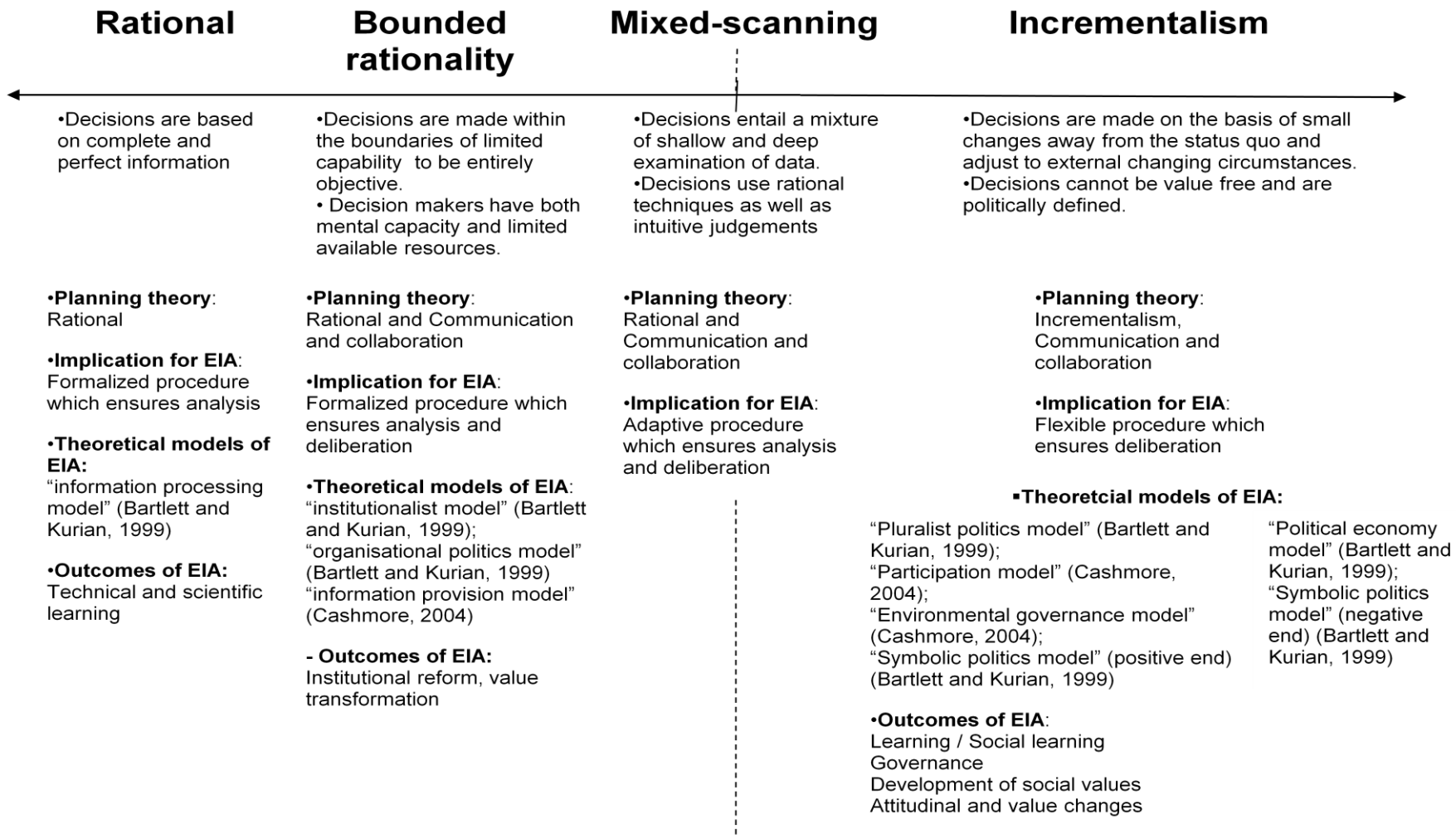

Fig. 4.1 Decision making models and implications for EIA

4.3.1 Rational model

In one of the extremes of the spectrum of decision making is the rational theoretical decision making model (See Fig. 4.1). The rational model assumes that decisions are based on complete and perfect information, reliable scientific knowledge, and the use of well-defined decision criteria derived from a clearly-stated set of objectives (Kobus and Lee, 1993; Wood and Jones, 1997; Kørnøv and Thissen, 2000; Leknes, 2001; Dalkmann *et al.*, 2004; Jay *et al.*, 2007). Decision-makers identify and evaluate all courses of action and select the 'best' one to achieve their objectives using relevant data and criteria (Kobus and Lee, 1993; Wood and Jones, 1997; Kørnøv and Thissen, 2000; Leknes, 2001). For example, decision makers consider alternative outcomes and weigh the costs and benefits; and choose the action that gives the highest benefit (Dalkmann *et al.*, 2004).

Decision makers, therefore, are seen to act in an objective and value free manner and base their decisions on a objective, systematic and technical assessment of the evidence, information, and alternatives placed before them (Weston, 2000). Thus, decisions are arrived at by systematically considering all possible alternatives; assessing all possible solutions; and analysing all available information which is objectively assessed (Weston, 2000).

Not surprisingly, the rational model of decision making shares characteristics with the rational model of planning (See Fig. 4.1). Rational planning assumes that: reason is systematically applied; there is a single set of goals, objectives and criteria; a comprehensive analysis of available ends and means occurs, and leads to the selection of the best alternative; the environment is predictable and controllable; the planner is objective; and, all members of the society have access to power (Lawrence, 2000).

The introduction and development of EIA occurred during the 1960s when the rational model of decision-making was dominant (Weston, 2000; Nilsson and Dalkmann, 2001; Dalkmann *et al.*, 2004; Jay *et al.*, 2007). Indeed, Nilsson and Dalkman (2001) argued that the foundation for the development of the environmental

assessment concept was based on the notion of rationality in decision making. According to Weston (2000), EIA brought together demands of the 1960s and 1970s such as a proactive approach to development planning and a rational approach to decision making.

Placing the EIA process within the rational model, means that it is envisaged as a tool that generates scientific data which is used by apolitical stakeholders, alongside other information, to make decisions (Nilsson and Dalkmann, 2001). Furthermore, it is also perceived as neutral with respect to the political and economic goals (Bartlett and Kurian, 1999): its role is to analyse the environmental consequences of a proposed action and communicate the findings (Bartlett and Kurian, 1999; Weston, 2000). The assumption is that better quality of data in the EIA and the EIS will result in better quality of the decision (Kobus and Lee, 1993; Bartlett and Kurian, 1999). The quality of decision-making is enhanced, according to the rational model, as EIA provides information not only about the project but also on the baseline environment, and the environmental impacts (Kobus and Lee, 1993). Thus, documentation in EIA should be technically informed, reasonably thorough and unbiased (Wood and Jones, 1997).

The rational model of decision making matches relatively closely one of the implicit models of EIA suggested by Bartlett and Kurian (1999), the 'information processing' model (See Fig. 4.1). According to this model EIA is a technique for generating, organising, and communicating information. It is a technical process governed by scientific and technical rationality, comprising the collection of relevant information through mainly quantitative techniques. In addition, public participation is seen as an information source (Bartlett and Kurian, 1999).

The rational model assumes EIA to be an objective process in which scientific advice influences decisions (Owens *et al.,* 2004). According to Kørnøv and Thissen (2000), EIA is based implicitly on the assumption that passive information of accurate predictions on the environmental consequences of a wide range of alternatives will lead to better decisions. Thus, guidelines and methods in EIA focus on the collection, analysis and presentation of objective information to improve the judgement of decision-makers.

The practical outcomes of EIA that can be related to the 'information processing' model are the scientific and technical learning advanced and observed by Cashmore *et al.* (2007) in the UK (See Fig. 4.1). Technical learning was defined as knowledge concerning, or derived from, applied scientific, engineering, and management practices. For example, technical learning was related to the collection or processing of more detailed and specific data on environmental conditions. Technical learning occurred in the form of experimental learning related to an improved understanding of legal provisions for environmental governance (Cashmore *et al.*, 2007). In addition, according to Cashmore *et al.* (2007), the generation of technical knowledge about local environments, through the collection of new data, has scientific application.

Based on this model, the effectiveness of EIA focuses on the extent to which expectations of accuracy and precision of environmental prediction are met, and of the efficacy of institutional and administrative arrangements (Bartlett and Kurian, 1999). In addition, effectiveness is determined by factors such as: rigorous undertaking of the key stages in the EIA process; an emphasis on quantification of data (in particular impact predictions); and, presentation of the EIA findings in a logical, coherent and comprehensible manner (Cashmore *et al.*, 2004). For example, the emphasis on the quality of EIS is evident in the wide literature regarding this subject in different countries [See for example Sandham and Pretorius (2008), Pinho *et al.*, (2007), Androulidakis and Karakassis, (2006), Canelas *et al.*, (2005)] as well as in Mexico (Bojórquez-Tapia and García, 1998).

The 'information processing' model also dominates attempts to increase capacity-building in developing countries. For example, Doberstein (2004) analysed the extent to which aid agency capacity-building programs promoted a technical model of EIA in Viet Nam. He determined that the dominant concept of EIA was that of science and quantitative data gathering methods and that this view was translated into capacity building. Thus, EIA was promoted as a process which would lead to accurate predictions of impacts, and which would allow the selection of the least damaging of a series of project alternatives or project designs (Doberstein, 2004).

From a more critical perspective, it has been advanced that the rational model of decision making is normative, as it describes decision making as it should be, rather than how it takes place in practice (Kørnøv and Thissen, 2000; Weston, 2000; Leknes, 2001; Nilsson and Dalkmann, 2001; Caratti *et al.*, 2004; Dalkmann *et al.*, 2004). Decision-makers do not have complete knowledge, there is imperfect information; there are multiple objectives; values underlying objectives are not commonly shared; and the capacity for rational analysis of alternatives in complex situations is limited (Kobus and Lee, 1993; Kørnøv and Thissen, 2000; Nilsson and Dalkmann, 2001; Caratti *et al.*, 2004; Dalkmann *et al.*, 2004). Following on from this, decisions are subject to contingencies and uncertainties; and are often shaped by political expediency (Caldwell, 1991). In addition, decision-makers rarely use the information presented in an impartial manner; instead, decisions reached are likely to depend more upon underlying interests, reflecting the norms and values of decision-makers who are usually operating within a political arena (Jay *et al.*, 2007).

There is, then, this fundamental criticism of the rational model: it does not consider how real world public decision making takes place; decisions are characterised by uncertainty, the involvement of mutually dependent organisations, social interaction, unpredictability, divergent problem definition, and lack of knowledge (Nilsson and Dalkmann, 2001; Caratti *et al.*, 2004; Dalkmann *et al.*, 2004). Public decisions involve a number of stakeholders that are dependent upon each other in order to come to a decision (Nilsson and Dalkmann, 2001). In addition, the rational model does not explain issues such as power, conflict, trust, solidarity, inequality, communication and legitimacy (Nilsson and Dalkmann, 2001; Caratti *et al.*, 2004; Dalkmann *et al.*, 2004). For example, political decisions are reached through a process that involves trade-offs, compromise and stakeholder interactions, and may reflect power relationships and interests (Cashmore *et al.*, 2004).

Lawrence (2000) takes the criticism further. He contends that the rational model of planning fails to consider resource and cognitive limits; does not consider expertise, and scientific and technical bias; it overestimates the ability to predict and control environment; fails to consider inequities that occur and the central role of dialogue; and fails to integrate social and environmental needs.

Since decisions in practice do not follow the rational model of decision making, basing the role of EIA in decision making on this model is inadequate. The 'information processing' model does not describe how EIA actually works or ought to work (Bartlett and Kurian, 1999). According to Owens *et al.* (2004), the rational model ('information processing') of EIA is inadequate as it fails to provide a convincing account of observed relationships between analysis and decisions; it can disguise important ethical and political judgements as technical ones; and therefore may result in loss of legitimacy for EIA techniques and policies. Environmental assessment is based on a normative theory of causation grounded rationality in science and decision-making and these perspectives are not adequate (Cashmore *et al.*, 2004). In addition, decisions made in political arenas, even if they are informed by science, will not be truly rational (Cashmore *et al.*, 2004); therefore, initiatives to improve scientific rationality in EIA will not automatically result in rational decisions (Cashmore *et al.*, 2004).

According to Lawrence (2000), EIA based on the rational model is technically biased; limited at considering the contextual characteristics of decision making and weak at facilitating dialogue. Since decision making is a process of learning and negotiation, EIA methodologies based on the rational model and focusing on the prediction of environmental impacts does not ensure the integration of environmental considerations and values into the decision-making process (Nilsson and Dalkmann, 2001; Dalkmann *et al.*, 2004). In addition, Jay *et al.* (2007) stated that even if EIA is presenting environmental information satisfactorily, it is unlikely to succeed in ensuring that environmental considerations are fully incorporated into decision making as it is probable that other perspectives will have a role. Since the rational decision making model, and therefore the information processing model of EIA, are limited at explaining the influence on decisions other alternative decision making models have been suggested.

4.3.2 Bounded rationality model

The next theoretical model of decision making which addresses some of the limitations of the rational decision making model is the "bounded rationality" model (Fig. 4.1). Bounded rationality model states that decision-making process takes place within the boundaries of the limited capability of human beings to be entirely free and objective (Weston, 2000; Nilsson and Dalkmann, 2001; Dalkmann *et al.*, 2004). Decision makers are constrained by institutional norms such as laws, policies and codes of conduct (Nilsson and Dalkmann, 2001; Dalkmann *et al.*, 2004). This model assumes that decision makers face conflicting influences upon them, together with their own subconscious values (Weston, 2000).

Arguably, it is in the constraint of decision makers by laws, policies and codes of conduct that the 'institutionalist model' of EIA advanced by Bartlett and Kurian (1999) becomes relevant (Fig. 4.1). The 'institutionalist model' of EIA assumes that institutions are governed by rules (routines, procedures, conventions etc.) as well as by the beliefs, paradigms, and knowledge that support those rules. Therefore, the purpose of EIA is to transform institutional values to incorporate environmental values such as environmental protection (Bartlett and Kurian, 1999). Thus, the effectiveness of EIA depends on the degree to which values are transformed, ways of doing things are changed, and perspectives on what ought to be done are modified in institutions to incorporate environmental values (Bartlett and Kurian, 1999).

Linked to the concept of institution is the concept of organisations. Institutions are formal and informal rules that guide and constrain behaviour of actors and shape interactions between them; and organisations are the actors that are submitted to those rules (Nykvist and Nilsson, 2009). According to Bartlett and Kurian's (1999) organisational politics model (Fig. 4.1), EIA can influence decisions as it can change the internal politics of an organisation required to undertake it. EIA may change internal structures and processes of organisations and therefore also change values and organisational culture (Bartlett and Kurian, 1999). EIA improves decision making as it introduces environmental criteria and outcomes in organisations (Bartlett and Kurian, 1999). In addition, EIA changes organisations by changing

kinds of individuals hired, retained, and promoted who incorporate environmental values into the organisation (Bartlett and Kurian, 1999).

Cashmore *et al*. (2007), who investigated practical outcomes of environmental assessment in cases in the UK, determined that institutional reform through value transformation was observed in a non-governmental organisation which experienced transformation described as "professionalization". According to Cashmore *et al*. (2007), the non-governmental organisation had to adopt a rationalist philosophy to be taken seriously and technical staff was hired.

In the bounded rationality model it is acknowledged that decision makers have both a limited mental capacity and limited available resources. Consequently, decision makers are able to cope with only a restricted amount of information and a narrow range of alternatives (Kørnøv and Thissen, 2000; Nilsson and Dalkmann, 2001; Dalkmann *et al.*, 2004). Decision-makers do not have perfect information about resulting consequences upon which to determine the best alternative, and there will therefore, always be uncertainty and risk about the impacts of decisions taken (Kørnøv and Thissen, 2000).

According to the bounded rationality model decisions are a compromise, based on criteria for 'satisficing' rather than 'maximizing'(Weston, 2000; Nilsson and Dalkmann, 2001). From a limited range of known alternatives a decision maker comes to a decision which is 'good enough' (Weston, 2000; Nilsson and Dalkmann, 2001; Caratti *et al.*, 2004). In situations where several stakeholders are involved, feasibility criteria are central to the debate (Nilsson and Dalkmann, 2001). The decision is procedurally rational only if it is the outcome of appropriate deliberation, which compensates for the lack of information and uncertainty, and a socially acceptable decision is arrived at (Caratti *et al.*, 2004). Thus, EIA should be a formalized procedure which ensures analysis and deliberation (Caratti *et al.*, 2004).

The characteristic of EIA as being a procedure which ensures analysis and deliberation is similar to the findings made in the Netherlands. In this country it has been argued that EIA contributed indirectly to local planning authorities' decision making through stimulating discussion (Heuvelhof and Nauta, 1997; Breda and

Dijkema, 1998). This effect of EIA through dialogue was also indicated in a later study. According to Christensen *et al.* (2005), changes in projects prior to formal application were explained by the dialogue that occurred between developers and consultants. Thus, EIA was an instrument that systematically structured a dialogue between the involved parties, and therefore had an effect throughout the decision process (Christensen *et al.*, 2005).

The bounded rationality decision making model shares characteristics with the 'information provision model' of EIA advanced by Cashmore (2004) (Fig. 4.1). According to the latter, EIA is a short-term decision tool, driven by time and resource constraints, which is conducted in a context of political and public controversy. In this model, predictions must be made and alternative development options compared (Cashmore, 2004). The EIA process is envisaged as analytical, where a reasonable range of alternatives are identified and evaluated; modelling techniques are used, wherever possible, to quantify impacts' characteristics; and expert judgement is applied in the determination of impact significance. Rigorous analysis which includes the application of best practicable science is balanced against responsive consultation and responsible administration (Cashmore, 2004). Stakeholder involvement is limited to one way consultation which occurs once the final EIA report has been published (Cashmore, 2004). In addition, inputs of fact and value judgement are demarcated during impact assessment and evaluation of significance (Cashmore, 2004).

4.3.3 Mixed-scanning model

In the middle of the spectrum is the mixed-scanning theoretical decision making model (Fig. 4.1). According to the mixed scanning decision making entails a mixture of shallow and deep examination of data – generalized consideration of a broad range of facts and choices followed by detailed examination of a focused subset of facts and choices (Etzioni, 1986). Mixed-scanning involves two sets of judgments: the first are broad fundamental choices and the second are incremental decisions (Etzioni, 1986). Mixed scanning is less detailed and demanding than a rational decision making but broader and more comprehensive than incrementalism (Etzioni, 1986).

For Nilsson and Dalkmann (2001) and Caratti *et al*. (2004), the mixed-scanning theoretical model and the bounded rationality are close models. The mixed-scanning model synthesises the rational and incremental approaches (Nilsson and Dalkmann, 2001). Mixed-scanning decision making uses rational techniques of assessment, such as EIA, cost-benefit analysis or goals-achievement matrices, as well as more intuitive judgements that are based upon experiences, codes of practice and political values (Weston, 2000; Nilsson and Dalkmann, 2001; Caratti *et al.*, 2004). This model assumes that there is a need for structured and rational decision making in policy processes, while acknowledging the necessity to take multi-actor complexity into account (Nilsson and Dalkmann, 2001; Caratti *et al.*, 2004). Thus, EIA should be an adaptive procedure which ensures analysis and deliberation (Caratti *et al.*, 2004).

This agrees with Kobus and Lee (1993) and Wood and Jones (1997) who stated that decision making and environmental assessment contain elements of both rational and behavioural models. Decisions are usually influenced by political pressure as well as by the environmental advantages and disadvantages of the proposal (Wood and Jones, 1997). EIA provides information about the project, base-line environment and environmental impacts; and makes environmental goals more explicit in the process for their more conscious consideration by decision makers (Kobus and Lee, 1993). In addition, EIA increases the information available to participants and the opportunities, through consultation, for participants with environmental concerns to influence the decision-making process (Kobus and Lee, 1993).

Weston (2000), who analysed the screening and scoping process in the UK, determined that there are aspects of environmental assessment which attempt to be based on the objective measurement and assessment (e.g. measurement of environmental baseline, prediction of quantitative impacts). However, screening and scoping processes rely on professional judgement and experiences. Key factors during the screening and scoping are the consultation and the nature of the receiving environment, as well as political considerations (e.g. local policy priorities). In addition, consent decisions are based in part on evidence, professional judgement and experience, and in part on the ideology of the politicians making the decision (Weston, 2000). Decisions made within the EIA process, he argued, are based on the

following: nature of the project and the receiving environment; the policy context of the locality; the environmental priorities of the receiving population; the experience of key actors involved in the process; and the legislative and regulatory framework (Weston, 2000).

According to Nilsson and Dalkmann (2001), project-level EIA processes have varying levels of rationality and incrementalism. After examining various theoretical perspectives to decision making, they determined that decision making, especially strategic decision making, is based on rational techniques of assessment as well as on codes of practice, political ideology, and political values held. For example, tests of significance are based on value judgements and made within a political context (Nilsson and Dalkmann, 2001). Consequently, decision support tools such as EIA should focus on both content and process; and it should be based on open and deliberative approaches which consider the different actors, their powers and interests (Nilsson and Dalkmann, 2001).

4.3.4 Incrementalism

At the other extreme of the spectrum is the "incrementalism" theoretical decision making model (See Fig. 4.1). Incrementalism assumes that decision makers are not able to oversee all aspects of the decision; neither can all alternatives nor their consequences be known; and, all information cannot be adequately processed (Nilsson and Dalkmann, 2001; Caratti *et al.*, 2004). This model acknowledges that decision making cannot be value free and that it is politically defined (Weston, 2000; Nilsson and Dalkmann, 2001; Caratti *et al.*, 2004).

According to the incrementalism decision making model, similar to the incrementalism planning theory, decisions are made on the basis of small changes away from the status quo, and are reactive and adjust incrementally to external changing circumstances (Lawrence, 2000; Weston, 2000; Nilsson and Dalkmann, 2001; Caratti *et al.*, 2004). Arguably, this characteristics can be related to the 'political economy' model of EIA suggested by Bartlett and Kurian (1999). According to the political economy model, EIA has an impact on decision making

because it alters financial opportunities, risks, constraints, and by the internalisation of externalities it leads to the anticipation and prevention of environmental harm (Bartlett and Kurian, 1999). Firms realise market or regulatory benefit from undertaking EIA as it promotes better environmental performance, represents public recognition, and improves the relationship with regulators and stakeholders (Bartlett and Kurian, 1999). These can be considered as external changing circumstances to which decision makers react and adjust during decision making. Thus, the economic and environmental benefits are mutually reinforced and therefore help to integrate environmental objectives into decision-making (Bartlett and Kurian, 1999).

The political economy model agrees with the findings of a research undertaken in Australia and Canada. Annandale and Taplin (2003) analysed the impacts that environmental approvals regulation (mainly EIA) has on new proposed projects in the mining sector. They determined that most firms in Australia and Canada perceived EIA as a catalyst for integrating environmental design into the early planning of projects, which then alleviated the need to spend money on overcoming environmental problems of poorly designed projects.

The incrementalism decision making model also focuses on the processes of political negotiations and sees decision making as a process of gradual change (Lawrence, 2000; Nilsson and Dalkmann, 2001; Caratti *et al.*, 2004). Thus, agreement is the test of a satisfactory decision (Lawrence, 2000). Based on this model, EIA should be a flexible procedure which ensures deliberation (Caratti *et al.*, 2004).

The incrementalism model shares characteristics with the behavioural models of decision making. Behavioural models recognise that human knowledge is often incomplete, that the values that underlie objectives are not always shared; and, that the capacity for rational analysis of alternatives in complex situations is limited (Kobus and Lee, 1993; Wood and Jones, 1997). It also recognises that during decision making there are multiple goals which are not well defined and potentially conflicting (Kobus and Lee, 1993; Wood and Jones, 1997). Thus, decision making attempts to balance conflicting interests whose relative influence may change during the process (Kobus and Lee, 1993; Wood and Jones, 1997). This agrees with Richardson (2005) who stated that power struggles around questions of value occur

in EIA. He analysed four cases of EIA practice and demonstrated that value conflicts are present in EIA. According to Richardson (2005), EIA is being used by stakeholders to mediate and contest value differences and conflicts. Therefore, there is a need to address how values are put at stake in the practice of EIA.

As has been mentioned, the incrementalism theoretical decision making model focuses on the process of political negotiations, and attempts to balance conflicting interests during the process (Kobus and Lee, 1993; Wood and Jones, 1997). Based on these characteristics of the model, the participation approach suggested in the literature on EIA becomes relevant. For example, Webler *et al.* (1995) suggested criteria for evaluating public participation processes in impact assessment which included fairness, competence, and social learning. According to Webler *et al.* (1995 p. 447) "*focusing on social learning and cooperation draws us away from the pure egoistic approach of rational choice theories toward an approach which highlights the interaction of individuals and puts emphasis on understanding the values, beliefs, and intentions of oneself and others*".

Breda and Dijkema (1998) proposed a participative approach for EIA which has the following features: involvement of all relevant parties during decision making; the scope and contents are established during decision-making; and, discussions are encouraged and facilitated. Kørnøv and Thissen (2000) also advanced an approach which involves relevant actors in decision making. Relevant actors are determined based on their formal position (e.g. a government authority); their control of relevant resources (e.g. money, expertise); and, their power to hinder or block implementation (e.g. lobby groups, implementers). The approach emphasises openness of the process, transparency of procedures, freedom and protection of participants (Kørnøv and Thissen, 2000). Participation in this approach improves decision making because different points of view are taken into account; the acceptance of the result of the assessment or decision process is increased; and, contributes to the democratic character of the process (Kørnøv and Thissen, 2000).

Palerm (2000) developed an analysis framework for the assessment of public participation in EIA based on the underlying principles of Habermas' theory of communicative action and Webler's model. In the Habermas' theory of

communicative action, the term discourse refers to a dialogue in which all affected parties have equal rights to present their claims and test their validity in a context free of social or political domination (Renn, 2006). According to Palerm (2000), to assess the effectiveness of public participation the analysis framework should consider the opportunities for participation, willingness to participate, and capacity to participate.

The characteristic of political negotiations of the incrementalism theoretical decision making model matches closely with the participative approach and with models of EIA advanced by Bartlett and Kurian (1999) and Cashmore (2004) (Fig. 4.1). Bartlett and Kurian's (1999) 'pluralist politics' model of EIA assumes that EIA has an impact on decisions because it increases participation and involvement of public and organised interests. The model focuses on public participation and perceives EIA as a process of negotiation which ensures democratic processes through citizen involvement (Bartlett and Kurian, 1999).

In the 'participation model' suggested by Cashmore (2004) sound environmental management is the primary aim of EIA. Stakeholder involvement is substantive and participation is considered as an engagement process in which the developer of the project deliberates with a wide range of stakeholders, and is prepared to amend the development proposal. Stakeholder participation is a result of the need to make environmental decision-making more responsive and transparent, and the need to embrace the priorities and values of the society (Cashmore, 2004).

The participative approach of EIA also shares characteristics with the 'communication and collaboration' planning theory (Fig. 4.1). This theory focuses on communication and on consensus building and states that planning occurs through group deliberation, argument, discussion, and negotiation which contribute to more transparent decision making, and a greater likelihood of public agreement, acceptance and support (Lawrence, 2000).

Arguably, the participative approach to EIA can have practical outcomes, such as those observed by Cashmore *et al*. (2007), such as attitudinal and value changes (Fig. 4.1). Cashmore *et al*. (2007) observed these changes as outcomes of EIA in cases in

the UK. Attitudinal and value changes included increased confidence and trust among various stakeholders. Environmental assessment influenced the attitudes of the public toward the project by reassuring them that their concerns had been addressed. Public trust in the council was improved; however, poor management, or mismanagement by the council resulted in an erosion of confidence and trust (Cashmore *et al.*, 2007). In addition, the participatory approach adopted persuaded non-statutory stakeholders that the issues were being dealt with openly and honestly (Cashmore *et al.*, 2007).

Even though participative and more deliberative approaches have been advanced to explain more fully the contribution of EIA in decision making, it has also been suggested that this polarisation between information processing and participative approaches does not aid the understanding of the problem. According to Owens *et al*. (2004), while the rational model (information processing) has been criticised, the participative or deliberative approach does not offer a solution to avoid the problem of little effect on decision making (e.g. difficult, expensive, time consuming). Therefore, polarisation between these models is unhelpful (Owens *et al.*, 2004).

Linked to the characteristic of political negotiation of the incrementalism decision making theory and to the participative approach of EIA is the 'environmental governance model' of EIA advanced by Cashmore (2004) (Fig. 4.1). According to this model, EIA must be inclusive, deliberative and participatory; EIA is a framework for negotiation and compromise; and, EIA is viewed as a decision tool used in environmental governance to empower stakeholders, and promote an egalitarian society. EIA is used to promote social justice and equality, to make decision-making transparent and institutions accountable, to minimise losers, and to realise community self-governance (Cashmore, 2004). As Pischke and Cashmore (2006) have argued, decision-oriented theory in environmental assessment should seek to promote transparency and accountability; for example, by mandating that the contribution of environmental considerations to individual decisions is documented, through a high level of stakeholder involvement, and by ensuring there are opportunities for judicial intervention.

This model agrees with the findings later made by Cashmore *et al*. (2007). After analysing case studies in the UK, they observed governance outcomes of EIA. Environmental assessment enhanced public access to data, increased transparency and accountability in decision making; and stakeholders' involvement contributed to local autonomy and democracy (Cashmore *et al.*, 2007).

Learning has also been linked to the participative approach of EIA (Fig. 4.1). According to Webler *et al.* (1995), social learning occurs in impact assessment when citizens become involved in working out a mutually acceptable solution to a project or problem that affects their community, they mature into responsible democratic citizens and therefore reaffirm democracy. For Webler *et al.* (1995 p. 445), "*social learning refers to the process by which changes in the social condition occur – particularly changes in popular awareness and changes in how individuals see their private interests linked with the shared interests of their fellow citizens*".

Social learning has two general components: cognitive enhancement and moral development (Webler *et al.*, 1995). Cognitive enhancement means gaining technical competence, learning about collective values and preferences, as well as impressions and feelings of others (e.g. learning about the problem, learning about possible solutions and consequences, learning about other peoples' and groups' interests and values) (Webler *et al.*, 1995). Moral development highlights how individuals make judgments about right and wrong; thus, in public participation moral development includes: developing a sense of self-respect and responsibility to oneself and others, being able to take on the perspective of others, developing skills for moral reasoning and problem solving, developing a sense of solidarity with the group, learning how to integrate new cognitive knowledge into one's opinion, and learning how to cooperate with others in solving collective problems (Webler *et al.*, 1995 p. 446).

Social learning has been observed by Webler *et al.* (1995) in public participation in a decision making process about siting a municipal waste disposal facility (landfill) in Switzerland. They identified cognitive enhancement such as learning about waste stream composition, landfill technology, geology, and hydrology. Cognitive enhancement was promoted through a cooperative discourse model (e.g. giving detailed and accessible information, offering citizens chances to discuss why they

learned in small groups, encouraging citizens to put their new knowledge to work in impact assessment activities). Moral development was facilitated by offering people opportunities to work together (e.g. face-to-face small group work, an egalitarian atmosphere, repeated meetings, unrestricted opportunities to influence the process) (Webler *et al.*, 1995).

According to Kørnøv and Thissen (2000), learning is triggered because participation allows debate and therefore the emergence and change of perspectives over time; as well as a reflective discourse in which the views of participants are adjusted and constructed (Kørnøv and Thissen, 2000). This agrees with Saarikoski (2000) who stated that EIA can function as a collective process where different actors can deliberate and exchange their views and knowledge about the impacts of proposed developments; and can serve as a learning process if negotiation and discussion occurs to search for acceptable solutions (Saarikoski, 2000). To test this statement, Saarikoski (2000) analysed an EIA process associated with developing a regional waste management strategy in Finland which attempted to involve different participants and serve as a collective learning experience about waste policy options. She concluded that EIA led to reflection on some of the participants' beliefs and preferences. In addition, it led to refocusing the discussion; it introduced a new option that allowed the participants to move away from the initial position of waste management strategies; and it helped to reach a solution which most participants found acceptable. Thus, the EIA process produced a broader understanding among participants and improved communication (Saarikoski, 2000).

Wilkins (2003) also stated that social learning is achieved through communication between stakeholders and the public, and the reaching of agreements through understanding. Communication or discourse allows people to learn from others and changes may be made to the positions on all sides in an EIA (Wilkins, 2003). In addition, according to Deelstra *et al*. (2003), decision makers learn through negotiation about knowledge, and therefore the effectiveness of EIA is constrained by the limited ability of involved actors to take part in a social learning process that addresses complex issues.

Deelstra *et al*. (2003) proposed an approach where knowledge may generate new insights and views for the involved actors, thus changing their perceptions and problem definitions. The involved actors learn about the possibilities of several alternatives, and they learn about each other's perceptions, thus, the most desirable and socially acceptable decision is achieved. Therefore, EIA should be conducted to fit the dynamics of negotiation and changing problem definitions (Deelstra *et al.*, 2003).

Owens *et al*. (2004) contended that learning in environmental assessment can be of a rationalist kind or more fundamental reframing. Environmental assessment can provide a forum for dialogue within which knowledge can be assembled, argument can take place, and learning can occur (Owens *et al.*, 2004). Such learning may be of a rationalist kind, in which participants accept new facts and recognise errors within their own belief systems, or it may involve more fundamental reframing, as actors engaged in EIA of successive projects encounter alternative world-views and are confronted by new arguments and ideas (Owens *et al.*, 2004).

Learning was determined by Cashmore *et al.* (2007) who investigated practical outcomes of environmental assessment in the UK. This research observed four categories of outcomes including learning outcomes. As part of the learning outcomes, Cashmore *et al*. (2007) identified social learning which was defined as reflection and collective action that occurs as stakeholders seek to solve a mutual problem. The forms of social learning identified were increased environmental awareness in relation to public understandings of local environments; learning about ways to communicate effectively in different fora; the values and interests of other stakeholders; developing a sense of community solidarity; and reflection by individuals on their personal interests and agendas (Cashmore *et al.*, 2007).

Social learning in this context coincides with a new approach to environmental planning (Randolph, 2004) and communication planning theory (Persson, 2006) (Fig. 4.1). This new approach involves collaborative environmental decision making (social learning) in which stakeholder involvement, consensus building, conflict resolution, and collaborative learning occur (Randolph, 2004). The approach aims not only to consider public participation but also to foster "collaborative learning" by

stakeholders who better understand the perspectives of others. In addition, collaborative learning leads to more creative solutions as it uncovers new options which are more acceptable to the wide range of interests involved (Randolph, 2004).

In communication planning theory, communication between parties helps to accomplish a dialogue which leads to mutual learning and where people's values and needs are considered as important (Persson, 2006). The effects of the dialogue are increased empowerment, development of trust, and reduction of conflicts (Persson, 2006). Therefore, according to Persson (2006), when conducting an environmental assessment, methods that are based on communication about values and interests ought to be preferred.

Sinclair *et al.* (2008) analysed studies undertaken in participation in environmental assessment in Canada since the early 90's. Based on their findings they developed a conceptual framework which linked the design of public participation and environmental assessment process, non-formal education, individual and collective learning, social action, and sustainability. According to Sinclair *et al.* (2008), meaningful participation (i.e., early, inclusive, deliberative, transparent and empowering) enables processes of individual and collective learning. Deliberative involvement stimulates communication, dialogue, synthesis of diverse perspectives, mediation of conflict, and development of collaborative relations. In addition, experiential learning from participation in environmental assessment can shape person's values, understanding, attitudes and behaviour (Sinclair *et al.*, 2008).

Linked to the participative approach is also the perception of EIA as a source of development of social values (Fig. 4.1). According to Wilkins (2003) EIA is a forum in which the public, developers and regulators deliberate and create discourse. EIA is used to support or oppose projects and therefore stimulates discourse in which people can expose their views and hear and understand the concerns of others. The discourse that is nurtured through EIA influences the values people hold regarding the environment and their communities. Therefore, EIA promotes the development of values that foster greater personal and social responsibility and has the capacity to increase the importance of long-term environmental considerations in decision-making (Wilkins, 2003). This agrees with a finding made by Cashmore *et al.* (2007),

who determined that, as EIA had attitudinal and value changes as outcomes, EIA promoted greater community spirit and cohesion.

Arguably, the perception of EIA as a source of development of social values is comparable to the 'symbolic politics model' of EIA advanced by Bartlett and Kurian (1999) and can be related with the incrementalism decision making model. According to one extreme of the 'symbolic politics' model (positive side), EIA is a set of language acts which create meanings (Bartlett and Kurian, 1999). Through language, knowledge is created and expressed, and what people see is constructed and interpreted. Thus, according to this model, EIA functions by "*fostering the generation of strategically crafted arguments and by guaranteeing some kind of audience for those arguments*" (Bartlett and Kurian, 1999 p. 419). These arguments are part of the political negotiations that occur between stakeholders during decision making according to the incrementalism decision making theory.

In addition, for the symbolic politics model, EIA is an "*iterative mechanism for creating meaning, evoking emotional response, and reaffirming moral commitment*" (Bartlett and Kurian, 1999 p. 418). In addition, the goal of EIA is "*to become a tool for moral reaffirmation of certain values that have environmental preservation at their core*"(Bartlett and Kurian, 1999 p. 427).

In political negotiations that occur between stakeholders, according to the incrementalism decision making theory, EIA may be used in line to the other extreme of the 'symbolic politics' model advanced by Bartlett and Kurian (1999). According to this extreme of the 'symbolic politics' model, the rhetoric and official style adopted in EIA is used to convince people that, because EIA has been undertaken, the environment will be protected, in order to lessen opposition to a proposal. EIA is used to legitimise decisions made for reasons of political expediency (Bartlett and Kurian, 1999).

The use of EIA to lessen opposition to a proposal has also been reported in the UK by Cashmore *et al.* (2008). In cases analysed in the UK, the role of environmental assessment as a passive information provision was used in an advocacy manner by the developer to obtain the development consent (Cashmore *et al.*, 2008). Rigorous

scientific analysis and provision for impact mitigation were required to engender support amongst stakeholders (e.g. statutory consultees) (Cashmore *et al.*, 2008). Passive information of scientific analyses engendered support as it created the perception of due diligence; it illustrated to the public that their concerns had been considered in detail and demonstrated to statutory consultees that the proponent understood the potential impacts and the need for impact mitigation. It thereby helped to legitimize decisions to grant development consent (Cashmore *et al.*, 2008).

In addition, for this extreme of the symbolic politics model, EIA can also be considered a formality and therefore EIA involves the generation of detailed reports that few read and that have no effect on decision-making process (Bartlett and Kurian, 1999).

The incrementalism decision making model addresses some of the limitations of the theoretical rational decision making model. However, the incrementalism model has also been critized. According to Caratti *et al.* (2004) and Nilsson and Dalkmann (2001 p. 312), powerful interests can dominate incremental decision making, and discourage social innovation and thus, "*give an image of decision making (in organisations) as something over which decision makers cannot exert any influence*".

The models and outcomes of EIA described in this Chapter were useful to establish a framework of the different roles that EIA can have on decision making. The following Chapter describes the research design and data collection methods used to investigate the influence that EIA has on decision-making process for HWMF in Mexico.

Chapter 5

Research design

5.1 Introduction

This Chapter reiterates the objective and aims of this research, followed by the design and data collection methods used. Different research designs are discussed and an explanation is given of why a "case study" approach was adopted. Research strategies and data collection methods cited in the literature regarding the role of EIA in decision making are described including those used for this research (documents and semi-structured interviews). The sampling of the project applications selected for the case study is described, followed by an explanation of how the semi-structured interviews were undertaken and analysed together with the documents. In addition, it describes how the quality of EIS and the EIA system for HWMF were evaluated.

5.2 Objective and aims

The objective of this research is to critically evaluate the role of EIA in the decision-making process for HWMF in Mexico. Since decision making for HWMF encompasses different stages of decision making with different stakeholders (e.g. planning and design by developers and consultants; environmental permit by Ministry of Environment's officers; and building permit by municipal authorities), the aims of this research are to:

- determine the influence of EIA in decisions regarding the planning and design of HWMF, the environmental permit, and building permit;

- determine the influence of EIA on decision-making for HWMF from stakeholders' perspectives (developers, consultants, Ministry of Environment officers, municipal authorities; members of the community, and NGOs); and
- critically examine the models determined in the HWMF decision making process in Mexico against the theoretical models of EIA suggested in literature.

To achieve these aims, the following section describes the research design and data collection methods used.

5.3 Research design

According to Bryman (2004), a research design in social research is the framework that guides the collection and analysis of data. The research design helps to ensure that the data obtained answer the research questions (de Vaus, 2001). Studies about the role and effectiveness of EIA in decision making have used cross sectional design [See for example Sadler (1996), and Wood and Jones (1997)] and case study design [See for example Saarikoski (2000), Stenstadvold (2001), Hokkanen (2001), Leknes (2001), Deelstra *et al*. (2003), Bekker *et al.* (2004), Elliot and Francis (2005), and Bekker *et al*. (2005)].

In cross-sectional design, data are collected at one point of time, but from more than one case (de Vaus, 2001; Bryman, 2004). Data obtained are mainly quantitative, which are later analysed to determine patterns and variation linked with group differences (de Vaus, 2001; Bryman, 2004). An example of this type of research design in a relevant study on the role of EIA in decision making is that undertaken by Wood and Jones (1997); they studied applications of different types of projects, from three different time periods to investigate whether increasing experience of Environmental Assessment had any effect on decisions. Another example is Sadler (1996) who, in a survey of different practices in different countries, studied the effectiveness of the Environmental Assessment process by considering the adequacy of institutional frameworks of EA, the methodological basis for assessment, and the influence on decision making.

Cross-sectional research design relies on counting and establishing causal relationships between variables and measurement of concepts (de Vaus, 2001; Bryman, 2004). However; the role or the influence of EIA in decision-making processes is difficult to quantify objectively (Cashmore *et al.*, 2004), since it is not easy to define or count the variables involved during the decision-making process.

Case study research design, on the other hand, consists of a detailed and intensive analysis of a single case (Bryman, 2004) which can be represented by individuals, groups, organizations, decisions, or social and political phenomena (Yin, 2003). In a case study research design, contextual information is collected in order to understand causal processes (de Vaus, 2001). There are instances of the role of EIA in decision-making processes being investigated using this type of research design.

Examples where case study research design has been applied to investigate the role of EIA in the decision-making process include the final disposal of nuclear waste (Hokkanen, 2001); for the location and construction of an airport (Stenstadvold, 2001; Deelstra *et al.*, 2003); and, for projects for petroleum fields and pipelines (Leknes, 2001). In addition, it has been applied to examine the role of environmental assessment in promoting sustainable development; how environmental assessment operates in practice; and what the theoretical implications are (Cashmore *et al.*, 2008). Data collection methods used by these researchers have concentrated on interviews with relevant stakeholders and a review of documents.

Through case study research design, researchers have been able to examine milestones of the decision-making process and EIA process (Hokkanen, 2001; Stenstadvold, 2001); the perceptions of stakeholders; conflict generated during the process (Hokkanen, 2001); have achieved a rich description of the structures, processes and outcomes (Elliot and Francis, 2005); and, a rich understanding of environmental assessment's contextual operation and causation (Cashmore *et al.*, 2008).

Case study research, some argue, allows the determination of the complete characteristics of real-life events and their contextual conditions (Yin, 2003). Consequently, this research approach is recommended for examining contemporary

events, when research questions include “how” and “why”, and when the researcher has little control over events (Yin, 2003). Since this research about the influence of EIA on decision-making processes for HWMF in Mexico has no control over the decision-making processes and it aims to understand how EIA influences decision making, case study was considered as an appropriate research design. In addition, this research design will allow a detailed and intensive analysis of the decision-making processes in order to investigate the role of EIA.

Case study design might consist of a single case study or a series of case studies (multiple-case study) (de Vaus, 2001; Yin, 2003) (See Fig. 5.1). Single cases and multiple case studies can be classified as holistic or embedded. In an embedded case study, the case involves multiple units of analysis, while a holistic case has one unit of analysis for each case (Yin, 2003) (Fig. 5.1). In embedded cases studies, the identification of sub-units allows for a more detailed level of inquiry. The embedded case study design is appropriate for descriptive studies, where the goal is to describe the features, context, and process of a phenomenon. In addition, the embedded case study approach is particularly relevant for the examination of an environment where the boundaries between the phenomenon of interest and context are not clearly evident (Yin, 2003). In addition, the embedded case study is appropriate to organize different types of knowledge, such as different stakeholders (Scholz and Tietje, 2002). Thus, the embedded case study design was considered as useful for the investigation of the influence of EIA in HWMF decision making.

This research identified three stages in HWMF decision making in Mexico which were considered as the units of analysis (Fig. 5.2): a) project site selection and design decision making; b) environmental permit decision making; and c) building permit decision making. The subunits of analysis determined were the different types of HWMF for medical and industrial waste and stakeholders. The different types of HWMF were: landfill for containment (LC), incinerator (I), treatment (T), recycling and reuse (RR), and temporary storage (TS). The stakeholders were: developers, consultants, Ministry of Environment officers, NGOs and members of the community.

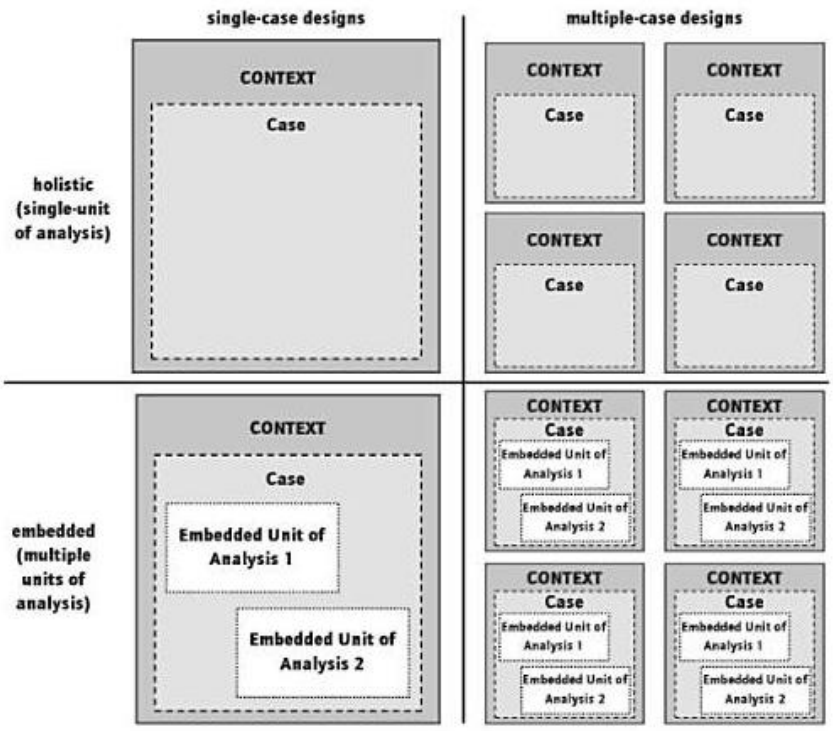

Fig.5.1Basic types of designs case studies according to Yin (2003 p. 40)

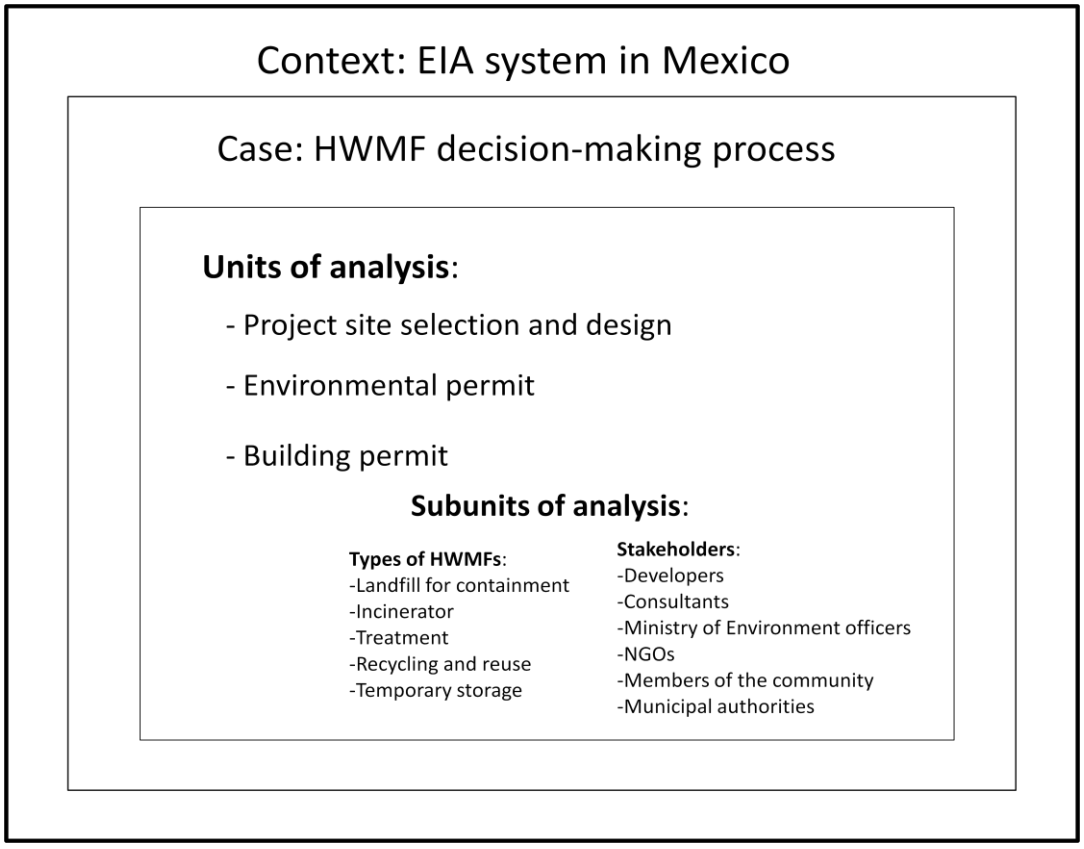

Fig. 5.2 Embedded case study design to investigate the influence of EIA in HWMF decision-making process

Case study research design is characterized by the employment of multiple methods for data collection (de Vaus, 2001); it can use both quantitative and qualitative research strategies (Bryman, 2004). It has been stated that a good case study research will use as many sources as possible, as this will help the researcher to triangulate the findings, and therefore to have more convincing and accurate conclusions (Yin, 2003). The following paragraphs will describe the different research strategies and data collection methods cited in the literature regarding the role of EIA in decision making and thus, those used for this research.

In order to understand the research strategies and methods used by other researchers for studying the role of EIA in decision making, the research strategies are classified in this Chapter as quantitative and qualitative according to Bryman (2004). The quantitative research strategy emphasizes quantification in the collection and data analysis, whereas the qualitative research strategy emphasizes "words", and the way in which individuals interpret their social world (Bryman, 2004; Yates, 2004).

Quantitative research strategy and methods

By employing a quantitative research strategy, the role and effect of EIA on decision-making has been studied through sample surveys, and applying questionnaires to relevant stakeholders including: developers, planning authorities, statutory consultees, and consultants [See for example, Kobus and Lee (1993); Heuvelhof and Nauta (1997); Wood and Jones (1997); Sadler (1996); and Weston (2002)]. The results from this type of strategy have been used for producing frequency analyses, cross-tabulations and correlations.

Surveys undertaken to study the influence of EIA on decision-making have used indicators of the importance, and usefulness, of the contents of EIS's in reaching decision (Kobus and Lee, 1993; Wood and Jones, 1997); and the importance and usefulness of consultations based on the EIS (Kobus and Lee, 1993; Wood and Jones, 1997), according to different quantitative scales, ranging from "not useful" to "very useful" (Wood and Jones, 1997), or "marginal" to "very important" (Kobus

and Lee, 1993). Also, in the International Study of the Effectiveness of Environmental Assessment (Sadler, 1996), seven dimensions of influence of EIA were evaluated by respondents according to a four-point scale ranging from "very influential" to "no influence". The dimensions evaluated were: ensuring environmental considerations are fully taken into account; ensuring social factors are fully taken into account; ensuring risks are fully taken into account; redesign of proposals; siting of proposals; establishing terms and conditions for development approval; and ensuring appropriate arrangements are in place for verifying implementation, monitoring effects and managing unanticipated impacts.

Other studies applying quantitative research strategies have, for example, considered the percentage of projects modified because of the EIA process (Kobus and Lee, 1993; Heuvelhof and Nauta, 1997; Wood and Jones, 1997); or the number of requests for more information made to the developer (Kobus and Lee, 1993; Wood and Jones, 1997). A documentary review of the planning officers' reports, in order to evaluate the weight given to the content of the EISs and to the consultations, through calculating the proportion of the report dealing with those aspects has been used as another indicator (Wood and Jones, 1997).

Using these quantitative research strategies also allow researchers to operationalise concepts and establish consistent measures in order to determine differences and regularities (Bryman, 2004; Yates, 2004; Sarantakos, 2005). Thus, authors such as Kobus and Lee (1993), Sadler (1996), and Wood and Jones (1997), stated that they were able to measure the importance and influence of EIA on decision making by using indicators and scales of the importance of the EIS in the decision-making process.

In addition, through the application of surveys, the quantitative researcher can acknowledge and attempt to control external factors. Questionnaires are designed, say proponents, to establish the same context and questioning to interviewees, ensuring that all the interviewees reply to an identical stimulus (Bryman, 2004; Yates, 2004). The results from questionnaires can, therefore, be aggregated, compared, and regularities be identified (Bryman, 2004; Yates, 2004). Another

strength of the quantitative research strategy is that it can limit the impact of the researcher's value system on the research itself (Yates, 2004).

This last contention is based on the fact that a quantitative research strategy assumes that all members of society define reality in the same way because objects generate the same meanings and people see them in the same way (Yates, 2004; Sarantakos, 2005). Research about the influence of EIA on decision making which uses a quantitative strategy, therefore, assumes that EIA has the same meaning for all the stakeholders who answer a questionnaire (e.g. local planning authorities, consultants, developers). However; it has been acknowledged that EIA is viewed very differently by various stakeholders (Glasson, 1999), and that the influence and role of EIA on decision making cannot necessarily be quantified objectively (Cashmore *et al.*, 2004). In addition, it has been stated that quantitative methodologies restricts respondents' opinions to a certain hypothesis or theories (Bryman, 2004; Yates, 2004; Sarantakos, 2005). Therefore, research about the influence of EIA which uses quantitative research strategies restricts the opinions of stakeholders to certain models of influence only (in the main rational decision-making model).

Qualitative research strategy and methods

An alternative social research strategy is to adopt a qualitative approach (Taylor and Bodgan, 1998; Bryman, 2004; Sarantakos, 2005) which applies methods such as participant observation, in-depth interviewing, and document analysis (Taylor and Bodgan, 1998). Qualitative research strategy emphasizes words rather than quantification in the collection and analysis of data (Bryman, 2004), and, it is argued, is useful for the understanding of human action and for the interpretation of people's actions from people's point of view (Taylor and Bodgan, 1998; Bryman, 2004).

EIA's role and effect on decision making has been studied using these qualitative research strategies. For example the role of EIA has been investigated through interviews with relevant stakeholders [See for example Hokkanen (2001); Leknes, (2001); Stenstadvold (2001); Bekker *et al*. (2005); Elliot and Francis (2005); Cashmore *et al*. (2008)]. This research strategy is based on attempting to understand

how individuals give meaning to, and express their understanding of, their experiences (Yates, 2004). It also helps to explore detailed processes in a social context (Yates, 2004). Thus, using a qualitative research strategy, researchers have analysed the purpose and the meaning of the EIA process for the different actors (Hokkanen, 2001); investigated how the perceptions of decision-makers were affected by Impact Assessment (Bekker *et al.*, 2005); and, have gained a richer understanding of the decision and EIA process (Pischke and Cashmore, 2006).

It has been claimed that qualitative research strategies provide richer data, as the data collection methods used do not constrain the concepts to measuring quantities, and the sources of data are wider (Yates, 2004). Thus, studies regarding EIA's influence using qualitative research strategies, have for example, analysed relevant documents, legislation and regulations; as well as milestones of the decision-making process, actors and procedural steps (Hokkanen, 2001; Stenstadvold, 2001; Pischke and Cashmore, 2006).

However, qualitative research strategies have been criticized because they can be influenced by the researcher's opinion of what is important according to their inclination (Bryman, 2004), whereas quantitative research strategies help to limit the impact of the researcher's value system on the research itself (Yates, 2004).

According to the literature regarding research about the role of EIA in decision-making, both research strategies have been useful for the investigation of this topic. However, since this research attempted to describe the decision-making process and understand the influence of EIA on decision-making processes from the stakeholders' perspectives, this research used qualitative data collection methods which will be described in the following section.

5.3.1 Data collection and analysis

A case study approach is characterized by the employment of multiple methods for data collection (de Vaus, 2001); it can use both quantitative and qualitative research strategies (Bryman, 2004). The case study relies on multiple sources of evidence to add depth to data collection, to assist in triangulation, and to contribute to the validity of the research (Yin, 2003). In addition, the case study combines a variety of information sources including documentation, interviews, and artefacts (Yin, 2003).

As has been discussed, qualitative research focuses on individual's perspectives and the way they interpret their social world (Bryman, 2004; Yates, 2004). In addition, qualitative methods such as participant observation and interviewing are commonly applied in case study design as they are helpful in the generation of an intensive and detailed examination of a case (Bryman, 2004). Through this research strategy, researchers have been able to analyse the purpose and the meaning of the EIA process for different stakeholders, and how perceptions of decision makers are affected by it. Therefore, the case study approach in this research used a qualitative research strategy.

The case study approach applied in this research considered as units of analysis project site selection and design, environmental permit decision making, and building permit of the different types of HWMF identified in Mexico (See Fig. 5.2). In each of the units of analysis different documents are produced and different stakeholders are involved. In the project site selection and design, developers and consultants are involved, and an Environmental Impact Statement (EIS) is produced (See section 3.4). Ministry of Environment officers make the decision regarding the environmental permit and produce a Final Statement (FS) (See section 3.4). During the environmental permit decision making, NGOs and members of the community may be involved if public consultation is undertaken through the Ministry of Environment. The decision regarding the building permit is made by municipal authorities and a statement regarding the building permit is produced. Thus, the case study approach used as qualitative data collection methods: documents (EISs and FSs), and semi-structured interviews with the stakeholders involved.

Qualitative interviewing is useful when the research is interested in interviewees' points of view (Bryman, 2004). Therefore, in order to understand stakeholder's perspectives about the influence of EIA on decision making for HWMF in Mexico, semi-structured interviews were undertaken with the different stakeholders identified. In addition, since the documents produced during the different stages of the decision-making process (e.g. EISs and FSs) reflect interpretations of decision makers regarding the influence of EIA, they were also analysed.

Sample of project applications for HWMF

In order to decide on the sampling procedure for relevant HWMF cases, it was first necessary to determine accessibility to, and availability of information. Therefore, in January 2006, contact was made with officers at the Ministry of Environment. Through an organisation that advises the Ministry of Environment in Mexico [Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ)], access was gained to the internal files from the Ministry. Also, a letter was obtained from the Ministry endorsing the research which was later used for contacting potential interviewees.

After reviewing the information available on the Internet and in the Ministry of Environment's internal files about the project applications and stakeholders, it was discovered that the information was more complete and accessible after 2000. This was due to the change of administration of the federal government at the end of 2000. In this period new officers started working at the Ministry of Environment and introduced new policies for keeping the files of the project applications. These policies, for example, allow the Environmental Impact Statements and Final Statements of all planning applications to be accessible on the Internet from the Ministry of Environment website and Library. Consequently, this study investigated the project applications for HWMF in Mexico, including both industrial and medical waste, which were made between the end of 2000 and the end of 2005.

These applications for HWMF in the Ministry of Environment's internal files comprised a total of thirty-six (See Table 5.1): twenty-nine project applications for industrial waste and seven for medical waste. For industrial wastes, the types of facilities identified included: landfill for containment; treatment; recycling and reuse; and temporary storage. For medical waste, the facilities comprised incinerator, and treatment and destruction. The thirty-six project applications are spread around the country (See Fig 5.3 Map of the project applications distribution).

Table 5.1 Project applications from the end of 2000 to the end of 2005 in Mexico [Based on the Ministry of Environment's internal files and SEMARNAT (2009)].

Industrial wastes		**Medical wastes**	
Type of facility	**No. of project applications**	**Type of facility**	**No. of project applications**
Landfill for containment	6	Incinerator	6
Centre for temporary storage, treatment, and recycling	2	Treatment and destruction	1
Treatment	10	**Total**	**7**
Recycling and reuse	7		
Temporary storage	3		
Incinerator (industrial and medical wastes)	1		
Total	**29**		

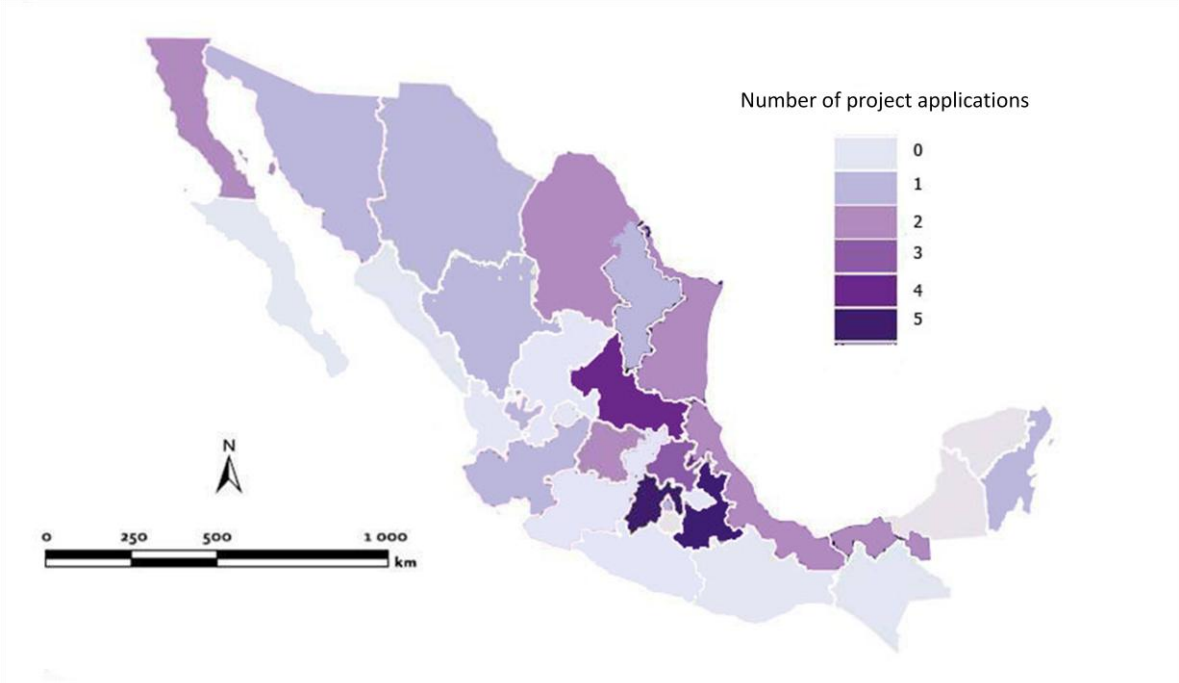

Fig. 5.3 Project applications distribution between the end of 2000 and end of 2005

From January to March 2006, information regarding the project applications received by the Ministry of Environment in Mexico City was obtained. This included, for all project applications: contact details for the stakeholders involved (developers, consultants, Ministry of Environment officers, local authorities, members of the community, and NGOs); Environmental Impact Statements; Final Statement from the Ministry of Environment; and reports from consultations made during the decision-making process.

Since decision making for landfill for containment facilities is more difficult (for example, more complex, covers a wider geographical area, more people are involved, and is more controversial), it was considered that obtaining interviews with key stakeholders of this type of facility was going to be more problematic and, to ensure sufficient response on which to draw conclusions, stakeholders from all six of these project applications (see Table 5.1) were contacted for this research. The stakeholders identified included: developers, consultants, Ministry of Environment's officers, municipal authorities, members of the community, and NGOs.

From the rest of the facilities identified (30 project applications), facilities for industrial wastes represented 77% and medical wastes 23%. In order to investigate the role of EIA during the decision-making processes from the stakeholders' perspective (developer, consultant, members of the community, planning authority and municipal authority), a semi-structured interview with them had to be undertaken for each case. It was expected that for each project application (30) approximately five interviews, on average, were going to be undertaken, making a total of 150 interviews. However, because of time and resource constraints, the number of project applications for which semi-structured interviews were to be undertaken had to be reduced. It was decided to undertake semi-structured interviews for at least 60% of all the project applications in order to have a representative sample of them. Therefore, from the 30 project applications identified, 18 project applications were considered for the collection of data through semi-structured interviews.

With the objective of obtaining proportional representation of each type of HWMF, a stratified sample as defined by Bryman (2004) was chosen; covering both industrial and medical waste, and the different types of facilities (landfill for containment, recycling and reuse, temporary storage, treatment, and incineration). From the thirty project applications identified, facilities for industrial wastes represented 77% and medical wastes 23%. Consequently, the sample chosen comprised the six projects for landfill for containment; fourteen project applications (78%) for industrial waste and four (22%) for medical waste (See Table 5.2 and Fig 5.4).

Table 5.2 Project applications to be sampled during the collection of data (Stratified sample).

Industrial wastes			**Medical wastes**		
Type of facility	**No. of project applications**	**No. of projects to be sampled**	**Type of facility**	**No. of project applications**	**No. of projects to be sampled**
Landfill for containment	6	6	Incinerator	6	3
Centre for temporary storage, treatment, and recycling	2	1	Treatment and destruction	1	1
Treatment	10	7	**Total**	**7**	**4**
Recycling and reuse	7	3			
Temporary storage	3	2			
Incinerator (industrial and medical)	1	1			
Total	**29**	**20**			

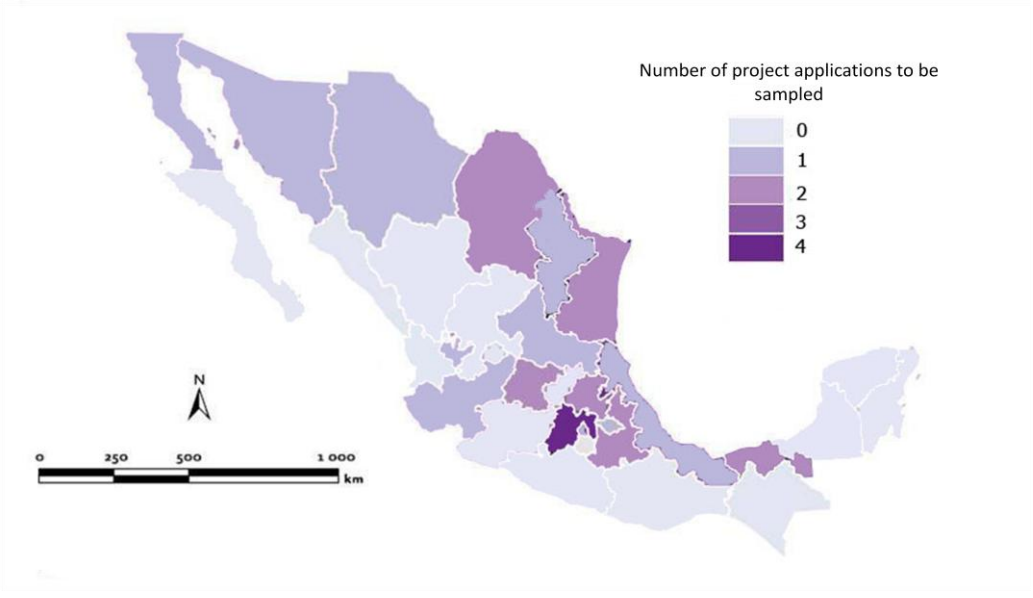

Fig. 5.4 Distribution of project applications to be sampled

The sample of the planning applications, except landfill for containment, was made in order to obtain the greatest variety between stakeholders and location of the projects; as well as practical grounds (time and resources constraints). Stakeholders from the different project applications were contacted and interviewed from March to August 2006. For these types of facilities, the stakeholders encompassed developers, consultants, Ministry of Environment's officers, and decision makers in municipal authorities.

Semi-structured interviews

There are two main types of interview in qualitative research: unstructured and semi-structured (Bryman, 2004). In semi-structured interviews, the researcher has an interview guide (list of questions or of specific topics to be covered), but the wording and the order of the questions are less important and can vary. In addition, the semi-structured interview is flexible, so the researcher can explore further any topics mentioned by the interviewee (Bryman, 2004; Yates, 2004). This type of interview was undertaken and, whenever necessary, the interviewees were asked for more information, or to elaborate on points from their answers. The questions during the semi-structured interviews were designed to be neutral (Yates, 2004) in terms of fitting into any type of theoretical model of the role of EIA in decision making.

The interview guide used for the semi-structured interviews covered the following topics:

- Role of EIA in decision making;
- Role of EIA for planning and design of projects;
- Influence and linkage of EIA to decision making; and
- Effectiveness of EIA for decision making.

The interview guide changed slightly according to the group of stakeholders to be interviewed (See Table 5.3). For example, Ministry of Environment's officers were asked about the environmental permit decision making, while Municipal authority's officials were asked about the building permit.

Table 5.3 Interview guide used for each group of stakeholders interviewed.

Interview guide	
Developers	**Consultant**
• What is the role of EIA during the planning and design of the project? • How does EIA influence/how is it linked to the planning and design of the project? • How can EIA be more influential on decisions? • How can EIA be more effective? • What characteristics does it need in order to be more effective? • How is EIA useful for decision making?	• What is the role of EIA for decision making? • What is the role of EIA for the design and planning of the project? How is it linked to decision making? • How does EIA influence the decision-making process? • How can EIA be more influential on decisions? • What characteristics does EIA need in order to be more effective? How can EIA be more effective? • How is EIA useful for decision making?
Ministry of Environment officers/ Municipal authorities	**Members of the community/ NGOs**
• What is the role of EIA in the decision-making process? • How does EIA influence decision making about the design and planning of the projects? • How is EIA useful for the decision making regarding the environmental permit/building permit? • How is EIA useful for the decision making regarding the building permit by the municipal authorities? • What characteristics does EIA need in order to influence decision making? • How can EIA be more effective for decision making?	• What is the role of EIA? • How does it work? • How does EIA influence the community's/NGO's decision making for accepting or rejecting the project? • What characteristics does EIA need in order to influence your decisions? • How can the EIA be more effective?

Two pilot interviews were undertaken with consultants who were not related to any selected case. Pilot interviews were undertaken to gain experience and confidence at interviewing (Bryman, 2004; Marshall and Rossman, 2006), and to explore stakeholders' terms (Yates, 2004). Minor changes were made to improve the wording and make the questions more comprehensible (Bryman, 2004). In addition, some feedback was received and recommendations made by the pilot interviewees.

During the subsequent semi-structured interviews with stakeholders from the project applications, it was realized that some of the interviewees interpreted the term "Environmental Impact Assessment" to mean the EIS Review procedure undertaken by the Ministry of Environment, and not as the complete EIA process. Consequently, the perceptions of the interviewees were explored at the beginning of each interview in terms of EIA as a complete process, and not just as the EIS Review by the planning authority.

Following Yates' (2004) recommendations, at the beginning of each interview, a letter signed by the researcher was given to the interviewee with the following information: researcher's name and contact details, the name of the sponsor of the research, school of studies, a statement that the researcher was not a member of any NGO or media, that the interview and information shared during the interview was going to be used for academic purposes only (for the PhD dissertation), and that confidentiality and anonymity of their participation would be respected at all times.

As part of the interview schedule, as recommended by Yates (2004), the interviewer explained briefly what the research was about, how the interview was going to be structured and, that the interviewee could stop the interview at any time. Also, the interviewee was asked for permission to be recorded, and was informed that a complete transcription of the interview was going to be sent to them through email or fax.

Interviews were recorded with a Digital Voice Recorder, and, as soon as possible, the transcriptions were made. Following Bryman (2004), the interviews were transcribed completely (verbatim) by the interviewer as this allowed detailed analysis subsequently.

The location of the interviews varied depending on the schedule and availability of the interviewees. Thus, interviews with developers, consultants and planning authorities took place mainly in their working offices, whereas interviews with members of the community and NGO's members more often took place in restaurants or coffee shops.

As recommended by Bryman (2004), during the interviews notes were made regarding the profession of the interviewee and the position they held during the decision-making process, as this information could be useful for contextualizing their answers. Also, as suggested by Yates (2004), notes were made regarding the key issues raised, plus details of interesting points mentioned by the interviewee to be followed up during the interview, or for future reference during the analysis.

Following suggestions from Yates (2004) and Marshall and Rossman (2006), during the interviews, non-verbal signals such as nodding and discourse markers ('OK', 'yes', 'right') were used by the interviewer to make the interviewee feel that he/she was making a positive contribution, and that the researcher was interested and involved in what the interviewee was saying. This strategy probably increased the amount of information provided by the interviewees.

As suggested by Kvale (1996), during the interviews, the interviewer condensed what the interviewee had explained, and relayed the meaning back to the interviewee in order to confirm that the interpretation was adequately and accurately understood by the interviewer.

Following Yates (2004), at the end of the interview, the interviewer explained about the transcription of the interview, and also that a copy was going to be sent via email or fax so that he/she could comment on it. The transcription was made in Spanish as it is the native language of the interviewees. Once the transcription of the interview was finished, a copy of it was sent by e-mail or fax to the interviewee for verification and agreement for its use.

Potential interviewees for all the planning applications were first contacted through email or telephone to request the interview. The emails sent made clear the identity of the researcher, explained the objective of the research, the place where the research was taking place, the sponsor of the research, an explanation of why they were being contacted, request for the interview, and made clear that the anonymity and confidentiality of their participation was guaranteed. In addition, in order to obtain the confidence of the potential interviewees, and therefore to increase the rate of response, a letter obtained from the Ministry of Environment endorsing the research project was attached. When positive replies from the emails were received, a telephone call was made to agree the time and place for the interview.

NGOs and members of the community were contacted first, as it was assumed that they would be more willing to participate in the research, and therefore more pilot interviews for this research could be undertaken. However, while attempting to contact members of NGOs and members of the community, it was realised that many of the details obtained from the Ministry of Environment files were not updated. Consequently, further research to obtain NGOs' and community members' contact details was undertaken through the Internet. Consultants, on the other hand, made a much more positive response to the requests. In addition, once the consultant had made a positive response to the request, it was relatively easy to also obtain a positive response from the developer for the same project application.

Regarding the municipal authorities, these are elected every three years in Mexico. When this occurs, the officers are usually replaced with new staff. Therefore, the contact details obtained from the Ministry of Environment regarding the municipal authorities' officers involved in the decision making for the "building permit" and the "environmental permit" consultees were not updated. As a result, the contact details for the municipal authorities had to be obtained from their official websites. Once the updated contact details were obtained, phone calls and e-mails were made to municipal authorities in order to request the interviews.

In order to gain access to the Ministry of Environment's officers, the following approach was undertaken. A preliminary visit to the Department of Environmental Impact and Risk within the Ministry of Environment was undertaken in May 2005, to

explain the project and determine the feasibility of the research. In addition, a formal request to the Department was sent in June 2006 to ask for permission to undertake interviews with the official for the sector and case officers involved in the decision making for the planning applications selected. The access to the Ministry of Environment's officers also relied on assistance from members of the Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ), which is an institution that advises the Ministry of Environment regarding waste management. The authorisation from the Ministry of Environment for undertaking the interviews with planning officers took approximately three months to obtain.

The Ministry of Environment's officers were the last group of stakeholders to be contacted as it was thought that by interviewing the other stakeholders first, a wider perspective and context of how the decision was made would be gained, and therefore, a better understanding during the interview of how the decision was made by the Ministry of Environment and municipal authority. Also, since the decision making regarding the environmental permit is all made in the Ministry of Environment, each planning officer was involved in several planning applications. For example, one planning officer participated in the decision making for landfill for containment, incinerators, as well as treatment and recycling. Therefore it was considered important to have a clear perspective of how the decision-making process occurred before undertaking the interviews with the Ministry of Environment's officers.

For all stakeholders, whenever possible, the interviews were face-to-face. However, due to the sample being geographically dispersed and time and resource constraints, some interviews had to be undertaken on the telephone. This caused some practical and methodological problems. For example, it was not possible to use verbal signals and to respond to signs of confusion or unease from the interviewees while asking questions. Another disadvantage of undertaking telephone interviews was the length of the interviews. It was observed that telephone interviews were shorter compared to the face to face interviews.

The Ministry of Environment's officers who were in charge of planning applications between the end of 2000 and 2003 changed in the year 2003; many of them stopped working at the Ministry of Environment. Their contact details were not accessible from the Ministry of Environment, and, therefore, it was difficult to obtain interviews with planning officers who were involved in the cases that occurred in that period. Thus, the interviews that were obtained involved mainly those who had been working at the Ministry of Environment since 2003 to when the interviews were undertaken.

Through phone calls and Internet research, it was realised that many of the officers at the municipal authorities that were consulted by the Ministry of Environment during the environmental permit decision making were no longer working at the municipal authority. In addition, the rate of response to the e-mails sent to the municipal authorities was very low. When the officers at the municipal authority replied to the e-mails, they explained that the Ministry of Environment (at federal level) was the institution in charge of the decision making for those types of facilities, and that they were only consulted during the environmental permit decision making.

When no response was received from any of the stakeholders of a project application, that was replaced by another similar application (same type of facility). The cases added to the sample were applications made between 2004 and October 2006. This time period was chosen in order to increase the likelihood of being able to contact stakeholders, especially from Municipal authorities.

Since hazardous waste management decision making is a sensitive subject in Mexico, the interviews undertaken with stakeholders were subject to availability and to the willingness of stakeholders to participate in this research. For example, as has been described, a low response was typical of some stakeholders such as municipal authorities. Therefore, all the interviews obtained were considered in the analysis and no selection strategy was applied. Thus, the results and analysis in this research are limited to the perspectives and experience of those stakeholders willing to participate in this research.

The final number of projects and types of facilities from which interviews were obtained are shown in Table 5.4. A total of fourty-two interviews were carried out: developers (n = 8); consultants (n = 15); consultees (n = 2) and statutory consultee (n = 1); NGOs (n = 3); Ministry of Environment officers (n = 7); members of communities (n = 3); municipal authorities (n = 3).

Table 5.4 Projects from which interviews were obtained for each of the types of facilities

Industrial wastes			**Medical wastes**		
Type of facility	**Number of projects to be sampled**	**Number of projects from which interviews were obtained**	**Type of facility**	**Number of project applications**	**Number of projects from which interviews were obtained**
Landfill for containment	6	5	Incinerator	3	3
Centre for temporary storage, treatment, and recycling	1	0	Treatment and destruction	1	0
Treatment	7	5	**Total**	**4**	**3**
Recycling and reuse	3	3			
Temporary storage	2	2			
Incinerator (industrial and medical)	1	1			
Total	**20**	**16**			

Once the interviews were obtained and transcribed, qualitative coding was undertaken for the analysis of the interviews, as suggested by Bryman (2004) and Charmaz (2006) for qualitative analysis. Coding encompasses the segmentation of the interviews into parts which are named with concise terms that summarize the accounts of the data (Bryman, 2004; Charmaz, 2006). According to Charmaz (2006), coding encompasses at least two phases: initial coding and focused coding. The initial coding involves naming each word, line, or segment of the interview. The focused coding uses the significant codes to synthesize, integrate, and organize the data.

The initial coding used in this research was 'line by line' as described by Charmaz (2006), involving coding sentence by sentence of the semi-structured interviews. Based on Charmaz (2006), by using this type of coding, it was possible to see differences between the data, and to identify explicit and implicit statements from the interviews. The initial coding, as recommended by Charmaz (2006), was close to the data and open to all possible theoretical directions (models), in this case, concerning the role or influence of EIA in decision-making. In addition, following Charmaz' (2006) recommendation, the codes used during the initial coding were provisional and were subsequently changed to better represent the meanings of the interviewees.

It should be noted that the language (and therefore the terms used by the interviewees), were in Spanish. Consequently, the coding process was undertaken by the researcher in Spanish, and once the coding process was finished, the categories were translated into English. The researcher functioned as an interpreter of the terms used by the interviewees (Marshall and Rossman, 2006). During this process, memos were kept of the terms used by the interviewee in Spanish and their translations made into English, as well as the links made with the codes and categories.

Based on Charmaz (2006), during the initial coding the following questions were considered:

- What does the data suggest about the role or influence of EIA in decision-making processes?
- From whose point of view? and,
- To what theoretical category about the role of EIA in decision-making does this specific datum point?

The recommendations made by Charmaz (2006) for coding were followed: remain open, stay close to the data, keep codes simple and precise, construct short codes, preserve actions, compare data with data, and move quickly through the data.

For coding the semi-structured interviews, the NVivo software was chosen to help with data analysis. This software is a Computer-Assisted Qualitative Data Analysis Software (CAQDAS) which helps to: code the interview segments quickly; write, store and view memos; retrieve the data coded; and, helps to make graphical

representation of the data analysis through diagrams representing the codes and their links between them (Bryman, 2004; Bazeley, 2007).

After the initial coding, as recommended by Charmaz (2006), focused coding was undertaken in order to examine, synthesize and explain larger segments of data. Focused coding means using the most significant and/or frequent earlier codes to sift through large amounts of data (Charmaz, 2006). By using focused coding it was possible to determine the adequacy of the codes and therefore decide which initial codes were useful for categorizing the data completely (Charmaz, 2006).

As Marshall and Rossman (2006) have suggested, during the category generation and coding of the interviews, patterns should be determined. In this research, they were determined by the different types of facilities and group of stakeholders. NVivo helped to identify patterns in the interviews (codes, categories) from different stakeholders (Silverman, 2005) as well as to interrelate the codes (Bryman, 2004).

Strauss and Corbin (1998) stated that comparisons during coding enable the researcher to identify variations in data and variations in categories and their patterns, under different conditions. Therefore, this research compared the categories and their patterns between different types of facilities and different stakeholders. By doing this, the researcher was able to recognize the variation in categories about the influence and role of EIA in decision-making processes applied to different types of facilities and stakeholders.

During the coding process, following Charmaz' (2006) recommendation, memos were used as they helped in remembering the code definition and the explanation of why a particular code had been assigned to a particular datum (Hardy and Bryman, 2004), as well as helping to summarize key findings (Marshall and Rossman, 2006). In addition, memos aided the comparison between data and data, data and codes, codes of data and other codes, and codes and categories (Charmaz, 2006).

According to Strauss and Corbin (1998), literature is a source of concepts and by using it during the coding process the researcher can extend development of concepts. Thus, during the analysis of the semi-structured interviews and of the

documents, the theoretical models of EIA on decision making suggested in literature were also considered for understanding the perspective of the stakeholders.

Based on the spectrum of the theoretical decision making models and theoretical models of EIA (See Fig. 4.1 in Chapter 4), the models about the role of EIA in decision-making identified in the existing literature were named in this research as follows: a) information processing model, b) institutionalist model, c) organisational model, d) participation model, e) symbolic politics model (positive and negative ends), and f) political economy model.

The information processing model of EIA in this research was associated to the rational theoretical model of decision making and to the "information processing" model of EIA suggested by Bartlett and Kurian (1999) (See section 4.3 in Chapter 4). Box 5.1 describes the general statements in literature which could relate to the "information processing" model and therefore were used during the analysis of semi-structured interviews and documents in this research.

Box 5.1 General statements of the information processing model in literature

Information processing model
- EIA is a tool that generates scientific data (Nilsson and Dalkmann, 2001) - EIA is neutral with respect to the political and economic goals (Bartlett and Kurian, 1999) - EIA is used to analyse the environmental consequences of a proposed action and to communicate the findings (Bartlett and Kurian, 1999; Weston, 2000) - Better quality of data in EIA and of EIS result in better quality of decision (Kobus and Lee, 1993; Bartlett and Kurian, 1999) - EIA enhances decision making as it provides information about the project, the baseline environment, and the environmental impacts (Kobus and Lee, 1993) - Documentation in EIA should be technically informed, reasonably thorough and unbiased (Wood and Jones, 1997) - EIA is a technique for generating, organising, and communicating information (Bartlett and Kurian, 1999) - EIA is a technical process governed by scientific and technical rationality, comprising the collection of relevant information through mainly quantitative techniques (Bartlett and Kurian, 1999) - Public participation is seen as an information source (Bartlett and Kurian, 1999)

- EIA is an objective process in which scientific advice influences decisions (Owens *et al.*, 2004) - Passive information of accurate predictions on the environmental consequences of a wide range of alternatives will lead to better decisions (Kørnøv and Thissen, 2000) - The effectiveness of EIA focuses on the extent to which expectations of accuracy and precision of environmental prediction and of the efficacy of institutional and administrative arrangements are met (Bartlett and Kurian, 1999) - The effectiveness of EIA is determined by factors such as rigorous undertaking of the key stages in the EIA process (Cashmore *et al.*, 2004) - The effectiveness of EIA depends on the presentations of the findings in a logical, coherent and comprehensible manner (Cashmore *et al.*, 2004) - Practical outcomes of EIA: scientific and technical learning (Cashmore *et al.*, 2007)

The institutionalist model of EIA in this research was connected to the bounded rationality theoretical decision making model and to the "institutionalist" model of EIA described by Bartlett and Kurian (1999) (See section 4.3 in Chapter 4). Box 5.2 describes the general statements identified in literature which could relate to this model.

Box 5.2 General statements of the institutionalist model in literature

Institutionalist model
- The purpose of EIA is to transform institutional values to incorporate environmental values such as environmental protection (Bartlett and Kurian, 1999) - The effectiveness of EIA depends on the degree to which values are transformed, ways of doing things are changed, and perspectives on what ought to be done are modified in institutions to incorporate environmental values (Bartlett and Kurian, 1999)

The organisational model of EIA in this research was linked to the bounded rationality theoretical model of decision making and to the "organisational politics" advanced by Bartlett and Kurian (1999) (See section 4.3 in Chapter 4). Box 5.3 lists the general statements in literature which could relate to the institutionalist model.

Box 5.3 General statements of the organisational model in literature

Organisational model
- EIA influences decision as it changes the internal politics of organisations (Bartlett and Kurian, 1999). - EIA changes internal structures and processes of organisations and therefore also changes values and organisational culture (Bartlett and Kurian, 1999). - EIA introduces environmental criteria and outcomes in organisations (Bartlett and Kurian, 1999) - EIA changes kinds of individuals hired, retained, and promoted who incorporate environmental values into the organisation (Bartlett and Kurian, 1999).

The participation model of EIA in this research was related to the incrementalism theoretical model of decision making and to the "pluralist politics" model (Bartlett and Kurian, 1999), "participation" model (Cashmore, 2004), and "environmental governance" model of EIA (Cashmore, 2004) (See section 4.3 in Chapter 4). Box 5.4 enunciates the general statements in literature which could relate to the participation model.

Box 5.4 General statements of the participation model in literature

Participation model
- EIA increases participation and involvement of public and organised interests (Bartlett and Kurian, 1999) - EIA is a process of negotiation which ensures democratic processes through citizen involvement (Bartlett and Kurian, 1999) - EIA should be a flexible procedure which ensures deliberation (Caratti *et al.*, 2004) - Discussion is encouraged and facilitated (Breda and Dijkema, 1998) - Emphasis is given to openness of the process, transparency of procedures, freedom and protection of participants (Kørnøv and Thissen, 2000) - Stakeholder involvement is substantive and participation is considered an engagement process (Cashmore, 2004) - EIA must be inclusive, deliberative and participatory (Cashmore, 2004) - EIA is a framework for negotiations and compromise (Cashmore, 2004) - EIA is a decision tool used in environmental governance to empower stakeholders, and promote an egalitarian society (Cashmore, 2004) - EIA is used to promote social justice and equality, to make decision-making transparent and institutions accountable, and to realise community self-governance (Cashmore, 2004)

- EIA allows debate and therefore the emergence and change of perspectives over time (Kørnøv and Thissen, 2000)
- EIA allows a reflective discourse in which the views of participants are adjusted and constructed (Kørnøv and Thissen, 2000)
- The effectiveness of EIA is constrained by the ability of involved actors to take part in a social learning process (Deelstra *et al.*, 2003)
- EIA is a forum for dialogue within which knowledge can be assembled, argument can take place, and learning can occur (Owens *et al.*, 2004)
- When conducting EIA, methods that are based on communication about values and interest ought to be preferred (Persson, 2006)

The symbolic politics model of EIA in this research was related to the incrementalism theoretical model of decision making and to the "symbolic politics" model of EIA suggested by Bartlett and Kurian (1999) (See section 4.3 in Chapter 4). Boxes 5.5 and 5.6 list the general statements in literature which could relate to the symbolic politics model.

Box 5.5 General statements of the symbolic politics model (positive end) in literature

Symbolic politics model (positive end)
- EIA is a set of language acts which create meanings (Bartlett and Kurian, 1999). - EIA functions by fostering the generation of strategically crafted arguments and by guaranteeing some kind of audience for those arguments (Bartlett and Kurian, 1999) . - EIA is an iterative mechanism for creating meaning, evoking emotional response, and reaffirming moral commitment (Bartlett and Kurian, 1999) - The goal of EIA is to become a tool for moral reaffirmation of certain values that have environmental preservation at their core (Bartlett and Kurian, 1999).

Box 5.6 General statements of the symbolic politics model (negative end)

Symbolic politics model (negative end)
- EIA is considered a formality and as a technique for the duplicitous ligitimation of the exercise of power by the powerful (Bartlett and Kurian, 1999). - The rhetoric and officiliase in EIA is used to convince people that because EIA has been undertaken the environment will be protected in order to lessen opposition to a proposal (Bartlett and Kurian, 1999).

The political economy model of EIA in this research was related to the incrementalism theoretical model of decision making and to the "political economy" model of EIA advanced by Bartlett and Kurian (1999) (See section 4.3 in Chapter 4). Box 5.7 enunciates the general statements of the model in literature.

Box 5.7 General statements of the political economy model in literature

Political economy model
- EIA has an impact on decision making because it alters financial opportunities, risks, constraints, and by internalisation of externalities it leads to the anticipation and prevention of environmental harm (Bartlett and Kurian, 1999). - Firms realise market or regulatory benefit from undertaking EIA as it promotes better environmental performance, represents public recognition, and improves the relationship with regulators and stakeholders (Bartlett and Kurian, 1999).

However, Strauss and Corbin (1998) also emphasize that using the concepts from literature might bias the researcher's interpretations and prevent the identification of new concepts from the data. This coincides with Charmaz (2006) who states that theoretical concepts from literature may provide starting points for analysing the data but do not give automatic codes for the analysis. Charmaz (2006) recommends doing the analytic work first, and, when applying theoretical models or concepts from literature, the researcher must ensure that these concepts are embodied in the data. They must also be clear about how the concepts from literature have similarities and differences with the research being undertaken (Strauss and Corbin, 1998; Charmaz, 2006).

Therefore, following Charmaz (2006) and Strauss and Corbin (1998), this research undertook coding and analysis first. During the analysis, the categories obtained from data were compared with the theoretical models in literature in order to identify the similarities and differences. In conjunction with the previous extensive review of the literature, this helped the researcher to determine the validity of the theoretical models for the HWMF decision-making process in Mexico.

Documents

Environmental Impact Statements (EISs) and Final Statements (FSs) were analysed through qualitative content analysis, which consists of defining categories or themes which were constantly revised during the examination of the documents (Bryman, 2004). During the examination of the documents, initial categories were developed, coding was undertaken, but other categories were expected to emerge and be refined during the study (Bryman, 2004).

Qualitative content analysis was undertaken of the EISs and FSs for each type of facility. The analysis of the EISs allowed the examination of the influence that EIA had on the developer and the consultant during planning and design of the project, while the analysis of the FSs was used for understanding the influence of EIA on the decision made by the Ministry of Environment officers, during the environmental permit.

a) Contents of EISs

According to regulations, EISs must include the following eight sections (SEMARNAT, 2000):

- general data of the project, developer and consultant;
- description of the project;
- relevant regulations and agreement of the project with the land use plan;
- description of the environmental baseline conditions;
- identification, description and assessment of environmental impacts;
- preventive and mitigation measures;
- environmental prediction, and if necessary, evaluation of alternatives; and
- methods and technical elements that support the information provided.

The EISs for HWMF analysed included these eight sections. Table 5.5 describes the general contents identified in the EISs for HWMF.

Table 5.5 General contents of EISs for HWMF analysed (based on the nineteen EISs analysed)

SECTIONS	CONTENTS	
I Developer and consultant's data	- Developer's name, location of headquarters, etc.	
II Project description	- equipment - regulations relevant for the facility and how it complies with them - location of the project (maps, area, land use, infrastructure required) - alternative project sites (LC cases) - project's activities	- hazardous waste management capacity - site preparation - operation of the facility - waste management - natural resources to be used
III Relevant regulations and land use plans	- Agreement of the project with land use plans and how the project complies with the relevant regulations	
IV Environmental baseline conditions	Description of climate, geology, soil, hydrology, flora, fauna, landscape, demography, population growth, working population, economic activities, religion	
V Identification, description, and assessment of impacts	- Description of impacts, impact assessment methods and criteria used, as well as an explanation about why the impact assessment method was chosen. The environmental aspects on which impacts were identified in most of the EISs are: a) Construction phase: soil, flora, fauna, air, noise, water, socioeconomic, landscape, and land use b) Operation phase: soil, flora, fauna, air, noise, water, socioeconomic, landscape, waste generation, and traffic in access roads c) Decommission phase: soil, waste generation, air, noise, flora, landscape, and traffic In LC cases, EIS listed as impacts on the social aspects the modification of the landscape, social opposition, and risk to human health because of accidents during hazardous waste transportation (LC #5, #4).	
VI Mitigation measures	- Description of the mitigation measures to be implemented during different stages of the project. - Environment aspects for which mitigation measures were proposed included: soil, flora, fauna, air, water, noise, and landscape. LC cases included an environmental management program to monitor air emissions, waste water and waste management, flora, fauna, and prevent soil pollution (LC #4, #5). LC cases proposed as mitigation measures public consultation before the construction of the facility; workshops for the participation of organizations and representatives of the local community; consultation with experts; provision of information to the community; and a process of permanent communication with the local community (LC #4, #5).	
VII Environmental prediction	- Description of the future environment's condition once the project has been built. - Description of the environmental program to be implemented in the facility which includes waste management, waste water monitoring, underground water monitoring, air emissions monitoring. LC cases included a monitoring program to identify unforeseen impacts on the environment and thus implement the necessary mitigation measures. As well as permanent monitoring for the detection of leachates from the containment cells, monitoring of underground water and soil (LC #3, #4).	
VIII Methods and technical elements	- Description of the methods used and additional information to complement the EIS such (e.g. photos, maps, and diagrams.	

b) Contents of Final Statements

For the purpose of this description, the contents of the Final Statements (FS) analysed were divided in three sections (See Appendix 2 for detailed contents of FSs per type of HWMF). The first section mentions the project and developer's name, and that according to regulations the Ministry of Environment is the governmental body which will review the EIS to determine whether the project should be granted the environmental permit.

The second section states whether the project's name was listed in the Ministry of Environment's journal; whether the EIS included all the information requested in regulations; whether compulsory consultation with local authorities was undertaken; whether additional information was requested from the developer; whether the EIS was available to the public; and whether public consultation was requested through the Ministry of Environment. In addition, Final Statements include a brief description of the comments made by the local authorities during compulsory consultation and the response by the Ministry of Environment to them; and, if undertaken, a description of the comments made by other departments within the Ministry of Environment or external experts consulted. If public consultation was undertaken, it describes when and where it took place; the relevant comments or concerns made by the public; and the response by the Ministry of Environment.

The third section describes the project (e.g. area, types of wastes to be handled, activities to be undertaken); whether the project is located within a natural protected area; whether the project agrees with the land use plan of the area; and the applicable regulations to the facility. It also describes the environmental baseline conditions of the area (based on the information provided by the EIS); the technical analysis made by the Ministry of Environment regarding the relevant environmental impacts and the mitigation measures to be implemented. The section finally states the conclusions regarding the environmental impacts; whether the authorization is granted or rejected; and, if the authorization was granted, how the project will be undertaken and the conditions attached to the development.

According to Bryman (2004), the steps for undertaking a qualitative content analysis of documents are: generate a research question, become familiar with the context of the document, become familiar with a small number of documents; generate some categories that will guide the collection of data and draft a schedule for collecting the data in terms of the generated categories; and, revise the schedule and select further cases to revise the categories (Bryman, 2004). Following Bryman (2004), the research questions used in the qualitative content analysis were:

- What is the role of EIA in the planning and design of the project?
- What is the role of EIA in the decision-making process regarding the environmental permit?

An initial coding of EISs and FSs was based on the theoretical models suggested in literature (See Boxes 5.1 – 5.7) but during the process the researcher was open to new categories that could emerge from the coding of the documents.

Evaluation of the quality of EISs and of the EIA system for HWMF

The review package used for the analysis of EISs quality is based on the "information processing" model of EIA as it assesses the quality and completeness of the information provided in the EIS. Thus, reviewing the quality of EISs for the different HWMF helped to determine how complete the EISs were and provided an extra coding opportunity for the analysis.

The criteria used for the evaluation of the Mexican EIA system for HWMF reveals implicit characteristics of the "information processing" and "participation" models of EIA in decision making. The information processing model assumes that accurate prediction of impacts and the consideration of a wide range of alternatives will lead to better decisions (Kørnøv and Thissen, 2000); and that EIA is a tool for generating, organising, and communicating information (Bartlett and Kurian, 1999). These statements are implicit in the following criteria used to evaluate the EIA system: consideration of alternatives, scoping of impacts, EIS preparation, and EIS review.

The participation model states that EIA increases participation and involvement of public and organised interests; that EIA is a process for negotiation where discussion is encouraged and facilitated; and that emphasis is given to transparency of the process (Breda and Dijkema, 1998; Kørnøv and Thissen, 2000). These characteristics are implicit in the scoping of impacts; EIS review; decision making; monitoring and auditing of impacts; and consultation and participation criteria. Therefore, the evaluation of the EIA system and how the criteria were met aided the determination of the influence of EIA in decision making according to the information processing and participatory models. In addition, it helped to establish the context of decision making process for HWMF in Mexico and provided information to be able to compare EIA practice in Mexico with that in other countries.

a) Quality of EISs for HWMF

The quality of the 19 EISs for the HWMF was reviewed using the ES quality review package and the rating scale designed by Lee *et al.* (1999). Each EIS was reviewed by two different people (the researcher in this study and a Master's degree student). This package was applied as it can be used to assess the quality and completeness of the information provided in the EIS (See Table 5.6 and 5.7). Lee *et al.* (1999) was considered as relevant for the review of the EIS in this study as it has been widely used in literature [See for example, McGrath and Bond (1997), Barker and Wood (1999), and Cashmore *et al.* (2002)].

Table 5.6 Review areas considered for the assessment of the quality of the EIS based on Lee *et al*. (1999).

Review areas
1. Description of the development, the local environment and the baseline conditions.
2. Identification and evaluation of key impacts.
3. Alternatives and mitigation of impacts.
4. Communication of results.

Table 5.7 Rating scale considered for the assessment of the quality of the EIS based on Lee *et al*. (1999).

Rating scale and explanation	
Symbol	**Explanation**
A	Relevant tasks 'well performed', no important tasks left incomplete.
B	'Generally satisfactory' and complete, only minor omissions and inadequacies
C	Can be considered 'just satisfactory' despite omissions and/or inadequacies
D	Parts are well attempted must, as a whole, be considered 'just unsatisfactory' because of omissions or inadequacies.
E	'Not satisfactory', significant omissions or inadequacies.
F	'Very unsatisfactory', important task(s) poorly done or not attempted
N/A	Not applicable. The review topic is not applicable or it is irrelevant in the context of this statement.

b) Evaluation of the EIA system for HWMF in Mexico

In order to evaluate the EIA system a documentary review was undertaken of the Legislation and Regulations of the EIA system and of HWMF in Mexico; as well as an analysis of the information obtained from the internal files and EISs for each of the cases. The legislation and regulations were obtained from the Ministry of Environment's library, internal documents and website.

The evaluation criteria of the Mexican EIA system for HWMF was based on Sadler (1996) and Wood (2003b). Sadler (1996) and Wood (2003b) were considered relevant for this analysis as both studies have analysed international systems in developed and developing countries (Wood, 2003a), and therefore can be applied to judge the effectiveness of the Mexican case. The evaluation criteria (See Table 5.8) were based on the checklist for review of the appropriateness of institutional controls of EIA process used by Sadler (1996), and the evaluation criteria applied by Wood (2003b) which focused on the requirements and operation of the EIA system and process. The rating scale used was based on Wood (2003b): "Yes", "No", and "Partially".

Table 5.8 Evaluation criteria of the EIA system based on Sadler (1996) and Wood (2003b)

1. Legal basis of the EIA system
2. Coverage of the EIA system
3. Consideration of alternatives
4. Screening of actions
5. Scoping of impacts
6. Environmental Impact Statements (EIS) preparation
7. Environmental Impact Statement Review
8. Decision making
9. Monitoring and auditing of impacts
10. Mitigation of impacts
11. Consultation and participation
12. Monitoring of EIA system

Each criterion listed in Table 5.8 has its own evaluation criteria. Boxes 5.8 – 5.19 list the questions considered for the evaluation of each criterion. When most of the questions were answered positively the criterion was considered as "met", when most of the questions were answered negatively, the criterion was considered as "not met".

Box 5.8 Evaluation criteria for the legal basis of EIA system

Is the EIA system based on clear and specific legal provisions?
- Is each step in the EIA process clearly specified in law or regulations?
- Are the legal provisions sufficiently unambiguous in application?
- Is there a degree of discretion in the provisions which is acceptable to the participants in the EIA process?
- Are the EIA requirements clearly differentiated from other legal provisions?
- Is each step in the EIA process enforceable through the courts or by other means?
- Are time limits for the various steps in the EIA process specified?

Box 5.9 Evaluation criteria for the coverage of EIA system

Are the relevant environmental impacts of all significant actions be assessed?
- Does the EIA system apply to all public and private environmentally significant projects?
- Are the provisions applied in practice to all the actions covered in principle?
- Are all significant environmental impacts covered by the EIA system?

Box 5.10 Evaluation criteria for the consideration of alternatives

Is evidence of the consideration, by the proponent, of the environmental impacts of reasonable alternative actions be demonstrated in the EIA process?
- Must clear evidence of the consideration of the environmental impacts of alternatives be apparent in preliminary EIA documentation?
- Must the realistic consideration of the impacts of reasonable alternatives, including the no-action alternative, be evident in the EIA report?
- Does published guidance on the treatment of the impacts of reasonable alternatives exist?

Box 5.11 Evaluation criteria for the screening of actions

Does screening of actions for environmental significance take place?

- Is there a legal test of whether the action is likely to affect the environment significantly?
- Is there a clear specification of the type of action to be subject to EIA?
- Do clear criteria/threshold exist (e.g. size, location)?
- Do different types of EIA exist for different types of action?
- Must documentation be submitted by the proponent to assist in screening?
- Does published guidance about actions, criteria, thresholds and screening procedures exist?
- Is the screening decision made by a publicly accountable body?
- Does consultation and participation take place during screening?
- Is there a right of appeal against screening decisions?

Box 5.12 Evaluation criteria for the scoping of impacts

Does scoping of the environmental impacts of actions take place and specific guidelines be produced?

- Must the proponent consult the environmental authority early in the EIA process?
- Must the proponent prepare information as a basis for scoping?
- Is scoping mandatory in each case?
- Must a general or generic set of impacts be addressed in the EIA?
- Must action-specific scoping guidelines be prepared?
- Are irrelevant impacts screened out?
- Does published guidance on scoping procedures and methods exist?
- Is consultation and participation required in scoping?
- Is there a right of appeal against scoping decisions?

Box 5.13 Evaluation criteria for the preparation of EIA reports

Do EIA reports meet prescribed content requirements and do checks to prevent the release and inadequate EIA reports exist?

- Must EIA reports describe actions and environments affected, forecast impacts, indicate significance and contain a non-technical summary?
- Must information held by the relevant authorities about the environment or type of action be made available to the proponent?
- Does published guidance on EIA report preparation exist?
- Must specified EIA methods or techniques be employed?
- Does accreditation of EIA consultants exist?
- Do checks on the content, form, objectivity and accuracy of the information presented occur before publication of the EIA report?
- Is consultation and participation required in EIA report preparation?

Box 5.14 Evaluation criteria for the review of EIA reports

Must EIA reports be publicly reviewed and the proponent respond to the points raised?

- Must a review of the EIA report take place?
- Do checks on the objectivity of the EIA report review exist?
- Do review criteria to determine EIA report adequacy exist?
- Does an independent review body with appropriate expertise exist?
- Must the findings of the EIA report review be published?
- Can the proponent be asked to respond to comments and to provide more information following review?
- Must a draft and final EIA report be prepared?
- Does published guidance on EIA review procedures and methods exist?
- Is consultation and participation required in EIA report review?
- Is consultation and participation required where further information is submitted?
- Is there some form of appeal against review decisions?

Box 5.15 Evaluation criteria for decision making

Must the findings of the EIA report and the review be a central determinant of the decision on the action?

- Must the decision be postponed until the EIA report has been prepared and reviewed?
- Can permission be refused, conditions be imposed or modifications be demanded at the decision stage?
- Is the decision made by a body other than the proponent?
- Is any summary evaluation prepared prior to decision making made public?
- Must the EIA report, and comments upon it, be used to frame the conditions attached to any consent?
- Are the decision, the reasons for it, and the conditions attached published?
- Must these reasons include an explanation of how the EIA report and review influenced the decision?
- Does published guidance on the factors to be considered in the decision exist?
- Is consultation and participation required in decision making?
- Is there a right of appeal against decisions?

Box 5.16 Evaluation criteria for the monitoring and auditing of action impacts

Must monitoring of action impacts be undertaken and is it linked to the earlier stages of the EIA process?

- Must monitoring of the implementation of the action take place?
- Must the monitoring of action impacts take place?
- Is such monitoring linked to the earlier stages of the EIA process?
- Must an action impact monitoring programme be specified in the EIA report?
- Can the proponent be required to take ameliorative action if monitoring demonstrates the need for it?
- Must the results of such monitoring be compared with the predictions in the EIA report?
- Does published guidance on the monitoring and auditing of action implementation and impacts exist?
- Must monitoring and auditing results be published?
- Is there a public right of appeal if monitoring and auditing results are unsatisfactory?

Box 5.17 Evaluation criteria for the mitigation of impacts

Must the mitigation of action impacts be considered at the various stages of the EIA process

- Must clear evidence of the mitigation/avoidance of environmental impacts be apparent in the initial action design described in preliminary EIA documentation?
- Must a schedule of mitigation measures and their implementation be set down in the EIA report?
- Must evidence of the consideration of mitigation be presented during screening, during scoping, during EIA report review and revision, during decision making and during monitoring?
- Does published guidance on mitigation and modification exist?

Box 5.18 Evaluation criteria for consultation and participation

Must consultation and participation take place prior to, and following, EIA report publication?
- Must consultation and participation take place prior to scoping, during scoping, during EIA report preparation, during review and following revision, during decision making and during monitoring?
- Must a public participation strategy be initiated for each EIA?
- Are copies of EIA documents made public at each stage of the EIA process?
- Can copies of EIA documents be accessed free of charge or purchased at a reasonable price?
- Do confidentiality/secrecy restrictions inhibit consultation and participation?
- Are consultation and participation methods appropriate to the stage of the EIA process at which they are employed?
- Is funding of public participants provided for?
- Are obligatory consultees specified at various stages in the EIA process?
- Must adjoining authorities/states/countries be consulted?
- Does published guidance on consultation and participation exist?
- Must the results of consultation and participation be published?
- Do rights of appeal exist at the various stages of the EIA process?

Box 5.19 Evaluation criteria for EIA system monitoring

Must the EIA system be monitored and, if necessary, be amended to incorporate feedback from experience?
- Is there legal provision for periodic review of the EIA system?
- Have reviews of the EIA system been carried out and changes made?
- Is consultation and participation required in EIA system review?
- Is a record of EIA reports for various types of action kept and made public?
- Are records of other EIA documents kept and made public?
- Are EIA reports and other EIA documents publicly available at one or more locations?
- Are records of the financial costs of EIA kept and made public?
- Is information on the time required for EIA collected and made public?
- Are the lessons from specific EIAs fed back into the system?

This Chapter described the ‘case study’ research design and the qualitative approach used in this study. The units of analysis were the project site selection and design decision making, environmental permit decision making, and building permit decision making. The data collection methods included semi-structured interviews with stakeholders and documents generated during the different stages of decision making.

The Chapter also explains the sampling of project applications for HWMF and how the analysis of the interviews and documents was undertaken. The Chapter presented the general statements identified in literature, regarding the theoretical models of EIA, which were considered during the data analysis. Then, it described how the quality of EISs and the EIA system for HWMF were evaluated. Thus, the next Chapter will describe the findings of this study about the influence of EIA on HWMF decision making in Mexico.

Chapter 6

Influence of EIA on decision making for HWMF in Mexico

6.1 Introduction

This chapter describes the influence of EIA in HWMF decision making in Mexico. First, the evaluation of the quality of EISs and of the EIA system is characterized. Then, based on the content analysis of relevant documents and analysis of the semi-structured interviews with stakeholders, the chapter describes the different stages of planning of HWMF and the models of EIA in decision making are identified. In addition, an examination against theoretical models of decision making and models of EIA is undertaken.

6.2 Evaluation of the quality of EISs and of the EIA system for HWMF

In this Chapter, where documents are described, the abbreviations FS and EIS were used to describe Final Statements and Environmental Impact Statements respectively. These abbreviations were followed by a unique reference number.

6.2.1 Quality of EISs

The overall proportion of satisfactory EISs (those receiving an overall score of A, B, or C) and unsatisfactory EIS (those receiving an overall score of D, E, or F) is summarised in Table 6.1. A further distinction was made between EISs classified as good (a score of A or B), borderline (a score of C or D), and poor (a score of E or F). Results show that more than half of the EISs (58%) were of satisfactory quality. However, all of the EIS (100%) analysed were assessed as borderline.

Table 6.1 Overall quality assessment of the EISs

Overall assessment	Percentage of sample (Number out of 19)
Satisfactory (A, B or C)	58 % (11)
Unsatisfactory (D, E or F)	42 % (8)
Good (A or B)	0
Borderline (C or D)	100 % (19)
Poor (E or F)	0

The best areas performed were the communication of results followed by the description of development, local environment and baseline conditions (See Table 6.2 and Appendix 1 for detailed assessment of each review area). The worst areas were the identification and evaluation of key impacts, and the alternatives and mitigation measures. Therefore tasks were better performed in review areas which relate to description and presentation of EISs than in more analytical review areas.

Table 6.2 Quality of review areas (percentage of EISs)

Review area categories	Satisfactory (A, B or C)	Unsatisfactory (D, E, or F)	Good (A or B)	Borderline (C or D)	Poor (E or F)
1. Description of the development, the local environment and the baseline conditions	**84**	16	37	58	5
2. Identification and evaluation of impacts	37	**63**	5	84	11
3. Alternatives and mitigation measures	**53**	47	0	89	11
4. Communication of results	**95**	5	37	63	0

Comparing the requirements by Mexican regulations with the quality of the EISs reviewed in this research, it can be stated that the requirements were partially met by the EISs for HWMF. The description of the development, relevant regulations, agreement of the project with land use plans, and description of the environmental baseline conditions were satisfactory in a large proportion of the EISs; however, more than half were assessed as borderline (See Table 6.2 and Appendix 1). The performance of the identification, description and assessment of environmental impacts was unsatisfactory in most of the EISs. The preventive and mitigation measures, environmental prediction, evaluation of alternatives were assessed as satisfactory; however, again, a large proportion of EISs had a borderline performance.

Previous research regarding the quality of EIS in Mexico analysed highway projects submitted between 1989 and 1994 (Bojórquez-Tapia and García, 1998). A comparison with this research is limited because different types of projects were analysed and different criteria and scores were used. Nevertheless, similarities and improvements were identified in the quality of EISs in Mexico.

Similar to this research, Bojórquez-Tapia and García (1998) determined that the description of activities, materials to be used, and number of workers to be employed were problem areas; and that EISs omitted information regarding the description of the environment. In addition, agreeing with Bojórquez-Tapia and García (1998), in this research most of the EISs were assessed as unsatisfactory in the identification and evaluation of impacts (i.e. the assessment of impacts, prediction, impact magnitude, and significance were problematic); and the consideration of alternatives was assessed as poor in most of the EISs.

Improvements were identified in the description and consultation of the local land use plans and policies and mitigation measures. Bojórquez-Tapia and García (1998) determined that all EISs presented a deficient analysis of the congruence of the project with prevailing development plans and programs. In this research the description and consultation of the local land use plans and policies to determine the baseline conditions had a satisfactory performance in most of the EISs (i.e. ten cases were graded as good). According to Bojórquez-Tapia and García (1998), mitigation

measures were insufficiently described or not present at all in the EISs analysed. While in this research, a large proportion (79%) of EISs was graded as borderline.

The review package used for the analysis of EISs quality is based on the information processing model of EIA as it assesses the quality and completeness of the information provided in the EIS. Based on the information processing model, the effectiveness of EIS for HWMF to generate and provide information about the development, the local environment and baseline conditions, and environmental impacts is limited. Most of the EISs reviewed were satisfactory but borderline; for example, in more than half of the EISs the important components of the affected environment were described, but the methods and investigations undertaken were not disclosed or appropriate to the assessment task, and uncertainty was not indicated.

The information processing model also states that EIA is used to analyse the environmental impacts and that accurate predictions on the impacts will lead to better decisions. However, in the identification and evaluation of impacts most of the EISs for HWMF were assessed as unsatisfactory. Within this review area, the scoping, the prediction of impact magnitude, and assessment of impact significance were unsatisfactory. Omissions were detected; for example, in more than half of the cases reviewed EISs did not describe the data and methods used to estimate and predict the impact magnitude; and did not express, where possible, the prediction of impacts in measurable quantities. Therefore, based on the quality of the EISs reviewed, the influence of EIA as the information processing model was expected to be limited.

6.2.2 Evaluation of the EIA system for HWMF

The EIA system for HWMF in Mexico met three of the twelve evaluation criteria: legal basis; coverage; and screening. The rest were either partially met or not met. Table 6.3 shows the analysis of the EIA system for HWMF in Mexico against the evaluation criteria.

Legal basis of the EIA system

Each step in the EIA process is clearly specified in legislation for HWMF. Regulations specify the screening process for HWMF for both industrial and medical hazardous wastes. The EIA requirements are clearly differentiated from other legal provisions and the time limits for the steps in the EIA process as a whole are specified. For example, the Ministry of Environment makes the decision regarding the environmental permit in no longer than sixty working days, and during the first forty days the Ministry of Environment reviews the EIS and undertakes consultation with experts and governmental bodies.

Coverage of the EIA system

The EIA Mexican system applies to all public and private environmentally significant projects; in the case of HWMF these projects are mainly private projects. Regulations list the types of HWMF which should be subject to the EIA process: facilities for the containment (landfill for containment); facilities for the treatment, reuse, recycling or destruction of industrial hazardous wastes; and facilities for the treatment or destruction of medical hazardous wastes (SEMARNAT, 2000). Regulations also cover the types of environmental impacts that should be considered when undertaking EIA: cumulative, synergistic, significant, and residual (SEMARNAT, 2000).

Table 6.3 Performance of the EIA system for HWMF in Mexico

Criterion	Criterion met?
1. Is the EIA system based on clear and specific legal provisions?	Yes
2. Are the relevant environmental impacts of all significant actions assessed?	Yes
3. Is evidence of the consideration, by the proponent, of the environmental impacts of reasonable alternative actions demonstrated in the EIA process?	Partially
4. Does screening of actions for environmental significance take place?	Yes
5. Does scoping of the environmental impacts of actions take place and are specific guidelines produced?	No
6. Do EIA reports meet prescribed content requirements and do checks to prevent the release of inadequate EIA reports exist?	Partially Content: Yes Checks: No
7. Must EIA reports be publicly reviewed and the proponent respond to the points raised?	No
8. Must the findings of the EIA report and the review be a central determinant of the decision on the action?	Partially
9. Must monitoring of action impacts be undertaken and is it linked to the earlier stages of the EIA process?	Partially
10. Must the mitigation of action impacts be considered at the various stages of the EIA process?	Partially
11. Must consultation and participation take place prior to, and following, EIA report publication?	Partially
12. Must the EIA system be monitored and, if necessary, be amended to incorporate feedback from experience?	No opinion

Consideration of alternatives

According to regulations in the Mexican EIA system, the assessment of alternatives (if necessary) should be included in the EIS (SEMARNAT, 2000). Non-compulsory guidelines mention that if there are two or more alternatives for the project they should be analysed, and the selection of the project site explained. The non-action alternative is not mentioned either in regulations or in guidelines and it is not a common practice in the EIA process. The consideration of alternatives in the HWMF projects analysed was assessed as poor in most of the EISs (see section 6.2.1). For example, sixteen out of nineteen cases did not consider alternatives sites, alternative processes, designs or operating conditions.

Screening of actions

Regulations regarding EIA have an inclusive list of projects for which EIA is necessary (SEMARNAT, 2000). HWMF are included in this list, and are classified as facilities for industrial wastes and for medical wastes. Regulations list the types of HWMF which should be subject to EIA process: facilities for the containment (landfill for containment) of industrial hazardous wastes; facilities for the treatment, reuse, recycling or destruction of industrial hazardous wastes (SEMARNAT, 2000).

Scoping of impacts

Published guidance on scoping procedures and methods does not exist in the Mexican EIA system. The Ministry of Environment has produced non-compulsory guidelines regarding the contents of the EIS for HWMF which suggest a set of environmental factors and impact indicators to be used (Dirección General de Impacto y Riesgo Ambiental, 2002). However; these guidelines are not specific for each type of HWMF. The developer is not required to consult the Ministry of Environment early in the EIA process. In addition, consultation or participation is not required by regulations for the scoping of impacts and it is not a common practice. In more than half of the EIS analysed there was no attempt to contact the general

public and special interest groups, and the reasons why impacts were not selected for thorough study were not detailed.

EIS preparation

The general contents required in an EIS are mentioned in regulations regarding EIA (SEMARNAT, 2000). The contents are: description of the project; link with land use plans; description of the environmental baseline conditions; identification and assessment of impacts; mitigation measures; environmental prediction; and description of the methodologies supporting the information provided (SEMARNAT, 2000). In addition, non-compulsory guidelines regarding the contents of the EIS of HWMF project applications have been published by the Ministry of Environment.

Accreditation of EIA consultants does not exist at the Ministry of Environment; and no formal requirement for developer to consult, or for checks on the EIS before submitting to the Ministry of Environment. The low performance in this criterion is also evident in the results described in section 6.2.1. All EISs analysed were assessed as borderline from which forty-two percent were graded as unsatisfactory.

EIS review

After the submission of the EIS, the Ministry of Environment checks that the contents of the EIS comply with regulations using review criteria. Published guidance on EIA review procedures and methods does not exist. The Ministry of Environment can ask the developer to provide more information regarding the project if necessary. The Ministry of Environment consults other governmental bodies and/or departments within the Ministry; however participation where further information can be submitted does not occur. In addition, an independent review body does not exist and the findings of the EIA report review are not published.

Decision making

The decision regarding the environmental permit is made after the EIS has been reviewed by the Ministry of Environment. In the case of HWMF, the decision regarding the environmental permit is made by the Ministry of Environment at the federal level. The environmental permit can be refused, conditions imposed or modifications be demanded. Guidance on the factors to be considered in the decision is indicated in the guidelines for preparing an EIS for HWMF.

In HWMF cases, consultation with local authorities is compulsory; however, this consultation is limited to the determination of the project's compliance with land use plans. Public consultation is undertaken by the Ministry of Environment if it is requested within the period of time established in regulations. Public consultation occurs as an information session, and if environmental concerns are raised, they are considered in decision making.

The EIS and documents associated with it are used to frame the conditions attached to the consent of the environmental permit. The Final Statement has a description of the information provided by the EIS and the decision made. However; the Ministry of Environment neither makes public any summary evaluation prior to the decision making nor publishes the Final Statement. The developer can appeal against the decision made by the Ministry of Environment.

Monitoring and auditing of impacts

Non-compulsory guidelines regarding the contents of the EIS suggest a program for impacts monitoring as part of the EIS (Dirección General de Impacto y Riesgo Ambiental, 2002). However, published guidance on the monitoring and auditing of impacts does not exist.

The Ministry of Environment, through PROFEPA, audits that the implementation of the project complies with the conditions mentioned in the Final Statement (FS). In the cases analysed, as conditions attached to the Final Statement of TS, LC, RR and

T projects, the Ministry of Environment requested a 'program for environmental auditing' which should include the follow-up of the impacts identified and the implementation of mitigation measures (FS #2, #3, #4, #5, #7, #10, #12, #15 See Appendix 2). In addition, a report of the program for environmental auditing should be submitted to the Ministry of Environment periodically (i.e. every six months, every year).

Results of auditing are not published and there is not a public right of appeal if monitoring and auditing results are unsatisfactory. However, members of the public can inform the Ministry of Environment of anomalies from the project's implementation.

Mitigation of impacts

No published guidance on mitigation exists in the Mexican EIA system. According to regulations, mitigation measures must be described in the EIS (SEMARNAT, 2000). However, the description of the schedule for implementation of mitigation measures is not requested in regulations. The performance of the scope of mitigation measures was graded as satisfactory in most of the EIS (69%); however, most of them were assessed as borderline (79%) as it was not clear to what extent the mitigation methods would be effective when implemented (see section 6.2.1). In addition, the commitment to mitigation measures was graded as unsatisfactory in most of the EISs (64%).

Consultation and participation

No published guidance on consultation and participation exist. Consultation and participation does not occur either prior to scoping or during scoping. In more than half of the EISs for HWMF analysed there was no attempt to contact the general public and special interest groups during scoping of impacts.

When EISs are submitted to the Ministry of Environment to apply for the environmental permit, a list of projects is published in the Ministry of Environment's

journal and website on the Internet. In addition, the EIS is available to the public at the Ministry of Environment's office (at the federal and local level). Free of charge or purchased at a reasonable price copies of EIA documents cannot be obtained from the Ministry of Environment. However, the EIS can be consulted by any member of the public at the Ministry of Environment's library.

According to regulations, consultation occurs during the review of the EIS with other governmental bodies and departments within the Ministry of Environment (SEMARNAT, 2000). During the review of the EIS, any member of the public can consult the EIS and request a public consultation through the Ministry of Environment (SEMARNAT, 2000). Only if requested, will the Ministry of Environment undertake public consultation during the decision making regarding the environmental permit (SEMARNAT, 2000). However; this does not occur frequently and, when it does, it is in the format of an information session during a public meeting. In the cases analysed in this research, public consultation occurred only in LC projects (three cases) and consisted of public information sessions. A summary of the results from the consultation and participation are briefly described in the Final Statement regarding the environmental permit, but the Final Statement is not publicly available.

Monitoring of EIA system

On the Ministry of Environment's website, the Department of Environmental Impact and Risk has published statistics about the number of projects (EISs) reviewed between 1997 and 2008; the number of projects authorized and rejected in the department between 2001 and 2008; and the average period of time required to undertake EIS review between 2001 and 2008. Statistics are mainly shown with graphs but details relating to the precise title of each EIS, its length, date, type of project and cost are not available. In addition, regulations do not request a periodic review of the EIA system in Mexico and there is no published information available to determine whether any reviews and changes have been undertaken in the system.

The EIA system for HWMF in Mexico is weak; it did not meet a significant proportion of the criteria used and significant improvements need to be made. The strengths identified in the Mexican EIA system for HWMF are the legal basis, the coverage of the system, and the screening stage. The system partially met several criteria including the consideration of alternatives; EIA report preparation; decision making; monitoring and auditing of impacts; mitigation of impacts; and consultation and participation.

The findings regarding the Mexican EIA system for HWMF agree with the description of the Mexican EIA system made by Clark and Richards (1999). For example, according to Clark and Richards (1999) scoping was not considered in regulations and therefore during this stage the public did not have input on the scope of the EIS. This indicates that even though weaknesses in the system have been identified earlier, there is still the need to make improvements.

Comparing the findings of the Mexican EIA system for HWMF with those of developing countries made by Wood (2003a), Mexico is meeting more criteria (although several of them partially) than other developing countries. Similar to the average developing country, EIA system for HWMF in Mexico did not meet the scoping and EIA report review; and partially met mitigation. According to Wood (2003a) public consultation in scoping is frequently missing and the review stage of the EIA process is poorly undertaken in some developing countries (Wood, 2003a). Mitigation of the impacts of some projects in developing countries is generally considered during the EIA process but is not always implemented (Wood, 2003a).

EIA system for HWMF in Mexico partially met the alternatives, EIA report preparation, decision making, impact monitoring, and consultation and participation; while, according to Wood (2003a), the average developing country did not meet these criteria. The consideration of alternatives in an average developing country is frequently weak (Wood, 2003a). EIA reports in developing countries are often confidential; are not user-friendly and are weak on alternatives, scoping, prediction, the attribution of significance, and the justification of proposals (Wood, 2003a). In addition, similar to an average developing country, decision making on projects is

frequently closed to external scrutiny, there is little information about the accuracy of predictions, and there is no tradition of consultation and participation (Wood, 2003a).

Unlike the average developing country, EIA system for HWMF in Mexico met the following criteria: legal basis, coverage, and screening. The legal basis of EIA systems in many developing countries may be weak, non-mandatory or non-existent (Wood, 2003a). The coverage of EIA systems in developing countries is markedly patchy in relation both to the projects covered and to the impacts assessed (Wood, 2003a). In addition, the screening of actions is not undertaken satisfactorily in many developing countries (Wood, 2003a).

The criteria used for the evaluation of the Mexican EIA system for HWMF reveals implicit characteristics of the information processing and participation models of EIA in decision making. The information processing model assumes that accurate prediction of impacts and the consideration of a wide range of alternatives will lead to better decisions (Kørnøv and Thissen, 2000); and that EIA is a tool for generating, organising, and communicating information (Bartlett and Kurian, 1999). These statements are implicit in the following criteria used to evaluate the EIA system: consideration of alternatives, scoping of impacts, EIS preparation, and EIS review. The EIA system for HWMF and its performance partially met or did not meet all of them (See Table 6.3). For example, the consideration of alternatives in the projects analysed was assessed as poor in most of the EISs; published guidance on scoping procedures and methods does not exist in the Mexican EIA system; and formal requirements for checks on the EIS before release do not exist.

The participation model states that EIA increases participation and involvement of public and organised interests; that EIA is a process for negotiation where discussion is encouraged and facilitated; and that emphasis is given to transparency of the process (Breda and Dijkema, 1998; Kørnøv and Thissen, 2000). These characteristics are implicit in the scoping of impacts; EIS review; decision making; monitoring and auditing of impacts; and consultation and participation criteria. However, the EIA system for HWMF and its performance partially met or did not meet all of these criteria. Several deficiencies were determined; for example, consultation and participation is not required by regulations for the scoping of impacts and it is not a

common practice; the Ministry of Environment neither makes public any summary evaluation prior to the decision making nor publishes the Final Statement; no published guidance on consultation and participation exists; and public consultation, when it occurs, is in the format of an information session during a public meeting. Consequently, the role of EIA in decision making in terms of both the information processing and participation models is limited in the EIA system, and therefore may be perceived as limited by stakeholders. Thus, the next section will describe the qualitative analysis of the documents and semi-structured interviews with stakeholders to determine their perceptions regarding the influence of EIA in decision making.

6.3 Qualitative analysis

Based on the content analysis of relevant documents (Environmental Impact Statements and Final Statements), and analysis of the semi-structured interviews with stakeholders, this section describes the different stages of planning of HWMF and the models of EIA identified. The planning of HWMF was divided in the following stages: project site selection and design of the facility; impact determination; determination of mitigation measures and monitoring; environmental permit; and building permit. Developers and consultants were involved in the project site selection and design of the facility, impact determination, and determination of mitigation measures. Ministry of Environment officers made the decision regarding the environmental permit, and municipal authorities regarding the building permit. During these decisions other processes occurred such as statutory consultation, public consultation, and social opposition; consequently, other stakeholders were also involved (consultees, members of the community, and NGOs).

To better explain the theoretical models of EIA identified in the different stages of planning and in different stakeholders, this section describes the developers and consultant's perceptions of EIA. This is followed by a review of the influence of EIA during project site selection and design of the facility, impact determination, determination of mitigation measures and monitoring. Then, the influence of EIA on

the environmental permit, which includes the perceptions of Ministry of Environment officers and consultees, is described. The influence of EIA during public participation is based on different stakeholders' perceptions: developers, consultants, members of the community, NGO, and Ministry of Environment officers. Finally, the description of the influence of EIA in the building permit is based on developers, consultants, and municipal authorities' perceptions. Illustrative citations were used in this section; therefore, where semi-structured interviews or documents (EIS and FS) are described, the following abbreviations were used to specify the type of facility: landfill for containment (LC); treatment (T); recycling and reuse (RR); temporary storage (TS); incinerator for industrial waste (II); incinerator for medical waste (MI). These abbreviations were followed by a unique reference number to refer to interviewees or documents.

6.3.1 Developers and consultants' perceptions of EIA

Developers and consultants' perception and use of EIA showed characteristics of the information processing, institutionalist, symbolic politics, and political economy models (See Table 3.1 in Appendix 3 for detailed quotes and frequency of categories).

a) Information processing model

In line with this approach, EIA was indeed perceived as an instrument which provides or reports information regarding the project. According to one consultant, "*if EIA is made in an integrative way it gives a technical and legal foundation to the project, and provides the necessary and accurate information to stakeholders to make the decision"* (LC #16).

In LC cases, EIA was based on the preliminary design of the facility because developers did not make the final design of the facility until they obtained the environmental permit. Therefore, the design of LC might change after the environmental permit is obtained. According to developers and consultants of different types of facilities, EIA was used to report to the Ministry of Environment

how the facility would be built; the processes to be used; materials and volume of wastes to be handled; as well as impacts from the project (TS #3; RR #2, #9, #10; T #13, #14; LC #19; MI #21).

> *"EIA is useful to provide the authority with all the information about the likely impacts from the facility such as pollution, risk, environmental accidents" (MI #21).*

However, according to developers and consultants, since the design itself was completed independently from EIA in some cases, there was only limited EIA influence (RR #2, #10; TS #3; T #14).

> *"During the project's planning, I honestly think that EIA is not very influential because the design is made by the developer apart from EIA. EIA is used to report volumes, equipment to be used, processes, all that information. But in the planning, it does not influence" (RR #2).*

Consultants are contracted to prepare an EIA because they are perceived as having expertise in the regulations and the requirements of the Ministry of Environment; and in producing an EIS which complies with the EIS guidelines. Consultants analyse if the project has a high likelihood of being approved by the Ministry of Environment before an EIA is prepared, and make sure that the project design complies with regulations. However, developers hire consultants to undertake EIA after the design of the facility is complete and therefore consultants are not usually able to participate in this stage. According to consultants, developers do not have enough capacity in terms of knowledge of environmental aspects, EIA regulations, and specific regulations related to their project. Despite this, some consultants were able to influence the design of the facility (when their suggestions were based on technical grounds), and did propose mitigation measures even though their participation occurred at the end of the design of the project.

These perceptions and use of EIA are comparable with the 'information processing model' suggested by Bartlett and Kurian (1999) which states that EIA is a technique for generating, organizing and communicating information. However, in this research there was no evidence that the information provided by EIA was used in

planning and design decision making by developers. Instead, since EIA was undertaken at the end of the design, it was perceived and more often used as a means of providing and communicating information to the Ministry of Environment in order to obtain the environmental permit. Similar situations have been reported in the UK where developers used the information provided by EIA in an advocacy way to obtain the development consent (Cashmore *et al.*, 2008). The limited integration of EIA in planning decision making has also been reported by other authors, exemplified by undertaking and considering EIA after the design was completed (Kobus and Lee, 1993); and as a result of the limited understanding of the potential of EIA by stakeholders (Cashmore *et al.*, 2004).

b) Institutionalist model

EIA was perceived by both developers and consultants as a requirement of the authority in order for the developer to obtain the environmental permit; as a means for the authority to control and regulate project development; and as a means of creating 'environmental awareness' in developers. In addition, consultants perceived that the influence of EIA depended on the extent of their participation. To increase the influence of EIA, the consultants suggest regulations should be improved in order to instruct developers more effectively. Taking these ideas into account, the EIA process for HWMF could be categorised as following the institutionalist model.

As further evidence to support this idea, both developers and consultants perceived EIA as "*a requirement by the authority to obtain the environmental permit"* (II #1; TS #3, #11; LC #6, #19; RR #9, #10; T #13, #14; MI #21); and as a means for the authority to control and regulate project development (RR #2; TS #3; T #4, #5; MI #23). For them, through EIA, the authority determines the feasibility of the project; detects omissions or corrects issues in planning and design of the facility; establishes the environmental aspects that have to be considered; and, prevents environmental damage (RR #2; TS #3; T #4, #5; MI #23).

> *"EIA enables the authority to regulate any type of facility… and prevents uncontrolled development that happened before, when developers started building*

facilities without considering how the environment was going to be affected. I think that is the greatest value of EIA" (TS #3).

These perceptions coincide with EISs which described EIA as a legal requirement to obtain the environmental permit and comply with regulations (LC #1; RR #11); as an environmental policy instrument (LC #5; RR #11); and as a procedure to correct planning and mitigate impacts on the environment (RR #11). In addition, EIA was described in an EISs as a tool used by the authority to determine whether the project should be undertaken and determine the conditions attached to the environmental permit (RR #11).

In addition, these perceptions of EIA agree with the definition of 'institution' as a regulative principle, norm, and established law (The Oxford English Dictionary, 1989; Mitchell, 2007); as a standardized procedure governing relationships in society (Mitchell, 2007); and, as a normative framework (Bitondo and André, 2007). Thus, EIA is undertaken because it is recognized as something accepted and as something that should be. Therefore, developers' decision making did not necessarily follow the rational decision-making model because it resulted from following the rules, and was a consequence of standardised working procedure (Kørnøv and Thissen, 2000). This is comparable with the 'new institutional' planning theory advanced by Leknes (2001), who stated that decisions are explained by formal rules and legal frameworks.

According to one developer and one consultant, EIA is "*creating 'environmental awareness' in developers*" (II #1; RR #2). The 'environmental awareness' concept encompasses a knowledge and understanding of environmental regulations; having environmental empathy and responsibility with the society and natural resources; and, the protection of the environment. Consultants perceive that when developers are 'environmentally aware', they will ask the consultant for their opinion regarding the project and protected ecosystems; use the information provided by the EIA to operate the facility adequately; and, comply with the mitigation measures established in the EIS and Final Statement (LC #15, #19). EIA is, therefore, influencing planning and design decision making because EIA is gradually creating 'environmental awareness' in developers. This agrees with the international study on the

effectiveness of EIA which determined that the process led to a significant or moderate change in the awareness of environmental and social concerns of stakeholders (Sadler, 1996).

Arguably, the perception of EIA as something creating 'environmental awareness' in developers is comparable with the 'institutionalist model' suggested by Bartlett and Kurian (1999), with the socio-ecological idealism planning theory relevant for EIA by Lawrence (2000), and with one of the criteria of effectiveness of EIA suggested by Cashmore (2004). These authors stated that EIA can transform an individual's values and attitudes, perspectives, and ways of doing things, and therefore increasingly incorporates environmental values into decision making and planning. Therefore, as Kobus and Lee (1993) suggested, EIA could be triggering a more conscious consideration of environmental goals by decision makers.

The nature of this research could not determine whether these were indeed changes in values generated by EIA. However, since decision making does not necessarily follow the rational decision model, and maybe rather a consequence of cultural norms and rules (collections of attitudes and understandings of how the world functions and how to act) (Kørnøv and Thissen, 2000), the evidence obtained in this research can be considered as an indicator of the significant influence that EIA could be having on developers' decision making.

Not all the evidence points to increased consideration of the environment. According to other consultants, some developers see EIA merely as a requirement, precisely because they lack 'environmental awareness', and hire consultants to obtain the environmental permit only. To solve the lack of 'environmental awareness', these consultants suggested that the Ministry of Environment should make the developers aware of their obligations and responsibility for the impact on the environment (RR #2), whilst at the same time developers should expand their knowledge of EIA regulations and law (RR #10; MI #23).

For consultants, the degree of influence of EIA on the developer depends very much on how the consultant 'reflects' the importance of EIA to the developer; and, on the capacity of the consultant to empathize with, and convince the developer (e.g. about

the modifications needed in the project) (LC #16, #19). The consultants feel they should explain to developers how the regulations were considered in the design of the mitigation measures; involve the developer in deciding on mitigation measures; and, explain which environmental aspects will be protected through the mitigation measures (and why they are being protected) (T #13; LC #16, #19). A consultant perceives it to be "*his duty to 'transmit' (explain) to the developer how, through undertaking EIA and designing suitable mitigation measures, the environment is going to be protected"* (T #13). Consultants can change the developer's perspective regarding EIA and make them aware that EIA is not just a requirement (T #13; LC #16). In addition, according to one developer and one consultant, to solve the lack of capacity for many developers, "*EIA regulations should be improved so that they instruct developers about EIA's concepts"* (LC #20); and *"if EIA is to have an influence it should be adequately endorsed by laws and regulations"* (RR #2). This perception of EIA, linked to the capacity in developers, can be related to the verb 'institute' which is defined as to establish in principles; educate, and instruct (The Oxford English Dictionary, 1989). Thus, the EIA process and regulations can improve developers' capacity; make them aware of their obligations and responsibilities; and, therefore, influence decision making.

c) Symbolic politics model

EIA was perceived by developers as a requirement which is not useful for decision making and as an unwelcome expense. The problems identified were the developers' hidden agenda when applying for the environmental permit and their lack of 'environmental awareness'. According to consultants, EIA is undertaken when the construction phase of the project has already started or when the facility has been built and is operating; therefore, "*EIA is considered by developers as just a requirement"* to be complied with to obtain the environmental permit and a tool to justify the project (RR #9, #10; TS #11; T #14; LC #18). These perceptions of EIA have been indicated by Caldwell (1991) who stated that EIA can be seen as a legal hurdle to judicial approval; and by Bartlett and Kurian's (1999)'symbolic politics model' (negative end) which states that EIA is seen as a formality.

In the context of this model, EIA is perceived by both consultants and developers as an unnecessary requirement when facilities are located in industrial zones and when it is undertaken for enlargement of facilities, because the land use is not changed and impacts are not considered as significant (MI #21, #22; TS #11). According to these interviewees, to improve this, the EIA system should be changed and should be undertaken only when the project changes the land use of the area.

This perception leads to further disillusionment with the EIA process. In the first place, according to consultants, undertaking an EIA is considered by developers as an unwelcome expense (TS #11; MI #23; RR #9), and since projects are subject to credits and loans, developers are under considerable economic pressure, and ask consultants to undertake a limited EIA and write the EIS in a very short time (TS #11). Secondly, waiting for the Ministry of Environment's decision, given that the EIA is seen as of very little use in the decision making process, means the developer has to suffer a loss in their investment and incur extra expense (MI #23). This again impacts on the consultants' ability to perform the process effectively.

There is additional evidence from the more cynical end of the spectrum of the symbolic politics model. For example, one consultant stated that some developers get the building permit for smaller projects (e.g. warehouse), but with the hidden agenda of gradually changing the land use of the area (T #14). This is done in order to facilitate the further application for the environmental permit of a larger HWMF such as a treatment facility (T #14). Some developers prefer to start building the facility without having the environmental permit (and paying the fine) rather than undertaking EIA (TS #11).

From the perspective of both developers and consultants, developers lack 'environmental awareness' and therefore do not undertake EIA adequately; guidelines for writing EISs are not followed; and some developers choose not to comply with the need to make an application at the Ministry of Environment, and build the facilities without having the environmental permit (RR #2, #10; II #1; T #14; LC #16; MI #22, #23).

"Developers lack environmental awareness about the environmental permit… lack environmental awareness about environmental regulations… they are not aware of the things they have to do, about the impact assessment…" (II #1).

"I think only 5% of developers are aware of the importance of EIA to protect the environment" (RR #10).

d) Political economy model

This model assumes, according to Bartlett and Kurian (1999), that EIA might be undertaken because it improves financial opportunities; improves public recognition; provides market or regulatory benefit; and improves the relationship with regulators and stakeholders. EIA was perceived in this study by consultants as an instrument which creates a 'good image' for developers in terms of compliance with regulations, being environmentally friendly, achieving good environmental performance, maintaining a clean and competitive facility which impresses the environmental authorities and the community (MI #21, #23).

This section described the developers and consultants' perceptions and use of EIA. To complement this, the following section will describe how the EIA influenced project site selection and design of the different HWMF analysed.

6.3.2 Project site selection and design

Project site selection and design of HWMF considered the location of the facility in relation to industrial areas; environmental, economic, social, and political aspects; as well as national and international regulations. This study found that the EIA process had a variable influence on these decisions. Apart from landfill for containment (LC), industrial areas were preferred for temporary storage (TS), recycling and reuse (RR), medical incinerator (MI), industrial incinerator (II), and treatment cases (T).

The project site selection considered environmental aspects such as location in relation to natural protected areas, distance to water bodies, and topography and hydrology of the region. According to consultants, EIA was often used to identify the

environmental baseline conditions of the region where the facility would be located (T #13; LC #15, #18, #19) (See Table 3.2 in Appendix 3).

> *"It was really useful, the studies undertaken during EIA gave us a clear view of the conditions of the region" (LC #19).*

According to EISs, sites away from natural protected areas were selected in T and RR facilities (T #6, #7, #10; RR #11, #12, #13). In II and MI cases, geology and hydrology of the site were analysed to determine the adequacy of the area for the facility (II #16; MI #17). In LC cases, consultants stated that the information regarding the environmental baseline conditions obtained (e.g. geology, topography, climate, fauna) was useful for the design of the facility (LC #19) and to determine the feasibility of the project (LC #15, #18). During the studies regarding the baseline conditions, if the area was sensitive and more information was required, the consultant of a LC subcontracted appropriate experts or researchers in the area.

According to EISs, project sites were selected because an industrial facility already existed in the project site, and because the facility would be located within an industrial land use area defined by the government (T #6, #7, #8, #10; RR #11, #12; TS #14, #15; II #16; MI #17, #18).

Based on the analysis of EISs, during the project site selection the environmental baseline conditions were analysed to determine whether the project site complied with regulations (e.g. NOM–055–SEMARNAT–1993 in LC cases) and land use plans (LC #1, #2, #3, #4, #5). Alternative project sites were analysed using regulations as criteria for the decision. According to EISs, project site selection of all types of HWMF analysed the agreement of the project with the relevant Municipal Development Plan and State Land Use Plan (EISs: LC #1, #2, #3, #4, #5; T #6, #7, #8, #10; RR #12, #13; TS #14; II #16; MI #17, #18, #19).

Mexican regulations regarding the design, construction, and operation established for LC facilities were considered for all the LC cases analysed (EISs: LC #1, #2, #3, #4, #5). However, HWMF regulation is perceived by interviewees as inadequate because it is incomplete regarding the technology to be used in facilities, and it is either too

relaxed or too strict. In one LC case, the consultant perceived that the equipment to be used and technology to be implemented were outside the scope of the regulatory framework (LC #17). In other types of HWMF, regulations are perceived as relaxed and not specific; thus, developers suggest improving regulations to make them stricter regarding the design, safety within facilities, equipment to be used, and regarding the control of emissions (e.g. air emissions) (RR #2; T #14). On the other hand, regulations are perceived as obsolete and difficult to comply with in LC cases (LC #8; LC #19). Therefore, according to one developer, regulations should be improved and should function only as guidelines (LC #8). In addition, for interviewees, regulations should be appropriate to the local geographic context of the region (II #1; T #13; LC #19).

According to interviewees and EISs, the project site selection of HWMF considered the potential market for hazardous waste management; cost of the land; commercial needs of the developer; distance to industrial centres and urban areas; cost of transportation of hazardous waste; availability of infrastructure; as well as the cost of mitigation measures (Interviewees: TS #3; RR #9; T #14, #13; LC #15, #17, #18, #19; MI #21. EISs: LC #1, #2, #3, #4; T #6, #7, #9, #10; RR #11, #12 #13; TS #14, #15; II #16; MI #17, #18). In LC cases, a market study of hazardous wastes was undertaken to determine the types and amount of wastes generated. This information was then used to locate the facility close to industrial zones where hazardous wastes were generated, and to determine the types of technologies needed for the treatment of the wastes (EISs: LC #1, #2, #3, #4). In one LC case, according to the developer, the socioeconomic activities of the region were also considered during the project site selection (LC #8). The area should have an available work force; the socioeconomic activities of the area should be compatible with the project; and the project should be able to generate jobs in the region (LC #8).

According to interviewees and EISs, the social aspects considered as drivers for project sites being selected were absence of ethnic groups; absence of archaeological zones or places with historical value; public acceptance or no history of public opposition to similar facilities; generation of employment; availability of work force; level of migration; and landownership (Interviewees: LC #8, TS #11. EISs: T #9; RR #11, #13; II #16; MI #17). One developer perceived that EIA provided relevant

information regarding *"the social baseline conditions of the project site which was used to determine whether the project was compatible with the community"* (LC #8) (See Table 3.2 in Appendix 3).

Political issues were considered in the project site selection for one LC case; the developer considered whether the facility was supported by the current administration of the municipality and its political figures, and whether the administration was able to reach consensus within the members of the local government (LC #8). The fact that Municipal administration only had a three year term was perceived as a problem because this meant that the developer had to lobby both the current administration and its successor. In addition, it was perceived that LC projects are used as 'political flags', and therefore when elections are near, developers will not submit the EIS (LC #8).

a) Information processing model

The use of EIA and the problems indicated by the interviewees during the project site selection and design are compatible with the information processing model (See Table 3.2 in Appendix 3). As has been mentioned earlier, EIA was used to identify the environmental and social baseline conditions of the project site where the facility would be located; and in LC cases, the information identified was useful for the design of the facility and to determine the feasibility of the project. However, one developer and one consultant perceived that, since the information generated by EIA studies was obtained from secondary data (books and printed information available) rather than from the field, the information was neither accurate nor adequate for planning (TS #3; MI #21).

The provision of information regarding the baseline conditions of the area had a limited influence in decision making. There was evidence of influence in LC cases only, where the information provided by EIA about the baseline conditions was useful for the design of the facility and to determine the feasibility of the project. This finding coincides with the international study of the effectiveness of EIA which determined that EIA had a moderate or marginal influence in siting of proposals (Sadler, 1996). However, the usefulness of EIA in the Mexican case is being

hampered by poor practices. For example, the information provided by EIA was inadequate as it was often obtained from secondary data. Thus, EIA's function as a technique for generating information (Bartlett and Kurian, 1999); and, for providing information regarding the baseline environmental conditions and consequently enhancing decision making (Kobus and Lee, 1993), was very limited.

The decision made regarding project site selection and design is similar to the 'incrementalism', 'bounded rationality', and 'mixed scanning' decision making theories. The incrementalism theory states that decisions cannot be value free and are politically defined (Weston, 2000); and the 'bounded rationality' decision theory indicates that decisions are made within boundaries of the limited capability of human beings to be value free and are based on the principle of satisfying rather than on maximizing (Kørnøv and Thissen, 2000; Weston, 2000). Thus, the project site selection and design decision making of HWMF in Mexico considered the economic, social, and political aspects and aimed to meet (satisfy) the environmental aspects and regulatory framework.

According to the 'mixed scanning' decision making theory, decision making uses rational techniques of assessment as well as more intuitive judgements that are based upon experience, codes of practice and political values (Weston, 2000). In the Mexican case, EIA was used to identify the environmental and social baseline conditions of the region but the decision also considered economic, social, and political values.

6.3.3 Impact determination

EIA was used to determine the impacts from the project and to determine if the project could be approved by the Ministry of Environment. The problems and suggestions indicated by interviewees were related to impact assessment methods; the amount of information provided by EIA; and capacity and practices of consultants. Thus, during this stage EIA can be categorised as following the information processing model (See Table 3.3 in Appendix 3).

For developers, consultants and EISs, EIA was used to determine the impacts that the project could have on environmental aspects (e.g. water, soil, and flora), impacts on the community, and the economic benefits that the project would generate in the region (Interviewees: RR #2; LC #6, #7, #15, #18; TS #11; T #12, #14; MI #21, #22. EISs: LC #1, #3, #4, #5; T #6, #7, #10; RR #11, #13; II #16; MI #17, #18, #19). According to consultants, the determination of environmental impacts included experts from different disciplines (T #13; LC #15, #16, #17, #19).

> *"I think EIA was very important because it helped to determine the impacts on the area where the project would be developed; in its flora, fauna, community, positive and negative impacts"... (RR #2)*

In addition, according to one EISs, EIA was used to determine the compatibility of the project with the environment; EIA helped decisions regarding alternative sites and design of the project in order to reach compatibility with the environment (LC #1).

The information processing model was also evident in an EIS which stated that if EIA is to accomplish its objectives "*it should use adequate methods for the identification and assessment of impacts that guarantee that all the environmental aspects to be affected by the project are considered*" (LC #5, p. 132).

However, there was no evidence that the information provided by EIA regarding the impacts was used significantly for decision making. The information provided by EIA was used to determine if projects could be approved by the Ministry of Environment (RR #2; LC #6, #15), and in two LC cases it led to changes in the design and process to be installed (LC #7, #15). The limited modifications to projects due to EIA have also been reported for the UK by Wood and Jones (1997) and Cashmore *et al.* (2008).

The problems in EIA during this stage indicated by developers and consultants included uncertainty in EIA; inadequacy of impact assessment methods; poor participation of multidisciplinary teams; and lack of capacity in consultants, as well as inadequate information provided by EIA, inadequacy of EIS guidelines, and low

quality of EISs. According to consultants, there is uncertainty in impact assessment (RR #9) and the methodologies for impact assessment that should be used (LC #7).

Interviewees commented that the amount of information provided by EIA studies was excessive and that requested by the EIS guidelines was inadequate. For one developer and one consultant, the information provided by an EIA was considerable and was therefore difficult for the developer to assimilate (LC #6, #19). For this consultant, the guidelines for producing an EIS asked for too much information which could be irrelevant for the project and for the decision made by the Ministry of Environment (LC #19).

Another problem indicated by consultants was the low quality of EISs. They are of low quality because consultants do not have enough capacity to undertake a thorough EIA and EIS (MI #21); and because of inadequate practices (e.g. copying information from other EISs of similar facilities and including irrelevant information just to comply with the guidelines) (RR #9; TS #11; LC #19; MI #21). The low quality of EISs was evident in the evaluation of the quality of EISs undertaken in this research, where all EISs were assessed as borderline and forty-two percent were unsatisfactory (See section 6.2.1). Therefore, the influence of EIA on decision making, according to the information processing model, through the provision of information regarding the environmental impacts (Kobus and Lee, 1993; Bartlett and Kurian, 1999; Cashmore *et al.*, 2004) can be considered as very limited.

According to developers and consultants, impact assessment methods should be less theoretical and more focused on the important project activities that generate impacts on the environment (LC #7); they should be improved by updating them from international experience methods (T #14); should be quantitative to make EIA more objective (LC #16); and, should combine several methods according to the types of projects (LC #15). From the interviewees' perspective, impact assessment methods should also increase the participation of multidisciplinary teams to integrate the perspectives from different experts (LC #15, #16)); and consultants should have constant training in EIA and increase their level of expertise in specific types of projects (RR #9; T #13). In addition, since EIA is space and time limited, it should

evolve to Strategic Environmental Assessment in order to consider synergistic impacts (LC #16).

Even though there was no evidence that the information regarding impacts influenced decision making there was a perceived need for improvements in impact assessment methods (e.g. more quantitative methods; methods updated with international methods). Thus, it can be argued that developers and consultants expect EIA to be a technical process governed by scientific and technical rationality (Bartlett and Kurian, 1999); a process which focuses on the quantification of data and impact prediction (Cashmore, 2004; Cashmore *et al.*, 2004); and a process in which scientifically valid information and better quality of the environmental assessment data will result in a better decision (Kobus and Lee, 1993; Kørnøv and Thissen, 2000); very much an information processing model perspective.

6.3.4 Mitigation measures and monitoring

During this stage, EIA was perceived as useful to determine mitigation measures; to anticipate the conditions attached in the Final Statement; and to have an overview of the cost of the project. In addition, developers were interested in mitigation measures when they represented economic benefits. These perceptions agree with the information processing and political economy models (See Table 3.4 in Appendix 3).

a) Information processing model

According to developers, consultants and EISs, EIA was useful to determine mitigation measures and conservation strategies to be implemented in the project (Interviewees: LC #7, #15, #18, #19; RR #10; T #13; MI #22. EISs: LC #1, #3, #4, #5; T #6, #7, #10; RR #11, #12).

> *"… all the information generated during EIA is important as it is useful to correct, modify, to develop infrastructure to compensate or mitigate…" (Interviewee LC #7).*

Although this was indicated mainly by consultants; it can be stated that EIA is influencing decision making by providing information (Bartlett and Kurian, 1999) to be used in the determination of mitigation measures.

According to EISs, EIA was used to determine the viability of the project (T #6, #7, #9, #10; RR #11, #13; TS #14, #15; MI #18, #19). In T, RR, TS, and MI viability was determined based on the environmental baseline conditions; the project's characteristics; impacts from the facility; mitigation measures; and its compliance with regulations. In addition, according to EISs, EIA was used to design the environmental program or monitoring program to follow up the changes in the environmental system due to the facility (LC #1, #3, #4).

For one consultant, the mitigation measures determined during EIA were useful to anticipate the conditions that would be attached to the Final Statement by the Ministry of Environment, and therefore facilitated the later compliance (LC #19). In addition, according to consultants, EIA was useful in producing an overview of the expenses needed to undertake the project (T #13). In LC cases, EIA was used to determine the cost of mitigation measures needed as well as the indemnity cost (LC #15, #18, #19). Although there was no evidence of how this information influenced decision making, it is an indicator of other uses for EIA.

According to another consultant, in a LC case the community was analysed by a team of sociologists to determine their needs and what needed to be implemented in the project as mitigation measures (LC #16). However, the function of the team of sociologists was to identify the needs of the community but not to fully inform the community about the project. One consultant considered that opposition would be avoided by implementing the community's needs in planning the LC (LC #16).

For consultants, the problems in EIA during the determination of mitigation measures were their inadequate recommendations and the lack of consideration of social aspects and impacts by the developer during the design of compensation measures. "*Consultants' recommendations are not well grounded in technical arguments and therefore are not taken into account by the developer"* (MI #21). From the consultants' perspective, developers do not consider the social aspects and

impacts during planning and design (e.g. baseline social conditions and personal attachment of the community to the land) (LC #15, #17). Consequently, a consultant perceived that the compensation measures suggested by the developer were inadequate, causing opposition from the community (LC #17).

b) Political economy model

According to consultants, developers were interested in mitigation measures when they represented economic benefits (e.g. financial savings) or an increase in the public acceptance of the facility (RR #10; LC #15, #18).

> *"…when you approach a developer and tell him how the mitigation measures will, for example, reduce emissions and consequently save money, then they become interested…they take it into account because it represents economic benefits" (RR #10).*

Therefore, as Bartlett and Kurian (1999) stated in their 'political economy model', EIA is influencing decision making as it improves financial opportunities; improves public recognition; and improves relationships with stakeholders.

6.3.5 Influence of EIA on the environmental permit

Based on the content analysis of the Final Statements (FS) and analysis of the semi-structured interviews with Ministry of Environment officers and consultees, the following section describes the Ministry of Environment's decision making regarding the environmental permit and the models of EIA identified.

Review of the EIS

In line with the information processing model, according to Ministry of Environment officers, the review of the EIS considered the compliance of the EIS with regulations and the adequate assessment of impacts (see Table 3.5 in Appendix 3). Regulations establish the information that should be included in an EIS: description of the project; link with land use planning; description of the environmental baseline

conditions; identification and assessment of impact; mitigation measures; environmental predictions; and description of the methodologies supporting the information provided (SEMARNAT, 2000). Thus, according to Ministry of Environment officers, if the project does not comply with information stated in regulations the project is rejected (Min of Env #36, #37, #38, #39, #41). For example, in two T cases, the environmental permit was not issued because the EIS did not provide enough information (See Appendix 2).

Ministry of Environment officers reviewed the EISs to verify that the assessment of impacts was adequate. According to them, the EIS should include results obtained through the best techniques and methodologies available; explain how the impacts were assessed (e.g. based on technical grounds and expertise from consultants); explain the impacts; and explain the methodologies used to assess the significance (e.g. criteria used for the significance) (Min of Env #37, #38, #39).

Problems indicated by Ministry of Environment officers included the low quality of EIS. EISs of HWMF do not describe the alternatives of the project (e.g. alternative sites for the facility) (Min of Env #37, #39), and provide a large amount of information but do not provide relevant conclusions regarding EIA (Min of Env #36). In addition, EISs describe the socioeconomic and environmental baseline conditions of the area, but the environmental conditions were not analysed in relation to the socioeconomic conditions (Min of Env #36).

According to Ministry of Environment officers, to improve EIA, EISs should not be restricted to describing only what the guidelines request, but should describe results based on technical grounds, relevant references, expertise, and impact identification and assessment thoroughly (Min of Env #37, #38). The quality of information provided in the EIS should be improved (e.g. information about the processes within the HWMF and wastes generated; the impact identification and the mitigation measures proposed) (Min of Env #38). In addition, large amounts of information should be avoided, EISs should focus on the relevant aspects of the project and impacts (Min of Env #39), and the EISs should include the community's perception regarding the project based on a social study, EISs should not only highlight the

positive impacts from the economic aspects but should also fully describe the negative environmental impacts (Min of Env #38).

Consultation with local authorities

During the consultation with local authorities EIA had a role in line with the information processing model (See Table 3.6 in Appendix 3). Statutory consultation was undertaken to determine the agreement with local land use plans, and EIA was used to identify issues to be considered in future land use plans.

According to Ministry of Environment officers and one consultee, consultation with local authorities was undertaken to determine the agreement with local land use plans (Min of Env #37, #38, #39, #40; RR #42). Municipal authorities were consulted in seventeen cases, of which two (TS and LC) responded to the consultation (See appendix 2). The Ministry of Environment (at the federal level) consulted the Ministry of Environment (at the state level) and received responses in ten out of fourteen cases. Responses were concerned with the agreement of the project with the land use plan of the region; its location in relation to Natural Protected Areas; and the lack of information in the EIS regarding the description of the processes within the facility, baseline conditions of the area, and the environmental impacts (See Appendix 2). According to Ministry of Environment officers, if the local authority (e.g. municipal authority) did not have a land use plan, the local authority had to form an opinion regarding the viability of the project in their territory (Min of Env #38). If the local authorities in this situation did not support the facility and this opinion was not based on the land use plan, then the Ministry of Environment would not consider it (Min of Env #37).

According to a statutory consultee, EIA was useful when a decision had to be made regarding projects located in places where there was not a well established Land Use Planning framework and where there were only indications of urban development (RR #42). Under these circumstances, he perceived that EIA had been useful to identify issues that had to be considered in the future land use plan of the region and to revalidate the indications of urban development suggested previously. However, this has not been a common situation.

The information provided by the EIS together with the statutory consultation was used during the Ministry of Environment's decision-making. The relevance of both the information provided by the EIS, and statutory consultation for decision making, are also judged as important by planning authorities in the UK when reaching a decision (Kobus and Lee, 1993). Later research, again in the UK, concluded that consultation was considered to be more important to the decision maker than the ES (Wood and Jones, 1997). However, it should be noted that statutory consultation in the Mexican case was limited to the determination of the compliance of the project with the land use plan, and public consultation occurred in LC cases only, where there is no evidence that it influenced decision making.

Making the decision

According to Ministry of Environment officers, the complexity and difficulty of decision making depended on the types of HWMF; LC being the most difficult followed by I, T, and R (Min of Env #36, #37). A Ministry of Environment officer perceived that the decision regarding a LC was different from other HWMF because LCs were contentious projects and were located in areas away from industrial areas, where land use planning may not have existed (Min of Env #36). The decision for other HWMF, such as treatment facilities, was easier because those facilities were controlled by regulations, and were located in industrial areas where a land use plan existed (Min of Env #36).

During the decision, other departments within the Ministry of Environment and experts outside the Ministry of Environment were consulted [Min of Env #37, #38, #39; LC FS #2, #3, #4, #5 (See also Appendix 2)]. In LC cases the Department of Impact Assessment consulted other departments within the Ministry of Environment regarding the project (e.g. Department for Integrated Management of Hazardous Materials and Activities; Department of Wildlife; Department of Forestry). According to Ministry of Environment officers, consultation with other departments occurred especially when the land use was going to be changed. Discussion sessions were organized with the different departments to consult and discuss environmental issues such as wildlife, wastes, and water management. Experts outside the Ministry

of Environment were consulted in LC cases such as the National Commission for Biodiversity and the National Commission for Water, and based on their opinions, conditions attached to the Final Statement were determined (See Appendix 2).

When making the decision, meetings with more senior members of the Department were held to discuss issues regarding the project and to determine the viability of the project (Min of Env #38). After reviewing the EIS, a draft Final Statement was written but the final decision regarding the facility was made by a senior colleague in the Department (Min of Env #36).

According to Ministry of Environment officers, the decision was subject to pressure from local authorities and social opposition, but the pressure did not influence the decision made by the Ministry of Environment officer (Min of Env #35, #40, #38, #39). When municipal authorities supported the social opposition against projects, these authorities pressured the Ministry of Environment to reject the facility. However, Ministry of Environment officers stated that the pressure from local authorities did not reach the Ministry of Environment officers, and therefore if a project was environmentally viable, the environmental permit was granted in spite of the opposition from local authorities (Min of Env #35, #40, #38, #39).

Ministry of Environment officers supported by information from Final Statements (FSs) stated that the environmental permit is independent from other permits granted by local authorities (Min of Env #35, #36, #37, #38, #39, #40, #41; FS: LC #5; T #7; TS #15; II #16). However, according to Ministry of Environment officers, despite this local authorities do use the FS comments and environmental permit as a basis to make decisions regarding their permits. Thus, if the local authorities are against the facility and the environmental permit is rejected by the Ministry of Environment, the local authorities use the arguments in the Final Statement to deny the building permit. But, if the local authorities support the facility and the Ministry of Environment rejects the environmental permit then the decision on the project becomes a conflict. This could be an indicator of how EIA is being used by politicians as an explanation to justify decisions (Nilsson and Dalkmann, 2001). However, this idea was introduced by Ministry of Environment officers and not by

municipal authorities. Therefore more research would be needed to determine if this is a use of EIA by municipal authorities.

During the decision at the Ministry of Environment, the perceptions and use of EIA agreed with the information processing, participation, and institutionalist models (see Table 3.7 in Appendix 3).

a) Information processing model

In line with this approach, EIA was perceived by Ministry of Environment officers as a learning resource. When making the decision regarding the environmental permit, a Ministry of Environment officer perceived EIA as a learning resource (e.g. about protected species, habitats, distribution), the information acquired was then used for the assessment of the impacts of the facility (Min of Env #37). The role of EIA as a learning resource is comparable with one of the transformative potentialities of environmental assessment observed by Cashmore *et al*. (2008) in the UK, that of technical learning. According to Cashmore *et al*. (2008), EIA helped stakeholders to acquire knowledge through the collection and interpretation of baseline data. However, this perception was indicated by one Ministry of Environment officer only and was not a common perception amongst stakeholders.

In line with the information processing model, according to a Ministry of Environment officer and FSs, during the decision-making process the impacts on the environment and the use of natural resources by the project should be considered to determine whether it keeps the functional integrity of the ecosystems (Min of Env #35). Final Statements of LC mentioned that "*the consideration of the functional integrity of the ecosystem and the environmental impact identification of the LC project provided evidence that the impacts could be reduced to both satisfy the legal framework and keep the ecological equilibrium*" (FS LC #3, #4, #5). In addition, Final Statements and a Ministry of Environment officer indicated that EIA was used to determine the compatibility of the activities of the project with the environment based on the impacts identified and the resilience of the area, and whether the impacts could be prevented, mitigated or compensated (Min of Env #35; FS LC #3, #4, #5).

From another perspective, Ministry of Environment officers perceived that EIA enabled them to determine the environmental and technical viability of projects (Min of Env #39, #40). This coincides with FSs which indicated that the Ministry of Environment through EIA (e.g. information provided in the EIS, technical opinions) determined the feasibility of the project at the site; and determined that the mitigation measures were viable and useful to reduce the negative impacts from the project (FS: T #7, #10; RR #12; TS #14, #15; MI #17, #19; LC #2, #3, #4, #5). These ideas were supported by further evidence from Final Statements and a Ministry of Environment officer where EIA was used to determine the impacts from projects and decide the measures to mitigate, compensate or prevent the impacts. Through EIA it was determined that the environmental impacts from the project could be mitigated or compensated by implementing mitigation measures, and that mitigation measures would reduce the significance of the negative impacts (Min of Env #39; FS: LC #2, #4, #5; T #7, #10; RR #12; TS #15; MI #19).

> *"EIA gives you information regarding the impacts that can be caused by the project, but the most important thing is that it is possible to establish measures to mitigate, compensate or prevent those impacts" (Min of Env #39).*

Therefore, EIA is being used in the Mexican case as a technique for the provision of information regarding the environmental consequences of projects. This role of EIA in decision making has been suggested by several authors (e.g. Kobus and Lee, 1993; Bartlett and Kurian, 1999; Cashmore *et al.*, 2004).

Final Statements and a Ministry of Environment officer indicated that EIA enabled the establishment of the conditions to be fulfilled for the development of projects in order to avoid damaging the ecological equilibrium of the ecosystem, reduce the impacts on the environment, and make facilities operate within the legal framework (Min of Env #35; FS: LC #3, #4, #5, #7, #8, #9, #10; RR #12, #13; TS #15; MI #18, #19). The influence of EIA in the establishment of conditions has also been reported for other countries. In an international study on the effectiveness of EIA it was determined that it was perceived as very, or moderately, influential in the establishment of conditions for the development (Sadler, 1996). In the UK, planning

officers perceived that EIA had benefits relating to provision of more information about environmental impacts and setting conditions (Wood and Jones, 1997). In Norway, EIA provided the authority early indication of the likely restrictions and requirements that would be placed on the project (Leknes, 2001).

Most of the conditions attached were related to the auditing and follow-up of HWMF such as reports for the Ministry of Environment regarding the compliance of mitigation measures and implementation of environmental management systems (see Appendix 2). However, in LC cases, the conditions attached to FSs changed the design (e.g. addition of a layer of geomembrane, construction of an impermeable floor resistant to chemical compounds) (See Appendix 2). This is different from other countries, such as the UK, where it has been reported that the environmental conditions most likely to be included were relating to environmental issues (e.g. landscape and noise); and only a few cases contained reference to the ES's and indicated that the measures contained were to be followed (Wood and Jones, 1997). The limited influence of EIA in design has also been reported in the international study of effectiveness which determined that EIA was moderately or marginally influential in the redesign of proposals (Sadler, 1996).

The problems and improvements mentioned by Ministry of Environment officers also indicate the information processing role that EIA is expected to have. The problems included the consultant's lack of capacity; inadequate impact assessment methods used; uncertainty in EIA practice; and time pressure. According to Ministry of Environment officers, consultants do not have the capacity to undertake EIA; they lack knowledge regarding environmental regulations, and do not undertake EIA with an interdisciplinary team (Min of Env #35, #37). In addition, Ministry of Environment officers perceived that since consultants compete for developers as clients, consultants offer their service at a very low cost; undertake a low quality EIA; and use bad practices (e.g. copying sections from other EISs of similar projects or from EISs of the same region) (Min of Env #35, #37).

Based on the opinions of Ministry of Environment officers, the methods of impact assessment should be improved; data should be obtained from fieldwork over one or two years to improve the certainty of the baseline environmental conditions, and

therefore improve the prediction of impacts and mitigation measures (Min of Env #36, #38, #40). In addition, impact assessment should consider impacts on a larger scale, plus cumulative, and synergistic impacts (Min of Env #38); EIA should also include follow-up programs of the projects based on the indicators considered during the determination of the baseline conditions of the area (Min of Env #40).

According to one Ministry of Environment officer, the strict regulations for LC that existed in the past obstructed the development of LC in the country (Min of Env #37). For example, complying with all the aspects established in regulations for LC's project site was extremely difficult (e.g. distance to the closest town of 5 km., distance to water body, permeability of soil). Consequently, according to him, there is uncertainty in EIA for LC projects because no LC has been built in Mexico since EIA was implemented, and it has not been possible to determine if the prediction of impacts and mitigation measures would be effective.

Other Ministry of Environment officers stated that the decision-making process was under significant time pressure due to the short time scale (sixty days) and the work load for each Ministry of Environment officer (Min of Env #35, #38, #39). Consequently, as Ministry of Environment officers commented, it was difficult for them to undertake a thorough review of large projects such as LC and to consult other departments within the Ministry of Environment before making the Final Statement. Therefore, for Ministry of Environment officers, the time limit for making the decision should be adjusted according to the complexity and contentiousness of projects. In addition, contacting the developer should be easier and less bureaucratic. The limited time to read the environmental assessment documentation has also been reported in the UK (Cashmore *et al.*, 2008).

Therefore, it can be stated that Ministry of Environment officers in Mexico expect EIA to work as the information processing model indicates: as a technical process governed by scientific and technical rationality (Bartlett and Kurian, 1999); and, assume that scientifically valid information and better quality of the environmental assessment data will result in a better decision (Kobus and Lee, 1993; Kørnøv and Thissen, 2000).

Ministry of Environment officers saw the decision being focused on how the project agreed with land use plans, development plans and Natural Protected Areas; the project's compliance with regulations; the environmental baseline conditions of the area (e.g. absence of protected species); impacts on the environmental aspects of the area (e.g. soil, water, air, flora and fauna) and on the functional integrity of the ecosystem (see appendix) (Min of Env #35, #36, #37, #38, #39, #40, #41). This coincides with the arguments expressed in Final Statements to accept or reject the HWMF which relied heavily on environmental regulations.

For Ministry of Environment officers, the three reasons why the environmental permit is rejected are: a) if the project does not agree with land use plans or comply with regulations; b) if the project can cause a species to become threatened or endangered; and c) if the EIS contains false information (Min of Env #39, #40) (See also Appendix 2). This is similar to what Weston (2000) stated, that decisions within the EIA process consider key issues including: the nature of the project and the receiving environment; the policy context of the locality; and the legislative and regulatory framework. In the UK it has also been reported that the overriding factors influencing the decision by the local authorities were the environment and the existing planning policies (Wood and Jones, 1997).

According to Kørnøv and Thissen (2000), the rational decision-making model is not followed when the decision either results from following rules, or is a consequence of standardised working procedures, cultural norms and institutional structures. Thus, even though EIA provided information according to the information processing model in the Mexican case, the decision made by the Ministry of Environment did not strictly follow the rational decision-making model, as it was also a result of standardised working procedures and institutional structures (e.g. based on the projects' agreement with land use plans and development plans). The decision was arguably similar to the bounded rationality decision making model and to the 'new institutional' perspective on decision making stated by Leknes (2001): decisions of organisations are explained by formal rules and legal framework.

Since the Ministry of Environment's decision making was based mainly on regulations (e.g. land use plans), the role of EIA during HWMF in Mexico was limited. This has been mirrored in Norway (Leknes, 2001). According to Leknes (2001), when the issues of the authorities' decision were regulated and technical, EIA had a minor role in the decision-making process because the decision was based on the interpretation of the application of legal regulations. Therefore, it could be stated that the role of the Ministry of Environment as an environmental planner was as a regulator, as described by Randolph (2004), focusing on enforcing regulations.

The decision made by the Ministry of Environment regarding the environmental permit in the Mexican case agrees with the mixed scanning model of decision making. According to this model, decision making uses rational techniques of assessment such as environmental assessment as well as more intuitive judgements based on codes of practice and political values (Nilsson and Dalkmann, 2001). Thus, the decision made by the Ministry of Environment considered the information provided by EIA regarding the environmental baseline conditions and impacts, as well as interpretation of the application of regulations (e.g. land use plans).

b) Participation model

During the environmental permit stage, EIA had a very limited participation role. Public consultations were undertaken through information sessions where the community was informed regarding the project and social concerns were considered. According to Ministry of Environment officers, social concerns were taken into account in the decision making by the Ministry of Environment as long as those concerns were regarding environmental issues (Min of Env #35, #36, #40).

For Ministry of Environment officers, if public consultation was requested, the environmental concerns of the community exposed during the public consultation were responded to and considered during the decision (Min of Env #35, #36, #40). Consequently, in line with the participation model, EIA allowed public participation and consideration of environmental issues (Bartlett and Kurian, 1999). However, public consultation was undertaken in Mexico as one way consultation and there was

no evidence in this research that the information obtained during it influenced decision making.

c) Institutionalist model

In line with this approach, EIA was perceived by Ministry of Environment officers as an instrument of environmental policy. According to a Ministry of Environment officer "*EIA is an instrument of environmental policy because it is referred to in an environmental law*" (Min of Env #35). This was also identified in the Final Statements of all cases analysed which relied heavily on regulations, and on the problems and improvements indicated by Ministry of Environment officers regarding land use planning.

In FSs, EIA is defined as a procedure to obtain the environmental permit, and as a procedure through which the Ministry of Environment establishes conditions to be complied with by the development (LC #3, #4, #5; T #7, #8, #9, #10; RR #12, #13; TS #15; MI #18, #19).

According to Ministry of Environment officers, land use planning has not been put into practice at regional and local levels (Min of Env #35, #36). One Ministry of Environment officer perceived that local authorities lack land use plans due to the high political cost of decisions regarding land use (Min of Env #36). In addition, according to the officer, land use plans of the municipal authorities have not been assessed through EIA and therefore may not be adequate to be considered during the Ministry of Environment decision-making process. For another Ministry of Environment officer, to improve EIA, complementary instruments of public policy (e.g. Land Use Planning; State government policies) should be improved to clearly define the policy for hazardous wastes and HWMF (Min of Env #35). In addition, land use plans and development programs in the country should be analysed through EIA and therefore SEA should be implemented (Min of Env #35). These examples indicate that the decision made by the Ministry of Environment does not always follow the rational decision-making model as it is a result from following rules, standardised working procedures, and institutional structures (Kørnøv and Thissen, 2000).

6.3.6 Influence of EIA during public participation

The following section describes how the community was engaged to support the HWMF by the developer; and how public consultation and social opposition occurred. For each stage, the perception and use of EIA is described, together with the associated problems and proposed solutions according to the interviewees.

Engaging the community

Engaging the community occurred only in LC cases and started before the submission of the EIS to the Ministry of Environment. In one of the cases it started two and a half years in advance (LC #19); in another case three years before (LC #17); and in the other ten years in advance (LC #18). In the first case, the developer opened discussions with the president of the municipal authority and landowners of the potential site first (LC #29). The developer approached landowners without informing them that the facility was going to be a HWMF. Instead, they were informed that it was an industrial facility (LC #29, #26). The developer convinced the landowners to make a deal regarding the land and payments were made (LC #29, #17). In addition, the developer engaged with the municipal authority and a few members of the community who belonged to the political party in power (LC #29, #31).

To convince the community to accept the facility, developers used as arguments the community benefits that the facility would bring. The developer of one case explained to the community that the facility would include a clinic and a fire station which could give service to the facility as well as to the community; that jobs would be triggered by the facility; and that environmental benefits would be obtained from having a facility to adequately manage industrial wastes (LC #8). The same developer negotiated with the community's small businesses to make them the suppliers of the facility. For example, a local tailor's business became the supplier of the uniforms for the workers at the facility (LC #8). Another developer also engaged the landowners of the area where the project would be located and convinced them that they would obtain a job in the facility (LC #29). In addition, the developer tried

to convince the community to accept a HWMF by telling them that the facility would manage wastes adequately; that jobs would be generated; and that the developer would buy the land from the community; but more information regarding the facility was not provided by the developer (LC #26). In another LC case, the community supported the facility because it would generate jobs (LC #18).

Leaders of opinion in the community are identified as part of a strategy for engaging the whole community. In one LC case, the consultant identified these leaders of opinion (e.g. priest, teacher, miners union) and organized meetings to inform them regarding the project and the benefits from the facility (LC #19). In two other LC cases, in order to convince the community, the developer first lobbied political representatives and leaders of opinion to accept the facility (LC #8, #18).

In addition to convincing representatives and leaders of opinion in the community, one of these developers engaged environmental NGOs in the region (LC #8). From the developer's perspective, getting in touch with the NGO and convincing them to accept the facility would avoid opposition to the facility (LC #8).

Information sessions regarding the LC projects were organized for the community in three LC cases (LC #8, #17, #18, #19). During the sessions the communities were informed about the project and were able to ask questions (LC #8, #18, #19). In one LC case, information sessions regarding the project were organized by the developer at the Government of the State's offices (LC #29). The developer and members of the community attended the information sessions but EIA was not mentioned; instead they were only informed about a new industrial facility (LC #29, #31, #26). Although it only happened in one LC case, the community was able to make suggestions about the project during information sessions. They suggested ways of removing the vegetation and it was decided that the community would work for the facility during the construction phase (LC #19).

In one LC case, the consultant participated by engaging the community and explained the project to the community without using the term EIA; instead, he explained the project, the activities within the facility, the effects of the project, and the mitigation measures to be implemented (LC #19). In another LC case, to

convince the community to accept the facility, they were not informed regarding EIA, but were informed that the facility would operate with strict safety measures, and that it did not represent a high risk for the community (LC #18).

Two State Ecology Councils (SEC), which were engaged in one LC project each, participated by attempting to convince the community to accept the facility. In one case, the SEC was asked by a member of the State Government to help to convince the community to accept the facility, and therefore the SEC attended the information sessions organised in the offices of the State Government (LC #24). These sessions were attended by the developer, members of the community, leader of the opposing group, and university members (LC #24). In the other LC case, the SEC participated in meetings to convince the community by providing information to the community regarding hazardous wastes; risks and effects from hazardous wastes when they are not adequately managed (e.g. pollution from hazardous wastes); the need for the facility in the region; and operation of the LC to be built (LC #25). The meetings were attended by members of the local community, neighbouring communities, environmental NGOs; and the municipal authority (LC #25). In addition, brochures with information regarding the facility were given to the community (LC #25). From this member of the SEC's perspective, the information sessions helped to make the community understand what the facility was about; the impacts from the facility; identify organizations that could benefit from the project (e.g. organizations that would benefit from the construction of a road); and therefore obtain the support from the community (LC #25). According to him, the developer was successful at convincing the community because they were approached, informed regarding the project, and their views taken into account, before engaging local authorities (LC #25).

The problems perceived by members of the community regarding the information sessions organized by developers were the lack of community representation; the limited participation; and confrontation during the sessions. The sessions organized were attended by representatives of local authorities and people who did not belong to the community (LC #31). The participation of some of these members of the wider community was limited because those members were not considered as inhabitants of the community (LC #31). In addition, from the member of the community's

perspective, the objective of the sessions with the developer was to discuss the project and the impact on the community; however, confrontation instead of discussion occurred between the developer and the members of the community (LC #31).

Public consultation

Public consultation during the decision-making process at the Ministry of Environment resulted from sending comments related to the project direct to the Ministry of Environment, and through public information sessions organized by the Ministry of Environment.

Comments to the Ministry of Environment

Comments regarding the project were sent by members of a NGO to the Ministry of Environment in one LC case (LC #28). The NGO was constantly monitoring the Ministry of Environment's website to identify projects applying for an environmental permit. The NGO downloaded the EIS of the LC project from the Internet and made comments regarding the project to the Ministry of Environment. The developer requested a meeting with the NGO to discuss these comments and subsequently, a meeting was held where issues regarding the project were discussed. As a result, the developer undertook the geological studies again and the design of the cells for the containment of hazardous wastes was improved. The NGO was satisfied with the changes made by the developer and supported the facility.

After the project obtained the environmental permit the developer continued being in touch with the NGO (LC #28). The developer consults the NGO through a consultancy firm; meetings are undertaken to consult the NGO regarding issues such as satisfaction with monitoring activities, improvements to the design of the geomembranes, and collection of leachates. The NGO suggested a permanent monitoring of leachates every hour and everyday. According to the member of the NGO, there is constant dialogue with the consultancy firm (LC #28).

Public consultation organized by the Ministry of Environment

Public consultation was requested to the Ministry of Environment in three LC cases; requested by an NGO in one LC case (LC FS #4) and by the municipal authorities in two cases (LC FS: #1, #2) (See Appendix 2). In two cases, the Ministry of Environment rejected the request because they were not made within the time set in regulations (LC FS: #1, #4).

In the LC case, for which the public consultation was organized by the Ministry of Environment, public consultation was requested by the municipal authority and consisted of a public information session (LC FS: #2). During the session the attendees were informed about the project, the equipment to be used, and its compliance with regulations; impacts, impact assessment, risks, mitigation measures, and monitoring; and questions regarding the project were answered (LC #15).

Perception and use of EIA during public consultation

During public participation, the use and perception of EIA can be classified as following the information processing, participation, and symbolic politics models (See Table 3.8 in Appendix 3).

a) Information processing model

Consistent with the information processing model, public consultation was used to inform the community about the project and as an information source. According to one developer and one consultant, information sessions were used to inform the community how the project was going to be undertaken (LC #7, #20). For a Ministry of Environment officer public participation was used as an information source about issues that had to be considered in the decision; the information obtained helped the Ministry of Environment officer to consider more information during the decision-making process and request additional information from the developer when necessary (Min of Env #38).

For members of NGOs, EIA was used to gain access to information regarding the project and determine the compliance with regulations (LC #26, #27, #28). Through the EIS, an NGO was able to access information regarding the baseline conditions of the area, hazardous wastes to be managed in the LC, processes to be used in the facility, impacts, risks, and review the mitigation measures suggested. For the NGO, accessing the EIS can make sure that the information is thorough, and later enables monitoring of the implementation of the mitigation measures. When having access to the EIS, NGOs determined the compliance of the project with national and international regulations. If the project had not complied with regulations the NGO would have made comments to the Ministry of Environment. In addition, based on the information in the EIS the NGO determined the agreement of the project with the land use plan for the area.

These perceptions of public participation are comparable with Bartlett and Kurian's (1999) 'information processing model' and with Cashmore's (2004) 'information provision model' of EIA as a civic science. Bartlett and Kurian (1999) indicate that public participation is seen as an information source during the decision making. According to the 'information provision model' of EIA as a civic science suggested by Cashmore (2004), stakeholder involvement is limited to one way consultation, which occurs only when the EIS has been published. However, during this research there was no substantial evidence that the information obtained during public consultation was used in decision making. Developers used public consultation to offer information on the project to the community but not to obtain information from the community. Ministry of Environment officers perceived public consultation as an information source, but there was no evidence the information generated was used in decision making regarding the environmental permit.

b) Participation model

In line with this model, EIA was perceived as a process with social participation and as a means to approach the Ministry of Environment and developer. EIA was perceived by a Ministry of Environment officer as "*the only decision-making process in Mexico which requires public participation…and therefore it should be able to*

consider the interests of stakeholders and concerns of the society regarding environmental issues" (Min of Env #35).

EIA was used and perceived by NGOs as a means to approach the developer and Ministry of Environment. Public information sessions were used by an NGO "*to express concerns and discuss the project"* with developers and the Ministry of Environment (LC #27). EIA was perceived by an NGO as an instrument that has enabled NGOs to approach the developer and make comments regarding the project and discuss technical issues related to the project (LC #28); and perceived as a means to approach the Ministry of Environment to make comments regarding compensation measures and, give reasons why the facility should or should not be approved, in addition to recommending changes to be made in the project (LC #28, #27).

The perception of public information sessions as a place to discuss the project coincided with a consultant's views in a LC case. However, according to him the discussion during the public information session depends on the level of education of the community (LC #20), because, in States where a large proportion of postgraduates exist the community is more likely to question technical and legal issues of the project, and therefore the public consultation can be used to discuss the project, but this does not occur in States with a lower proportion of postgraduates.

Even though developers did not perceive the EIA process as an opportunity to discuss the project, according to members of NGOs, discussion occurred in LC cases. For example, in one LC case an NGO made comments regarding the project to the Ministry of Environment; later this led to a discussion about the project with the developer of the project and changes in the design were undertaken. In another LC case, during the public information session organized by the Ministry of Environment, the developer realized that there was opposition in the community and decided to approach the community and NGOs to negotiate about the project. The results from the negotiation were sent to the Ministry of Environment to be considered as conditions attached in the Final Statement (LC NGO #27).

This input from NGOs in the decision making process coincides with Deelstra *et al.* (2003) and the participation model of EIA as a civic science suggested by Cashmore (2004). Deelstra *et al.* (2003) stated that decisions are made when there is a window of opportunity; decisions are made in rounds where actors negotiate and reach consensus about problems and solutions and therefore the decision is improved. Decision-making occurs in informal arenas where stakeholders such as NGOs and government bodies discuss and try to influence the decision (Deelstra *et al.*, 2003). For Cashmore (2004), when EIA has a role according to the participation model the developer deliberates with a range of stakeholders and is willing to change the development proposal. Consequently, EIA functioned in the Mexican case as a window of opportunity to negotiate and discuss the project and therefore had a significant role in decision making. However, this was identified in two LC cases only and was not a common practice in the other developments analysed.

The problems and improvements suggested by stakeholders were also indicators of the need for EIA to fulfil a participation role. For example, members of the community and NGOs perceived that they were not informed regarding the projects submitted at the Ministry of Environment (LC #26, #27, #29, #30, #31). For them, public participation is limited during EIA because EISs are not always available on the Internet. In any event, many rural communities do not have access to the Internet. The abstract of the project is published in a newspaper but the community does not have access to the newspaper, and the EIS is available at the Ministry of Environment offices situated a significant distance from the community. In addition, according to these NGOs, EISs use technical jargon and cannot be understood by either the community or the NGOs. Interviewees suggested that access to the EIS should be free for the host community. In addition, the community should be given a simplified and accessible EIS, which therefore they should be able to understand and discuss.

Further problems were perceived by interviewees in the public consultation (public information session) organized by the Ministry of Environment such as the short period of time to request it; the lack of a standardized public consultation; biased public consultations; confrontation during public consultation; and the lack of public support from the Ministry of Environment for the project. According to one

developer, one member of the community and one NGO, there is no clear guidance on how to undertake public consultation; it is not an obligation and is not standardized. Some developers do not undertake it, while others do it in various ways. Public consultation can be undertaken at developers' and authorities' convenience. Therefore public consultation processes should be well established and clearly specified in regulations (LC #7, #27, #31).

Moreover, for one developer, one consultant, and one Ministry of Environment officer, public consultation is biased. According to the officer, when public consultation is requested it is because people are already against the facility; and the concerns expressed during most of the public consultations are not regarding environmental aspects of the project (Min of Env #35). In addition, according to him, people who participate in the public consultation express their opposition but people who might be in favour of the facility do not. Consequently it gives the wrong impression that all the community is against the facility. One developer and one consultant asserted that public consultation was attended by people who were paid by a third party to oppose the facility (LC #7, #16). To improve this, the consultant suggested that the community should be made aware of what public consultation is and the community should be persuaded not to oppose the development just because a third party has given them money specifically to oppose.

In a LC case, a member of a NGO perceived that the way the public information session was undertaken was confrontational and did not encourage a constructive discussion regarding the project (LC #27). In the same case, the developer expected public support from the Ministry of Environment for the project during the public information session (LC #7). According to him, the Ministry of Environment did not support its decision regarding the authorization of the facility in front of the community during the public consultation.

According to one developer, public consultation should be undertaken by the Ministry of Environment (LC #8). It should gather the opinions of the different sectors of the population, and should have teams working in the community. Local universities and local NGOs should also be consulted (LC #8). On the other hand, according to Ministry of Environment officers, public consultation should be

compulsory and should be undertaken by the developer before submitting the EIS. This would enable early communication between the developer and the community. The community could express its concerns to the developer and the developer respond to them, and therefore conflict would be avoided (Min of Env #35, #39, #40).

For NGOs and members of the community, in order to improve public participation, developers should inform the community regarding the EIS with the support of local authorities. The community and NGOs should be informed regarding the project at the same time as the municipal authority is consulted by the Ministry of Environment. The community should have information regarding the project's impacts on the environment and social aspects, and locations where the debates on the project will take place should be available (LC #26, #27, #28, #29). In addition, according to them, the projects should be announced in high circulation newspapers in the communities (and not only in the Ministry of Environment's journal); and publishing the abstract of the project should be compulsory for all developments, not only for projects such as LC.

For one consultant, EIA should reconcile the interests of the different stakeholders; developers and consultants should discuss the project with the stakeholders and thus determine the shared interests that the facility could satisfy (LC #16). In this way, from his perception, the developer and consultant could obtain support from the different stakeholders.

In addition, according to Ministry of Environment officers, developers should involve the community early in planning; developers should consult the community in advance and make it aware of the risks from facilities; consultation should include the community and not only experts; and the community should be able to express its opinion to the developer and Ministry of Environment (Min of Env #35, #39, #40).

c) Symbolic politics model

From a member of an NGO's perspective, during the public information session the Ministry of Environment tried to represent EIA as "*a guarantee that the project was going to be analysed, that the decision would be well grounded, and that the project would comply with the conditions attached because local authorities would be auditing the facility if it was not successful*" (LC #27). According to another member of an NGO, EIA should become a guarantee that the facility will not cause danger in the region (LC #28).

> *"… EIS is an important instrument that will enable us (NGOs) to guarantee that the facilities are not dangerous, but we need to strengthen the EIS with environmental performance…and therefore give certainty to the community that nothing is going to happen…" (LC #28).*

Taking these ideas into account, the EIA perceptions could be categorised as following a symbolic politics model. Even though the symbolic politics model did not have a role during decision making, the perception expressed by NGOs is an indicator of the need for EIA to be an instrument which increases confidence in projects.

Social opposition

According to Ministry of Environment officers and consultants, social opposition occurs in LC cases, and sometimes in facilities for incineration due to the potential pollution. Social opposition does not occur in the rest of the types of HWMF because they are located in industrial areas and are seen in the same way as any other industry (Min of Env #35, #38; MI #21, #22).

Social opposition was identified in three LC cases analysed and, according to interviewees, was caused by a lack of knowledge regarding hazardous wastes (LC #18, #34); by a lack of knowledge regarding the project and strict conditions of operation (Min of Env #37); by false information being given by NGOs or leaders (LC #8, #24, #28, #34; Min of Env #37, #39); by a third party giving money to the

community to oppose the facility (e.g. to maintain their monopoly of hazardous waste management) (LC #16, #18, #34; Min of Env #37, #39); others cited personal interests (e.g. conflicts between politicians and power groups, obtaining a better price for their land, obtaining money and political positions for NGOs; political interests of candidates) (LC #7, #15, #16, #17, #24, #25, #26, #28, #29, #34; MI #22), cultural issues (Min of Env #37); lack of engagement of the developer with the community before submitting the EIS (LC #32, #34); prejudice against HWMF (T #12; LC #17, #18, #19, #20, #26, #27, #28, #31, #32, #33, #34; MI #22; Min of Env #35, #37, #39); previous rejection of facilities in the area (LC #17, #24); and the NIMBY attitude (LC #20, #27, #34; Min of Env #37, #39).

For interviewees, the reasons for opposing the LC by the community were the lack of compliance of the project with regulations (e.g. distance to the community, lack of public consultation) (LC #29, #30, #31); impacts on the environment and the community (e.g. damage to way of life, damage to underground water and water use) (LC #29, #31); lack of trust in the developer (e.g. due to the methods of engagement with the community, antecedents of bad environmental performance) (LC #29, #30, #31, #16; #8; MI #22); lack of trust in the government (e.g. lack of transparency, lack of capability for making the facility comply with regulations and auditing, government supports the developer instead of the community) (LC #33, #34, #29, #30, #31, #27; Min of Env #35); and the precautionary principle (LC #29).

Use and perception of EIA during social opposition

The perception and use of EIA during social opposition could be categorised as following the symbolic, institutional, information processing, and participation models (See Table 3.9 in Appendix 3). The models showed the different roles and expectations that different stakeholders such as NGOs and members of the community have of EIA.

a) Symbolic politics model

In line with this model, EIA studies were used by a LC developer to prove to the opposition groups that everything is being done in the correct way (LC #6). The need

for EIA to work as a proof or endorsement was also evident for one member of the community, who expected EIA to be an endorsement that the project would be compatible with the environment and that the environment would not be damaged (LC #31).

Therefore, EIA was used as Bartlett and Kurian (1999) indicated in their 'symbolic politics model', to convince people that because EIA had been undertaken the environment would be protected, and therefore lessen opposition. This use of EIA as determined for the Mexican case is comparable to how EIA is used in the UK. According to Cashmore *et al.* (2008), the information provided by EIA in cases analysed in the UK is used to engender support by creating a perception of due diligence.

On the other hand, a member of an NGO in a LC case, who was against facilities such as LC and incinerators, regardless of the EIA, used it to identify faults in the facility and the decision making process at the Ministry of Environment and therefore to obtain arguments to oppose the facility (LC #26). For one member of the community, EIA was a way for the developer to legitimise projects and consequently the member of the community did not trust the EIS and that the operation and control of the LC would be undertaken by the developer (LC #29).

b) Institutionalist model

Agreeing with this model, one member of the community perceived EIA as a means for triggering good environmental performance in developers (LC #30).

> *"... if things are done as they should be done we will reach a point where we'll be used to doing things in the right way. If developers see that resources are available, but that if they take care of the environment it will produce more, of course they are going to do things in the right way..."(LC #30).*

Thus, members of the community expect EIA to work as a process which changes values in developers, and ways of doing things to incorporate environmental values as Bartlett and Kurian (1999) suggested in their 'institutionalist model'.

c) Information processing model

For members of the community, EIA was perceived as an instrument to identify and analyse impacts from the facility on the environmental components and community; and to prevent these impacts (LC #29, #30). Thus, members of the community perceived EIA as a process which provides information regarding the environmental consequences of projects mirroring, the findings of, for example, Kobus and Lee (1993), Bartlett and Kurian (1999), and Cashmore *et al*. (2004).

In addition, EIA was perceived by a member of an NGO as a learning resource about environmental aspects (LC #27).

> *"… after reading many EISs, I have learned about the technical aspects and I have been able to understand for example regarding wetlands" (LC #27).*

This role of EIA has also been reported for the UK, where EIA helped some people to acquire knowledge (Cashmore *et al.*, 2008).

d) Participation model

For a member of a community, EIA was perceived as a means of exercising the community's right to be informed (LC #30).

> *"EIA definitely helps the community to get used to exercise their right of being informed" (LC #30).*

Therefore, members of the community expect EIA to work as a process which facilitates public participation (Bartlett and Kurian, 1999) and empowers the community (Cashmore, 2004; Cashmore *et al.*, 2004). Members of the community expect planning of HWMF to occur as the 'political-economic mobilization' planning theory suggested by Lawrence (2000), a planning process which considers, amongst other things, community empowerment, inequities, and barriers to involvement.

6.3.7 Influence of EIA in the building permit

The building permit can be granted by the municipal authority to HWMF after they have obtained the environmental permit from the Ministry of Environment. The following paragraphs describe how the developer engaged the local authorities to support the facility; how the decision was made by the municipal authority; the models identified based on the perception, use of the EIA, problems and potential solutions according to the interviewees.

Engaging with local authorities

Engaging with the municipal authority to obtain its support for the facility occurred only in LC cases. Developers of two LC cases lobbied local authorities before obtaining the environmental permit (LC #7, #8, #17); the developer of one LC case also engaged with local authorities but after obtaining the environmental permit (LC #18); and in two cases discussion with local authorities occurred before and after obtaining the environmental permit (LC #19, #34). When engaging with local authorities, EIA had a role according to the symbolic politics and information processing model (See Table 3.10 in Appendix 3).

a) Symbolic politics model

EIA was used by developers and consultants as a confidence endorsement. Arguably this perception could be classified as following a symbolic politics model. When engaging with local authorities before obtaining the environmental permit, the developer of one LC case made presentations regarding the project to the municipal authority and the community According to him, EIA studies were used during presentations with the municipal authority and the members of the community in meetings as "*a confidence endorsement and as a way of making clear how EIA had been undertaken"* (LC #8). This is similar to how EIA was used in the UK in an advocacy way through conciliatory mechanisms to minimize opposition, creating a

perception of due diligence, and to engender support for the development (Cashmore *et al.*, 2008).

When engaging local authorities occurred after obtaining the environmental permit, the developer provided the municipal authority with a copy of the environmental permit; presentations regarding the project were made with the municipal authority, and a copy of the EIS was provided. During these presentations, one consultant commented that EIA was used to explain the impacts of the project to the local authorities, and assure them that the impacts would not be significant (LC #18).

Although it did not occur in HWMF cases, according to a consultant of a LC facility, before submitting the EIS, negotiations and agreements are made between the developer and governmental stakeholders (e.g. Commission for Natural Protected Areas). The agreements made are related to issues such as mitigation measures. The agreements are then stated in the EIS and reviewed by the Ministry of Environment. The consultant perceives that the fact that the agreements are mentioned in the EISs and Final Statement makes the governmental stakeholders feel assured of their compliance (LC #16).

This use of EIA coincides with the 'symbolic politics' model suggested by Bartlett and Kurian (1999) which states that EIA is used to convince people that the project will be protected and therefore reduce the opposition to the project. However, in the Mexican case, EIA is not only used by developers to lessen opposition to the facility but also as a way to increase confidence in the project's protection of the environment and compliance with regulations.

b) Information processing model

In line with the information processing model, EIA was used by developers to inform local authorities regarding the project, and local authorities used the information provided in EISs to review the project and to identify missing information regarding impacts and risks. Therefore, EIA was used to communicate information regarding the project (Bartlett and Kurian, 1999).

The developer and consultant of one LC case engaged with the municipal authority once the community supported the facility. Presentations were made to officers of the municipal authority regarding the project, the EIA, and the EIS, and officers of the municipal authority were able to ask questions regarding the project and the information in the EIS. When it was determined that the municipal authority supported the facility the developer engaged the State Government. The EIS was then submitted to the Ministry of Environment and the environmental permit obtained. After this, the developer and consultant continued being in contact with the local authorities.

In addition to being involved in discussions with the municipal authority and the state government, developers of two LC cases also engaged with the State Ecology Council (SEC) before obtaining the environmental permit. The SEC is part of the state government and includes representatives of governmental bodies, NGOs from the state, communities, and universities. The SEC discusses environmental issues and advises the state government.

The developer of a LC held information sessions for the state government, the municipal authority, and the SEC. During these meetings, questions were answered regarding the project and the EIA. In another LC case, after submitting the EIS and when social opposition to the facility was occurring in the community, the developer approached the SEC and made a presentation regarding the facility to obtain their support.

The SECs used the EIS to review the LC project and made comments to the Ministry of Environment at the state level. In two LC cases, the councils obtained the EISs from the Ministry of Environment, reviewed the EISs, and identified missing information in the EISs. In one of the cases, the EIS lacked information regarding high risks from the access roads due to traffic and transit of trucks transporting hazardous wastes. In the other case, the EIS did not provide information regarding loss of flora and fauna and risks of underground water pollution due to leachates. In both cases, the SECs suggested changes in the project and gave their comments to

the Ministry of Environment at the state level (e.g. changes in the access roads; measures for protecting the soil).

When deciding on whether to support the facility, the SEC considered the environmental conditions of the area; resilience of the area; need for a HWMF to solve the problem of pollution in the region; and, the viability of the project (LC #25). Through the EIA, the SEC perceived that the LC was an adequate facility as long as the mitigation measures were undertaken. In another LC case, the SEC considered the facility viable if more mitigation measures were undertaken, access roads were improved, and more safety measures and monitoring were implemented (LC #24). This has also been reported for the UK, where provision for mitigation measures engendered the support of statutory consultees (Cashmore *et al.*, 2008).

Municipal authority's decision making on HWMF

In one LC case, the developer negotiated with the president of the municipality before buying the land for the project site and before submitting the EIS to the Ministry of Environment (LC #34). The municipal authority supported the project as it represented benefits to the municipality; it would generate jobs; trigger the development of infrastructure (e.g. electricity supply); and because such facilities were needed in the region to dispose of the large amount of hazardous wastes generated and avoid illegal dumping (LC #34, #33). The municipal authority wanted to obtain ISO 14000 certification and therefore having a LC would benefit the process. Also, the LC would attract more industry to the municipality as it would provide an adequate infrastructure for the disposal of hazardous waste, and it would help to achieve the environmental goals that the municipal authority had established. In addition, the industrial sector in the region had asked the president of the municipal authority to promote the development of HWMF to reduce the costs of hazardous waste management (LC #34). The developer bought the land for the project site after obtaining the support from the president of the municipality, undertook an EIA, submitted the EIS to the Ministry of Environment; and obtained the environmental permit (LC #34).

The president of the same municipal authority started engaging with the representatives of the different political parties within the municipal authority (LC #34). The representatives were given a copy of the EIS and invited to visit a similar facility in another country. However, those that were against the facility were reluctant to see the EIS and rejected the invitation (LC #34). In addition, the president of the municipal authority engaged with the industrial sector to obtain their support for the LC and their support was used as an argument to convince the representatives of the different parties within the municipality (LC #34). Deciding on whether to support the facility or not by the representatives of the different parties became a political problem (LC #34). Convincing the other members of the Municipal authority was difficult because they belonged to different parties (LC #34)

In the same LC case, the municipal authority participated in a process of convincing the community to accept the facility; leaflets were provided to the community; NGOs were approached; and, presentations regarding the facility's operation were made to the community and NGOs (LC #34). During the presentations, the need for the facility to have an adequate management of hazardous wastes was highlighted (LC #34).

The political party to which the president of the municipal authority belonged, directed him not to support the project as it would affect its political support (LC #34). In addition, the president of the municipal authority tried to obtain the support from the government of the state and the next president elected for the municipality (LC #34). However, neither the government of the state nor the next president of the municipality supported the LC (LC #34).

This visit to a similar operating facility in another country (developed country) was organised by the developer (LC #32, #34). During the visit members of the municipal authority identified conditions of the operating facility; learned about the process of a LC and safety measures and monitoring activities to be implemented. Visiting an operating LC helped to convince the municipal authority to accept the project (LC #32). Several meetings were held at the municipal authority with the representatives

of the different parties within the municipal authority and it was decided to approve the LC (LC #34).

The presidents of the municipal authority of two LC cases were pressed by the opposition groups in the community to reject the facility (LC #34, #31). In one of those cases, the community requested a ballot process regarding the facility to the municipal authority but the request was rejected (LC #34). The municipal authority perceived that the Ministry of Environment did not support the municipal authority when demonstrations against the facility occurred (LC #34).

The municipal authority learned that the local authorities of an operating LC in another country created a 'citizen council' which included members of the community (LC #32, #34). This 'citizen council' was in charge of constantly checking and informing the rest of the community regarding the operation of the facility (LC #34). Thus, the municipal authority in Mexico, as part of the building permit, created their own citizen council which would include environmental authorities, representatives of the government, citizens technically prepared, representatives from different sectors (e.g. industrial, agriculture), and members of the community. The citizen council would have frequent meetings with the developer of the facility to be informed and give feedback regarding the environmental performance of the facility (LC #32, #33). In addition, the citizen council would have access to an expert who would audit the facility and inform the community about its environmental performance and compliance with regulations (LC #34).

The municipal authority attached conditions to the building permit which encompassed benefits to the municipal area (e.g. free disposal of household hazardous wastes collected by the municipal authority such as batteries, and hiring a local work force from the community); hiring an environmental expert who would inform the community continuously regarding the environmental performance of the facility; insisting that the supplier of the technology of the facility should be ISO 14000 certified; stating that imported hazardous wastes were forbidden; mandatory monthly reports to the municipal authority regarding the environmental performance of the facility (e.g. monitoring of water and soil) together with the amounts of hazardous wastes received and disposed in the facility (LC #32, #33, #34).

EIA had a very limited influence in decision making regarding the building permit. The decision made by the municipal authority to support the LC was made before the developer undertook EIA and was based on the benefits that the facility would have on the municipality (e.g. job generation, the LC was needed to dispose hazardous wastes). In addition, during the building permit decision making, political problems were involved and there was social pressure from the opposing community. This lack of use of EIA during planning and economic criteria being dominant during decision making by authorities has also been reported for Mexico by Palerm (2005) in a dam case. In Norway, it has been reported that when political matters are involved in the decision by authorities the influence of EIA is diminished (Leknes, 2001).

Municipal authorities for the cases analysed in Mexico lacked the expertise to understand, interpret and use EIA in their decisions; political problems and social opposition occurred during decision making; and attempts to balance conflicting interests were made such as the creation of the citizen council. Thus, the decision made by the municipal authorities was similar to the behavioural model approach to decision making. According to this model human knowledge is incomplete; values are not commonly shared; capacity for rational analysis of alternatives is limited; goals are multiple and conflicting; and decision making attempts to balance conflicting interests (Kobus and Lee, 1993).

Perception and use of EIA

Perception and use of EIA during the building permit decision making could be categorised as following the information processing, institutionalist, participation, and symbolic politics models (See Table 3.11 in Appendix 3).

a) Information processing model

Adopting the stance of the information processing model, EIA was perceived by the municipal authority as a source of information, and was used for auditing facilities. EIA gave the municipal authority information regarding the project: how it was going to be undertaken; the impacts to be caused; and, the conditions that had to be

fulfilled by the project (LC #33). According to the municipal authorities, through EIA they can audit the construction of the facility, the compliance of the facility with regulations, and the conditions attached to the Final Statement (LC #33, #34). Therefore, EIA was perceived by the municipal authority, as Bartlett and Kurian (1999) stated in their 'information processing model', as an instrument to generate, organize, and communicate information. However, this role of EIA is being hampered by the lack of expertise in the municipal authorities to understand EISs and the uncertainty in the information provided in the EISs.

The problems perceived by municipal authorities replicate those that flow from the EIA process using the information processing model approach: uncertainty in the EIS and lack of expertise regarding EIA in the municipal authorities. One municipal authority perceived that there is uncertainty in the EIS, for example in the types and amount of hazardous waste stated (LC #33). Municipal authorities commented that they do not have the expertise to interpret EIA and do not have the expertise regarding hazardous waste management (LC #33, #34). Therefore, according to one municipal authority, a simplified version of the EIS should be produced for the municipal authority; with less jargon to make it more understandable, and developers should have staff able to communicate the EIA for the project to the municipal authority (LC #34).

Despite those problems, EIA was perceived by the municipal authority as a source of information, and considered useful for auditing facilities. The decision made by the municipal authority in the Mexican case considered the information provided by EIA, but was mainly based on the ideology of the politicians making the decision. This coincides with Weston's (2000) description of how decision making occurs in planning and EIA in the UK.

b) Institutionalist model

The municipal authority perceived EIA as an institution and assumed that if the developer obtained the environmental permit it meant that the experts at the Ministry of Environment had reviewed and analysed the project (LC #32, #33). This perception of EIA coincides with the concept of 'institution' as a standardized

procedure governing relationships in society (Mitchell, 2007). Thus, the decision made by the municipal authority did not follow the rational decision-making model. According to Kørnøv and Thissen (2000), when decision-making results from following rules (attitudes and understandings of how the world should function) and as a consequence of standardised working procedures, the rational decision-making model is not followed.

Even though the municipal authorities acknowledged EIA as something accepted, disagreements between the decisions made by the Ministry of Environment (environmental permit) and the municipal authorities (building permit) were identified in this research. According to consultants in LC cases, there is frequently disagreement over the decisions made at the Ministry of Environment level (LC #16, #17). For example, in two LC cases, the Ministry of Environment granted the environmental permit but the local authorities rejected the building permit.

c) Participation model

The problems indicated by the municipal authorities are indicators of the participation model that EIA needs to fulfil during decision making. For municipal authorities, EIA lacks the consideration of social opposition that occurs after the developer obtains the environmental permit (LC #33, #34). One municipal authority expressed that it is difficult to conciliate the different interests of the community during the decision making (LC #33). Therefore, EIA needs to fulfil a role as Lawrence (2000) stated; EIA should focus on consensus building through deliberation, discussion and negotiation; and consequently increase the likelihood of public agreement and support.

c) Symbolic politics model

For one municipal authority, EIA needs to represent a guarantee; arguably, this perception could be categorised as a symbolic politics model. The municipal authority perceived that it lacked certainty that the facility would be built and operated adequately. Thus, according to him, EIA needs to represent a guarantee or endorsement that the HWMF will be built and operated adequately (LC #33). This

need was also evident in the creation of a citizen council in one LC case. According to a municipal authority, the citizen council would be in charge of informing the community regarding the operation of the facility (LC #33).

This Chapter has characterized the quality of EISs and of the EIA system for HWMF in Mexico. It has also described the different stages of decision making for HWMF and the different models of EIA identified as well as the examination against theoretical models of decision making. The following Chapter will then summarize these findings and will make recommendations for increasing the opportunity for EIA to influence decision making.

Chapter 7

Conclusions

7.1 Introduction

Research presented in this thesis investigated the influence of Environmental Impact Assessment (EIA) in Hazardous Waste Management Facilities (HWMF) decision making in Mexico. This Chapter summarizes the findings of the thesis regarding the influence of EIA during three stages of decision making and makes recommendations for increasing the opportunity for EIA to influence decision making. It also makes recommendations to improve the Mexican EIA system and for further research.

7.2 Influence of EIA on decision making for HWMF in Mexico

The objective of this research was to critically evaluate the influence of EIA in the decision-making process for HWMF in Mexico. Since decision making for HWMF encompasses different stages of decision making with different stakeholders, the aims of the research were: to determine the influence of EIA in project site selection and design decision making, in the environmental permit decision making, and in the building permit decision making; to determine the influence of EIA on decision making from stakeholders' perspectives; and to critically examine the models in the HWMF decision making process in Mexico against the theoretical models of EIA suggested in literature.

To investigate the influence of EIA on decision making, this study used a case study research design and a qualitative research strategy to obtain a rich understanding of the decision-making process and of the influence of EIA. Therefore, the conclusions drawn from this research have methodological limitations. They are limited to the Mexican context and to hazardous waste management facilities decision making. In addition, they are based on the researcher's interpretations of stakeholders' perceptions about the influence of EIA during decision making. However, by comparing these empirical results with the theoretical models of EIA suggested in literature, this research contributes to the understanding of how EIA can influence decision making.

The case study research design determined as units of analysis three stages of decision making: a) the influence of EIA in project site selection and design, b) influence of EIA in the environmental permit decision making, and c) influence of EIA in the building permit decision making. Different models of EIA were observed in different stages of decision making and amongst stakeholders (Table 7.1). Even though public participation was described as part of the environmental permit decision making in Chapter 6, Table 7.1 shows public participation as another stage of decision making to illustrate the different perceptions that EIA also had for stakeholders.

Table 7.1 Theoretical models observed in different stages of decision making.

		Stages of decision making			
		Project site selection and design	Environmental permit	Public participation	Building permit
Models of EIA	Information processing	•	•	•	•
	Institutionalist	•	•	•	•
	Participation		•	•	•
	Political economy	•			
	Symbolic politics	•		•	•

The information processing and institutionalist models were the most recurrent models observed in the different stages of decision making; followed by the participation and symbolic politics model. The political economy model was observed only in the project site selection and design. These findings provide empirical evidence that no single theoretical model of EIA adequately describes the influence of EIA on decision making, and therefore indicates that the purpose of EIA, as perceived by stakeholders, is not restricted to the information processing model of EIA only.

Thus, focusing only on the information processing model of EIA (e.g. prediction and communication of environmental impacts) does not ensure the integration of environmental values into the decision-making process (Nilsson and Dalkmann, 2001). However, the information processing model of EIA, agreeing with Owens *et al.* (2004), still retains some appeal for stakeholders involved in decision making for HWMF in Mexico as was observed in this research. Therefore, as Cashmore *et al.* (2008) stated, rationality should not be abandoned in environmental assessment; instead, it should be acknowledged that basing EIA only on the rational decision making model is naive.

In addition, these findings indicate that, as Bartlett and Kurian (1999) and Nilsson and Dalkmann (2001) stated, different models of EIA are not mutually exclusive. For example, in the project site selection and design decision making EIA influenced decision making according to four different models of EIA: information processing, institutionalist, political economy, and symbolic politics models. Therefore, as Owens *et al.* (2004) advanced, polarisation between information processing and deliberative and inclusive process in environmental assessment may be unhelpful.

Agreeing with literature about decision making, findings in this research also indicate that the rational decision making model was limited at explaining how decision making occurred. Rather, decision making for HWMF was similar to the bounded rationality, incrementalism, and mixed-scanning models. In addition, the findings in this research for HWMF decision making in Mexico agree with literature about decision making and planning. The rational model of decision making is normative, as it describes decision making as it should be, rather than how it takes

place in practice (Kørnøv and Thissen, 2000; Weston, 2000; Leknes, 2001; Nilsson and Dalkmann, 2001; Caratti *et al.*, 2004; Dalkmann *et al.*, 2004). The limitations indicated in literature for the rational decision making model are also applicable to HWMF decision making in Mexico. Decision makers involved in HWMF did not have complete knowledge, consideration of alternatives was limited, and multiple objectives and values were involved (economic, social, and political). For example, decisions made by municipal authorities depended on interest and values such as economic development of the municipality. Thus, it agrees with Owens *et al*. (2004) and Richardson (2005), environmental assessment can never be a neutral or objective exercise, and in practice values cannot be separated from the environmental assessment processes.

This study assumed that research regarding the different models of EIA would provide guidance to increase the effect of EIA on decision making for HWMF in Mexico. However, due to the complexity of decision making and the diverse perceptions and use of EIA in decision making observed, recommendations for procedural practices in EIA are difficult to make and it is acknowledged that more research is still needed. Nevertheless, the following sections will summarize the findings of this research in each stage of decision making and some recommendations will be made for HWMF in Mexico based on the theoretical models identified.

7.2.1 Influence of EIA in project site selection and design

Developers and consultants' perceptions EIA showed characteristics of the information processing, institutionalist, symbolic politics, and political economy models of EIA. In line with the information processing approach, EIA was perceived as an instrument which provides or reports information regarding the project. Agreeing with the institutionalist model, EIA was perceived as a requirement of the authority in order for the developer to obtain the environmental permit and as a means of creating 'environmental awareness' in developers. The latter can be considered a potential outcome of EIA as it indicates that EIA may transform individual's values and ways of doing things, and gradually incorporate

environmental values in decision making. Thus, it supports the suggestions made in literature about the possibility that EIA is effective in ways other than by directly influencing decisions (Cashmore *et al.*, 2004; Owens *et al.*, 2004; Cashmore *et al.*, 2007; Jay *et al.*, 2007).

Coinciding with the political economy model, EIA was perceived as an instrument which creates a 'good image' for developers in terms of compliance with regulations, being environmentally friendly achieving good environmental performance, maintaining a clean and competitive facility which impresses the environmental authorities and the community. This can also be considered a potential outcome of EIA.

The symbolic politics model (negative end) of EIA was also observed in the developers' perception of EIA as a requirement which is not useful for decision making and as an unwelcome expense. Thus, EIA was perceived as an unnecessary requirement when facilities were located in industrial zones and when EIA was undertaken for enlargement of facilities. EIA was considered as an unwelcome expense, and since projects are subject to credits and loans, waiting for the Ministry of Environment's decision making process means the developers has to suffer a loss in their investment and incur extra expense.

Project site selection for HWMF was mainly based on economic aspects and on the compliance of the project site with land use plans and regulations, and did not consider environmental aspects at the same level. EIA was undertaken very late in the process and often independently of the design and therefore was perceived and more often used as an instrument to report to the Ministry of Environment on how the facility would be built; processes to be used; materials or volumes of wastes to be handled as well as impacts from the project. This coincides with the findings described in section 6.2.1. In the assessment of the quality of EISs, the description of the development, the local environment and baseline conditions was assessed as satisfactory in a large proportion of EISs (84%); as well as the communication of results (95% satisfactory). However, there was no evidence that the information provided by EIA was used in planning and design decision making by developers.

This might be explained by the developers' limited understanding of the purposes and potential of EIA (Cashmore *et al.*, 2004).

In most of the HWMF analyzed, alternative project sites were not considered. As was evident in the evaluation of the EIA system and performance for HWMF, most of the EISs did not state the alternatives to the project and the consideration of alternatives criterion was only partially met. In LC cases, alternative project sites were analysed using compliance with regulations as criteria. However, in this type of facility economic, social and political factors also influenced decisions on project site selection. The lack of consideration of alternatives during project site selection and design might be explained by the late integration of EIA in the decision by the developer and by the lack of a requirement for the consideration of alternatives in EIA regulations in Mexico. The latter argument has been advanced by Pölönen (2006), in a European context where EIA regulations do require the consideration of alternatives but regulations' wording is ambiguous and therefore there are significant differences between Member States in practice. Consequently, in reality developers are not always obliged to consider alternatives to the project.

In line with the information processing model, during project site selection and design of HWMF, EIA was often used by developers and consultants to identify the environmental baseline conditions and to determine the adequacy of the area for the facility. The information provided by EIA regarding the environmental baseline conditions was used to determine the project's compliance with regulations, the feasibility of the project in the area, and therefore determine the possibility to obtain the environmental permit. However, the information provided regarding the baseline conditions of the area had a limited influence in decision making. In LC cases, the information provided by EIA about the baseline conditions was useful for the design of the facility and to determine the feasibility of the project.

In the impact determination, agreeing with the information processing model, EIA was used to determine the impacts from the project and to determine if the project could be approved by the Ministry of Environment. The problems and suggestions indicated by interviewees were related to impact assessment methods; the amount of information provided by EIA; and capacity and practices of consultants. These

problems were also detected in the quality of EISs for HWMF analyzed in this research: the identification and evaluation of impacts was unsatisfactory in a large proportion of EISs (63%) (See section 6.2.1).

The information obtained from EIA about the environmental impacts was used to decide if the project could obtain the environmental permit; but there was no evidence that the information provided was used significantly for decision making. Only in LC cases, was the information regarding baseline conditions and environmental impacts in the EIA perceived as useful for the design and processes to be installed in the facility. However, in this type of facility it was also expressed that the information provided by the EIA process was excessive and therefore difficult for the developer to assimilate.

When determining mitigation measures, the influence of EIA agreed with the information processing and political economy models of EIA. In line with the information processing model, EIA was perceived as useful to determine mitigation measures and conservation strategies to be implemented in the project. EIA was used to design the environmental program or monitoring program to follow up the changes in the environment due to the facility and to anticipate the conditions attached to the Final Statement by the Ministry of Environment. In addition, EIA was useful in producing an overview of the expenses needed to undertake the project. Agreeing with the political economy model, developers were interested in mitigation measures when they represented economic benefits or an increase in the public acceptance of the facility.

Deliberation with different stakeholders was not observed in most of the projects during project site selection and design. This coincides with the finding made during the evaluation of the Mexican EIA system, where it was determined that consultation or participation is not required by regulations during scoping of impacts; and in more than half of the projects there was no attempt to contact the general public and special interest groups. However, according to a consultant in one LC case, negotiations and agreements about mitigation measures to be implemented in the project were made between the developer, consultant and local authorities. The mitigation measures agreed were stated in the EIS submitted to the Ministry of

Environment. In addition, according to members of NGOs, discussion between developers and members of the community and NGOs occurred in LC cases. These discussions led to changes in the design of the project and conditions attached to the Final Statement. The role of EIA as a place where discussion and negotiation occurs is further supported by the improvements suggested by one consultant. According to him, EIA should reconcile the interests of the different stakeholders; developers and consultants should negotiate the project with the stakeholders and thus determine the shared interests that the facility could satisfy.

It can be stated that the rational model of decision making only partly explained how decision making for the project site selection and design of HWMF occurred. Instead, decision making was more similar to the bounded rationality and incrementalism models. Agreeing with the bounded rationality theoretical decision making model, EIA was perceived as a requirement of the authority for the developer to obtain the environmental permit and as a means for the authority to control and regulate project development. Thus, the information provided by EIA regarding the environmental baseline conditions was used to determine the project's compliance with regulations, the feasibility of the project in the area, and therefore determine the possibility to obtain the environmental permit. In line with the incrementalism decision making model, which states that decision making cannot be value free, the decision considered economic, social, and political values.

a) How to increase opportunities for EIA to influence project and design decision making

This study recommends capacity building, improving communication between developers and consultants, and improving the Mexican EIA system. Through capacity building for developers and consultants, the perception of EIA as just a requirement which is not useful for decision making may be changed. Capacity building can help to instruct developers about EIA and its benefits such as environmental protection and economic benefits and therefore be more influential in decision making. Economic benefits were observed in this research, although not widely spread, in perceptions of EIA according to the political economy model. The need of capacity building was also identified in this research by consultants who

perceived that to increase the influence of EIA regulations should be improved in order to instruct developers more effectively.

Training activities and guidance on good EIA practice are means of establishing EIA, extending its influence, and increasing the standard of practice (Jay *et al.*, 2007). Therefore, capacity building of developers and consultants in Mexico will increase the possibility of EIA being undertaken early in the planning process; will help to improve the information provided to developers and make it more useful and easy to assimilate; will help to improve the practice of EIA (e.g. impact assessment methods, accuracy of predictions); and will help to correct the poor quality of EISs.

Although not widely spread, the perception of EIA as something increasing 'environmental awareness' is a relevant potential outcome of EIA in Mexico. The environmental awareness concept encompasses a knowledge and understanding of environmental regulations; having environmental empathy and responsibility with the society and natural resources. This potential outcome can also be spread through capacity building of developers and consultants.

Recommendations made by Vicente and Partidário (2006) are also relevant for EIA and HWMF decision making in Mexico. On one hand, impact assessors (consultants) enunciate technical findings to decision-makers (in this case developers of HWMF), and on the other hand decision-makers try to interpret those findings based on their own values. Thus, communication between consultants and developers should have the following goals: to be clear about the relevance of technical information, and to be able to incorporate the variety of values at stake (including the non-technical values) (Vicente and Partidario, 2006). Reciprocal communication and discourse between consultants and developers is needed to find a common understanding where the values of impact assessors and of decision-makers are not exclusive (Vicente and Partidario, 2006).

As will be explained in section 7.3, improving the Mexican EIA system for HWMF is also recommended. Guidance on the consideration of alternatives should be published by the Ministry of Environment; this would help to improve the consideration of alternatives during the planning and design of HWMF. To improve

the scoping of impacts, specific guidelines for scoping should be produced, and developers and consultants should consult the environmental authority (Ministry of Environment) early in the EIA process. In addition, accreditation of EIA consultants should be created.

7.2.2 Influence of EIA in the environmental permit decision making

During the decision making at the Ministry of Environment, the perceptions and use of EIA agreed with the information processing, participation, and institutionalist models of EIA. The assumptions regarding the information processing model of EIA were evident during the review of EISs and decision making. Ministry of Environment officers reviewed the EISs to verify that the assessment of impacts was adequate (e.g. based on technical grounds and best methodologies available). The decision making process considered the impacts on the environment, the use of natural resources, and compatibility of the project with the environment. It was perceived that EIA enabled the determination of the environmental and technical viability of the project, mitigation measures, and conditions to be attached in the Final Statement. In addition, in line with the information processing model of EIA, one Ministry of Environment officer perceived EIA as a learning resource. This can be considered a potential outcome of EIA.

When making the decision regarding the environmental permit, the Ministry of Environment was subject to social opposition and political pressure from local authorities. However, Ministry of Environment officers stated that these are not considered in decision making and if the project is environmentally viable the environmental permit is granted.

The problems and improvements mentioned by Ministry of Environment officers also indicate the information processing role that EIA is expected to have. The problems included the consultant's lack of capacity, low quality of EISs, inadequate impact assessment methods used, uncertainty in EIA practice, and time pressure. The problems indicated by Ministry of Environment officers were also observed in the

review of the EISs for HWMF undertaken. The identification and evaluation of impacts was unsatisfactory in a large proportion of EISs (63%) and half of the EISs (53%) had a satisfactory performance in the alternatives and mitigation measures (See section 6.2.1).

During the environmental permit stage, EIA had a very limited participation role. Deliberation with different departments within the Ministry of Environment occurred in LC cases when considered necessary. Based on the qualitative analysis and evaluation of the Mexican EIA system it was observed that public consultation was undertaken in LC cases through information sessions where the community was informed regarding the project and was able to express its concerns. According to Ministry of Environment officers and Final Statements, concerns from the community were considered in decision making as long as those concerns were related to environmental issues. However, the concerns during public consultation did not have an instrumental role in the environmental permit decision making. Thus, in line with the theoretical participation model, EIA in Mexico allows public participation, but it is restricted to a one way consultation and it does not influence decision making.

Even though public consultation did not instrumentally influence the environmental permit's decision making, the perceptions of the improvements to be made are indicators of the participation role that EIA needs to fulfil. Ministry of Environment officers perceived EIA should be compulsory and undertaken before the submission of the EIS.

The institutionalist model of EIA was observed in the perception of EIA as an instrument of environmental policy referred to an environmental law, and in the problems perceived which were related to land use planning and its connection to EIA decision making.

The rational theoretical model of decision making appears to be more relevant in the Ministry of Environment's decision making on the environmental permit. Officers from the Ministry reviewed the EIS to determine if the project complied with

regulations and if the impacts were adequately assessed. The decision considered statutory consultation regarding the project's compliance with land use plans; the impacts on the environment; and use of natural resources. EIA was used to determine the compatibility of the project with the environment. However, again, alternatives to the project were not considered. The decision making process at the Ministry of Environment focused mainly on how the project agreed with land use plans and its compliance with regulations. Therefore, their decision relied on their interpretation of the projects' compliance with the legal framework.

The bounded rationality model assumes that decision makers are constrained by institutional norms such as laws, policies and codes of conduct (Nilsson and Dalkmann, 2001; Caratti *et al.*, 2004). These assumptions were evident in the environmental permit decision making process where Ministry of Environment officers used and considered the information provided by EIA regarding the environmental baseline conditions and environmental impacts, as well as their experience, codes of practice, judgement about impacts, and interpretation of the project's compliance with regulations and land use plans. EIA was considered relevant during decision making as it was perceived as an instrument of environmental policy referred to an environmental law. In addition, the problems perceived were related to land use planning and its connection to EIA decision making.

a) How to increase the opportunity for EIA to influence decision making during environmental permit

This study suggests that identification, evaluation, and prediction of impacts, as well as the quality of EISs should be improved. This will be achieved by improving capacity building in developers and consultants as was explained in the previous section. In addition, agreeing with Vicente and Partidário (2006), consultants and developers should communicate with decision makers (in this case Ministry of Environment). This communication should have two goals: to be clear about the relevance of technical information, and to be able to incorporate the variety of values at stake (including the non-technical values) (Vicente and Partidário, 2006). In

addition, this communication will help to make transparent the interpretation of the compliance with regulations by the project (e.g. agreement with land use planning, and regulations for the design of the facility). Reciprocal communication and discourse between impact assessors and decision makers is needed to find a common understanding where the values of developers, consultants, and Ministry of Environment are not exclusive (Vicente and Partidário, 2006).

Influence of EIA during public participation

The use and perceptions of EIA were classified following the information processing, participation, and symbolic politics models. Agreeing with the information processing model, EIA was used to inform the community about the project and as an information source. In line with the participation model, EIA was perceived as a process with social participation and as a means to approach the Ministry of Environment and developer.

The problems and improvements suggested by stakeholders were indicators of the need for EIA to fulfil a participation role. For example, members of the community and NGOs perceived that participation was limited because they were not informed about the projects submitted to the Ministry of Environment, EISs were not available for the community, and there was a limited time period to request a public consultation.

Developers, consultants, and Ministry of Environment officers also perceived problems in public consultation. For example, they perceived that public consultations are biased and suggested that the community should be made aware of what public consultation is. According to one consultant, EIA should reconcile the interests of the different stakeholders; developers and consultants should discuss the project with the stakeholders and thus determine the shared interests that the facility could satisfy. Ministry of Environment officers commented developers should involve the community early in the planning; should consult the community in advance and make it aware of the facility; consultation should include the

community and not only experts; and the community should be able to express its opinion to the developer and Ministry of Environment.

The symbolic politics model was identified in members of NGOs; according to them EIA should become a guarantee that the facility will not cause danger in the region. This indicates the need for EIA to be an instrument which increases confidence in projects.

When social opposition occurred in LC cases, EIA was perceived and used according to the symbolic politics, institutionalist, information processing, and participation model. In line with the symbolic politics model, EIA studies were used by a developer to prove to the opposition groups that everything was being done in the correct way. The need for EIA to work as a proof or endorsement was also perceived by one member of the community, who expected EIA to be an endorsement that the project would be compatible with the environment and that the environment would not be damaged.

Agreeing with the institutionalist model, one member of the community perceived EIA as a means for triggering good environmental performance in developers. In line with the participation model, EIA was perceived by a member of a community as a means of exercising the community's right to be informed.

The information processing model was identified in the perceptions of members of the community and NGOs. They perceived EIA as an instrument to identify and analyse impacts from the facility on the environmental components and community. In addition, a potential outcome was observed, EIA was perceived as a learning resource about environmental aspects.

The limited consultation and participation during EIA might be explained by the limited guidance on these issues in the Mexican EIA system. Consultation or participation is not required by regulations for the scoping of impacts and no published guidance on consultation and participation exists. During the EIS review, the Ministry of Environment consults other governmental bodies and/or departments within the Ministry; however, participation where further information can be

submitted does not occur. The Ministry of Environment undertakes statutory consultation only to determine the project's compliance with local land use plans, and public consultation occurs as an information session. Results of auditing projects are not published and there is not a public right of appeal if monitoring and auditing results are unsatisfactory.

Assuming that EIA can be made more effective given a stronger regulatory backing (Jay *et al.*, 2007), public participation should be better established in EIA regulations in Mexico. As Palerm and Aceves (2004) suggested for Mexico, opportunities for public participation should be expanded by amending the EIA system. Early participation is necessary, from the screening stage as well as in a participatory scoping stage (Palerm and Aceves, 2004). As will be indicated in section 7.3, consultation or participation should be required by regulations for the scoping stage and guidelines on consultation and participation should be published. A formal and participatory scoping stage would allow competent authorities (Ministry of Environment, and municipal authorities) and the general public to be involved in EIA for particular projects and therefore context-specific aspects would be addressed which are significant for decision making (Palerm and Aceves, 2004).

The perceptions expressed by stakeholders about the role of EIA indicate that it could facilitate public participation (Bartlett and Kurian, 1999); and that EIA could influence decision making by augmenting the environmental information available for stakeholders and giving the opportunity to exercise influence through provision for consultation (Kobus and Lee, 1993). In addition, EIA could influence decision making by facilitating deliberation; and could function as an inclusive and deliberative process (Cashmore, 2004; Cashmore *et al.*, 2004). Therefore, during decision making for HWMF in Mexico, deliberation, argumentation, discussion and negotiation should occur. As Kornov and Thissen (2000) suggested, when there are strong value conflicts, negotiation and mediation approaches might lead to an accepted solution.

Improving public participation in Mexico will be difficult. Participation in Mexico, as mentioned by Richardson (2005) for environmental assessment in general, is undertaken and dealt with as a procedural issue rather than one of value. Mexico is a

consolidating democracy and there is a lack of participatory culture (Palerm, 2005). In addition, as results showed in this research, there is a lack of trust in developers and in EIA. This has also been observed in Mexico by Palerm and Aceves (2004), according to them actors do not engage in public participation because the trust in the EIA system is low. To gain confidence in the EIA system, transparent and participatory planning processes are needed (Deelstra *et al.*, 2003; Wilkins, 2003; Palerm, 2005). Also, as Palerm (2005 p. 133) stated for Mexico "*decision makers must realise the benefits of public participation, not only as a means to minimise conflict, but also as a way to enhance the environmental assessment of plans and programmes*".

In addition, since social opposition occurred during the environmental permit decision making and building permit, the recommendations made by Nilsson and Dalkmann (2001) and Owens *et al*. (2004) become relevant for HWMF decision making in Mexico. EIA must be adaptive and flexible to variations in the decision (Nilsson and Dalkmann, 2001). Technical and deliberative processes need not be mutually exclusive (Owens *et al.*, 2004). The context in which appraisal (environmental assessment) occurs should be the determinant of which approach (technical or deliberative), or combination of approaches to adopt (Owens *et al.*, 2004). Different decision situations that display different levels of social consensus and risk of conflict require different approaches (Nilsson and Dalkmann, 2001). For example, in LC cases where economic, political and social values have a greater role in decision making, a rational approach combined with a more deliberative approach might be needed. While in smaller facilities such as temporary storage a more rational approach would be adequate. Thus, as Kørnøv and Thissen (2000 p. 198) stated, "*attention should be given at the very beginning of a process to the nature and context of the decision situation...the fundamental interests of the actors, requirements in terms of openness and democratic nature*". However, it should also be acknowledged that deliberative and inclusive processes are expensive, time consuming, and potentially inconclusive (Owens *et al.*, 2004).

7.2.3 Influence of EIA in the building permit decision making

When engaging with local authorities, EIA was used by developers according to the symbolic politics model and information processing model. Agreeing with the symbolic politics model, EIA was used by developers and consultants by a developer who used EIA studies in presentations with the municipal authority as a confidence endorsement and as a way of making clear how EIA had been undertaken. In line with the information processing model, EIA was used by developers to inform local authorities regarding the project, and local authorities used the information provided in EISs to review the project and to identify missing information regarding impacts and risks.

The building permit decision making did not follow the rational model of decision making in terms of the EIA process. Instead, characteristics of both the bounded rationality and incrementalism decision making models were determined in the building permit. However, this decision was closer to the incrementalism model. The decision regarding the building permit was made before the developer undertook EIA and was based on the benefits that the facility would have for the municipality (e.g. economic benefits, image improvement). The decision was based on the ideology of the politicians making the decision and was subject to social opposition and political factors. In line with the bounded rationality decision making model, during the building permit decision making, municipal authorities perceived EIA according to the institutionalist model of EIA, as a standardized procedure and as a source of information regarding the project. In addition, problems perceived were uncertainty in the EIS and lack of expertise. The incrementalism theoretical model assumes that decision making cannot be value free and that it is politically defined (Weston, 2000; Nilsson and Dalkmann, 2001; Caratti *et al.*, 2004). In line with this model, the building permit decision making was based on political, economic, and social values.

The perceptions and use of EIA by municipal authorities during the building permit decision making were categorised as following the information processing, institutionalist, participation, and symbolic politics model. Adopting the stance of the information processing model, EIA was perceived by the municipal authority as a source of information which would be used for auditing the construction and operation of the facility, but it was not relevant during the decision making process.

Even though EIA was not instrumentally used during the building permit decision making, the problems perceived by the municipal authority were the uncertainty in the EIS and the lack of expertise to understand, interpret and use EIA in their decisions which again indicates assumptions based on the information processing theoretical model. The limited use and influence of EIA in the building permit decision making might be explained by the lack of expertise of municipal authorities, and the perception that environmental decision making regarding hazardous waste management is centralized to the Ministry of Environment. The lack of expertise in municipal authorities in Mexico has been reported by Assetto *et al.* (2003), according to whom, few municipal authorities are able to employ and retain qualified experts in environmental law and technical assessment. Most qualified personnel serve three years due to the national system of municipal term limits; consequently, there is discontinuity and local inability to hire and retain qualified experts. In addition, the national domination of policy processes such as federal reserved functions like hazardous waste management weakens local capacity (Assetto *et al.*, 2003).

Agreeing with the institutionalist model, municipal authorities perceived EIA as an institution and assumed that if the developer had obtained the environmental permit it meant that the experts at the Ministry of Environment had reviewed and analysed the project. Therefore, they perceived EIA as a standardized procedure and as something accepted.

During the building permit decision making deliberation did not occur; instead, municipal authorities tried to convince the community's representatives to accept the facility. However, the problems perceived by municipal authorities indicate the influence of the participation model. According to them, EIA lacks the consideration

of social opposition, and it was perceived that EIA was not useful to conciliate the different interests of the community during decision making.

The symbolic politics model was determined in one municipal authority who stated that EIA needs to represent a guarantee or endorsement that the HWMF will be built and operated adequately.

a) How to increase the opportunity for EIA to influence building permit decision making

To increase the opportunity for EIA to influence decision making, capacity building for municipal authorities is recommended. As Palerm (2005) advanced for the Mexican sectoral planning authorities, municipal authorities' capacity building is necessary to allow the integration of the environmental dimension in planning activities which will eventually be integrated in their institutional culture. In addition, is necessary for municipal authorities to abandon the perception that the environmental dimension of decision making is the exclusive competence of the Ministry of Environment (Palerm, 2005).

The problems perceived by municipal authorities indicate the need for EIA to be an instrument to conciliate the different interests of the community when social opposition occur during decision making; therefore, the recommendations made previously to improve public participation should also be considered for the building permit decision making.

As was recommended for the previous two stages of decision making, communication should occur between developers, consultants, Ministry of Environment, and municipal authorities. Developers and consultants should communicate with the Ministry of Environment, municipal authorities, and community. This communication should be undertaken to be clear about the relevance of technical information, and to be able to incorporate the variety of values at stake (Vicente and Partidário, 2006) in the building permit decision making. In addition, stakeholders should be able to empathize with potentially affected individuals, groups and communities, and values of stakeholders must be identified

(Lawrence, 1997). Reciprocal communication and discourse is needed to find a common understanding where the values of stakeholders are not exclusive (Vicente and Partidário, 2006).

Through basing environmental assessment on communication about values and interests, common gains and environmental compensations will be found (Persson, 2006); and, through discourse changes may be made to positions on all sides in EIA and solutions may be achieved (Wilkins, 2003). As Saarikoski (2000) observed in an EIA process for developing a regional waste management strategy, EIA can become a collaborative learning process as it can help participants to learn about policy goals, alternative strategies, and their consequences. In addition, this may help EIA to represent a guarantee or endorsement that the HWMF will be built and operated adequately.

7.3 Recommendations for the Mexican EIA system

The EIA system for HWMF met three of the twelve evaluation criteria used in this research: legal basis, coverage, and screening. However, the rest were either partially met or not met (See Chapter 6). The EIA system for HWMF in Mexico is weak and significant improvements need to be made. Thus, based on the evaluation criteria applied and weaknesses identified, the following recommendations for the Mexican EIA system are made.

- Consideration of alternatives. Guidance on the treatment of impacts of reasonable alternatives should be published by the Ministry of Environment. Regulations should require that all EISs detail a rigorous consideration and evaluation of alternatives. In addition, the non-action alternative should be mentioned either in regulations or in guidelines in order to make it a common practice.
- Scoping of impacts. Guidance on scoping procedures and methods should be published by the Ministry of Environment. In addition, specific scoping guidelines for each type of HWMF should be published by the Ministry of Environment. Guidelines should recommend consulting the environmental

authority (Ministry of Environment and local authorities) early in the EIA process, as well as consultation and participation of the hosting community of the development during the scoping of impacts. According to Wood (2003b), consultation of environmental authorities can reveal useful insights, increases the likelihood of coordination between the developer and the authority, and allows relevant authorities to express their opinion regarding the scoping of impacts.

- EIS preparation. Formal requirements for the developer to check on the EIS (e.g. content, form, objectivity, and accuracy) before submission to the Ministry of Environment should exist. In addition, accreditation of EIA consultants should be created at the Ministry of Environment. Accreditation could include requirements for continual professional development.
- EIS review. The Ministry of Environment should publish guidance on EIA review procedures. The guidance should include checks on the objectivity and review criteria to determine the EIA report adequacy. Action-specific scoping guidelines are useful for the EIS review. An independent review body with adequate expertise should be created and the findings of the EIA report review should be published. These would provide a means of reducing any bias in the relevant authority's decision and would ensure that the quality of EIA reports improves over time (Wood, 2003b).
- Decision making. Consultation by the Ministry of Environment with local authorities (e.g. municipal authority) should not be limited to the determination of the project's compliance with land use plans. Public consultation should not be limited to an information session organized by the Ministry of Environment. In addition, the Ministry of Environment should make public any summary evaluation prior to the decision making and publish the Final Statement (decision, reasons, and conditions attached). This will increase the level of transparency within the decision-making process at the Ministry of Environment.
- Monitoring and auditing of impacts. Guidance on the monitoring and auditing of impacts should be published by the Ministry of Environment. In addition, results of impact auditing by the Ministry of Environment should be published and the public should have the right of appeal if monitoring and

auditing results are unsatisfactory. This would provide public reassurance about impact management (Wood, 2003b).

- Mitigation of impacts. Guidance on mitigation should be published by the Ministry of Environment. Guidance should suggest the consideration of mitigation of impacts in the initial action design, during scoping, decision making, and monitoring. For example, preliminary documentation produced during the early stages of the EIA process should show clear evidence of the mitigation of environmental impacts in the initial action design (Wood, 2003b).
- Consultation and participation. Guidance on consultation and participation should be published by the Ministry of Environment. Guidance should suggest consultation and participation prior to scoping and during scoping; prior to, and following, EIA report publication; during decision making and monitoring. This would improve the quality of environmental decisions by the identification of, assignment of significance to, and mitigation of, impacts and the prevention of environmentally unacceptable development (Wood, 2003b). Consultation and participation in Mexico should not be limited to an information session organized by the Ministry of Environment. Copies of EIA documents should be accessed free of charge or purchased at a reasonable price and readily available at a number of locations convenient to those most likely to be affected by the proposal. In addition, results of consultation and participation should be published to check their use in the EIA process (Wood, 2003b). Recommendations made by Palerm and Aceves (2004) for the Mexican EIA system are also recommended in this study. For HWMF, public hearings should be mandatory and not left to the discretion of the Ministry of Environment, the system should introduce extensive notifications of EISs submitted to the Ministry of Environment. Notifications should not be published only in the Ministry of Environment's journal "*Gaceta ecológica*" but be published in mass local media as well as direct notification to affected stakeholders (Palerm and Aceves, 2004). In addition, public consultation should involve a two-way communication and should not be in the format of an information session only. As Palerm and Aceves (2004) indicated, the exchange of information will give the public a degree of empowerment to affect the decision-making. This could help to fulfil the

need for EIA to become a confidence endorsement in HWMF decision making.

- EIA system monitoring. EIA regulations in Mexico should require a periodic review of the EIA system. In addition, EIA reports and other EIA documents should be publicly available. The periodic review will allow amendments in the system and incorporate feedback from experience (Wood, 2003b).

Of all the criteria analysed, improving public participation and consultation will be difficult in Mexico as political and social constraints exist. This research identified lack of opportunities for capacity building in public participation, lack of trust in developers and in EIA, and poor perception of public participation and consultation in EIA. It was observed that members of the community do not trust developers and authorities and therefore do not trust the EIA process. Capacity building about public participation and consultation is very limited; for example, Ministry of Environment officers as well as local authorities change when there is a change of administration (e.g. every three, four or six years) and therefore the experience and capacity regarding public consultation acquired is lost.

Regarding the perception of public participation and consultation in EIA, this research determined that public consultation is used by developers and consultants to inform the community how the project is going to be undertaken but not to have a two way communication. Developers do not perceive EIA as tool to discuss projects; as an example of the poor perception of public consultation in EIA, one developer and one consultant asserted that public consultation was attended by people who were paid by a third party to oppose the facility.

Ministry of Environment officers perceived public consultation as an information source, but there was no evidence the information generated was used in decision making regarding the environmental permit. One Ministry of Environment officer perceived that when public consultation is requested it is because people are already against the facility, and that since concerns expressed during most of the public consultation are not regarding environmental aspects of the project they are not useful for decision making.

Other constraints to public participation and consultation in Mexico have been advanced by Palerm and Aceves (2004) and the Ministry of Environment (SEMARNAT, 2008a). According to Palerm and Aceves (2004), Mexico is a consolidating democracy and there is a lack of participatory culture. The findings of this research supports Palerm and Aceves (2004) as public consultation was undertaken for one LC case out of nineteen HWMF cases analysed and was undertaken in the form of an information session.

As constraints of public participation the Ministry of Environment in Mexico has acknowledged the lack of capacity in society and officers in the environmental sector regarding public consultation, and the social inequity that occurs for marginalised groups such as indigenous groups and women when accessing public consultation (SEMARNAT, 2008a). For example, indigenous groups are not able to participate in public consultations because they speak a different language, live in areas where means of communication are not available, and do not know about their rights to participate (SEMARNAT, 2008a). This has also been stated by Palerm and Aceves (2004).

To improve public participation and overcome some of its limitations, the Ministry of Environment has created a National Strategy for Citizen Participation in the Environmental Sector (Estrategia Nacional para la Participación Ciudadana en el Sector Ambiental). The values to be promoted in this strategy are: transparency, inclusion, respect, commitment, tolerance, justice, solidarity, and equity (SEMARNAT, 2008a). The objective of the strategy is to strengthen public participation and its impact on environmental policies. The aims suggested in the strategy are: a) promote values and culture of sustainable development, b) strengthen public participation mechanisms, c) orient environmental policy to be inclusive and participative, d) promote a greater influence of public participation at different stages of decision making, e) strengthen capacity in society regarding environmental issues, and f) increase financial resources to promote public participation in the environmental sector (SEMARNAT, 2008a). Even though these aims at the Ministry of Environment demonstrate the interest of improving public participation, they are suggested for the environmental sector in general and therefore specific aims and methods are still necessary for EIA practice.

7.4 Further research

This investigation aimed to contribute to the understanding of the influence of EIA in decision making. However, as has been discussed, this research has methodological limitations and therefore conclusions are restricted to the Mexican context and to HWMF decision making. Nevertheless, the findings about the influence of EIA in decision making could be relevant, to some extent, to other sectors in Mexico where contentious decision-making processes also occur such as construction of dams, construction of airports, and developments for the extraction of petroleum. Similar to HWMF, the decision-making process in these types of projects involves different levels of government (federal, state, and municipal) and social opposition and poor public participation occur. Therefore, the models and perspectives about the influence of EIA in decision making for different stakeholders identified in this research may be similar to those sectors.

It is recommended that further research about the influence of EIA in decision making is undertaken for other types of projects in Mexico, and in other contexts, to validate the observations made in this research and to contribute to the understanding of the different models that EIA can have, or should be adopted, in different decisions in Mexico. For example, the results about the influence of EIA in decision making for HWMF could be compared with decision-making processes of projects where the developer is the Mexican government and not the private sector (e.g. construction of highways, dams, and developments for the extraction of petroleum).

The findings of this research regarding the EIA system in Mexico could be compared with other countries in Latin America such as Brazil, Chile, Argentina, and Colombia. For example, with studies undertaken by Glasson and Salvador (2000) in Brazil and by Toro *et al.* (2009) in Colombia. In addition, further research regarding the influence of EIA in decision making could be undertaken in other developing countries in Latin America to contribute and compare with the findings of this research and contribute to a deeper understanding on EIA in Latin America.

This research was not able to investigate thoroughly the influence of EIA in the building permit decision making as the number of municipal authorities willing to participate was very limited and the information about this decision making was restricted. Therefore, it is recommended that further studies focus on the building permit decision making for HWMF especially in contentious projects such landfill for containment.

The potentialities observed for HWMF decision making in Mexico support the suggestions made in the literature about the possibility that EIA is effective in ways other than by directly influencing decisions. However, more research is needed to further investigate these potentialities of EIA in Mexico. For example, as Owens *et al.* (2004) suggested, through longitudinal research it would be possible to detect if the potential outcomes of EIA identified (e.g. learning, environmental awareness) lead to the reframing of policy problems.

REFERENCES

Androulidakis, I. and I. Karakassis (2006). "Evaluation of the EIA system performance in Greece, using quality indicators." Environmental Impact Assessment Review **26**: 242 - 256.

Annandale, D. and R. Taplin (2003). "Is environmental impact assessment regulation a 'burden' to private firms?" Environmental Impact Assessment Review **23**: 383 - 397.

Assetto, V. J., E. Hajba and S. P. Mumme (2003). "Democratization, decentralization, and local environmental policy capacity: Hungary and Mexico." The Social Science Journal **40**: 249 - 268.

Ayuntamiento de Puebla. (2008, 2008). "Licencia de construcción para edificios industriales, almacenamiento, o bodegas en zonas industriales." Retrieved August 23rd 2009, 2009, from http://www.puebladezaragoza.gob.mx/wb/pue/licencia_de_construccion_o_regularizacion_para_edi.

Ayuntamiento Ramos Arizpe. (2009). "Guía de trámites. Licencia de construcción mayor." Retrieved August 23rd 2009, 2009, from http://www.ramosarizpe.gob.mx/.

Baker, E., E. Bournay, A. Harayama and P. Rekacewicz. (2004). "Vital Waste Graphics." Retrieved 29/08/05, 2005, from http:www.grid.unep.ch/waste/.

Barker, A. and C. Wood (1999). "An evaluation of EIA system performance in eight EU countries." Environmental Impact Assessment Review **19**: 387 - 404.

Bartlett, R. V. and P. A. Kurian (1999). "The theory of environmental impact: Implicit models of policy making." Policy and Politics **27**(4): 415 - 433.

Batstone, R., J. E. Smith and D. Wilson (1989). The safe disposal of hazardous wastes. The special needs and problems of developing countries. Washington, World Bank Technical Paper Number 93. **1-3**.

Bazeley, P. (2007). Qualitative Data Analysis with NVivo. London, SAGE Publications.

Bekker, M. P. M., K. Putters and T. E. D. V. d. Grinten (2004). "Exploring the relation between evidence and decision-making. A political-administrative approach to health impact assessment." Environmental Impact Assessment Review **24**(2): 139-149.

Bekker, M. P. M., K. Putters and T. E. D. v. d. Grinten (2005). "Evaluating the impact of HIA on urban reconstruction decision-makinig. Who manages whose risks?" Environmental Impact Assessment Review **25**: 758 - 771.

Bio intelligence service and European Commission. (2008). "Establishing harmonised methods to determine the capacity of all portable and automotive batteries and rules for the use of a label indicating the capacity of these batteries." Retrieved August 18th 2009, 2009, from http://ec.europa.eu/environment/waste/batteries/pdf/battery_report.pdf.

Bitondo, D. and P. André (2007). "Contextual phases in the institutionalization of the environmental assessment of road development in Cameroon." Impact Assessment and Project Appraisal **25**(2): 139 - 148.

Bojórquez-Tapia, L. A. and O. García (1998). "An approach for evaluating EIAS - deficiencies of EIA in Mexico." Environmental Impact Assessment Review **18**(3): 217 - 240.

Breda, L. M. v. and G. P. J. Dijkema (1998). "EIA's contribution to environmental decision-making on large chemical plants." Environmental Impact Assessment Review **18**: 391 - 410.
Brodersen, J., M. Crowe and H. Jacobsen (2002). Hazardous waste generation in EEA member countires - Comparability of classification systems and quantities. Copenhagen, European Environment Agency**:** 117.
Bryman, A. (2004). Social Research Methods. New York, Oxford University Press.
Buenrostro Delgado, O., L. Márquez-Benavides and F. Pinette Gaona (2008). "Consumption patterns and household hazardous solid waste generation in an urban settlement in Mexico." Waste Management **28**: S2 - S6.
Caldwell, L. K. (1991). "Analysis-Assessment-Decision: The anatomy of rational policymaking." Impact Assessment Bulletin **9**(4): 81 - 92.
Canelas, L., P. Almansa, M. Merchan and P. Cifuentes (2005). "Quality of Environmental Impact Statements in Portugal and Spain." Environmental Impact Assessment Review **25**: 217 - 225.
Caratti, P., H. Dalkmann and R. Jiliberto (2004). Analysing Strategic Environmental Assessment. Towards better decision-making. Cheltenham, United Kingdom, Edward Elgar.
Carbonell, M. (2003). "El federalismo en México: principios generales y distribución de competencias." Anuario de Derecho Constitucional Latinoamericano Retrieved February 10th 2010, 2010, from www.juridicas.unam.mx.
Cashmore, M. (2004). "The role of science in environmental impact assessment: process and procedure versus purpose in the development of theory." Environmental Impact Assessment Review **24**(4): 403 - 426.
Cashmore, M., A. Bond and D. Cobb (2007). "The Contribution of Environmental Assessment to Sustainable Development: Toward a Richer Empirical Understanding." Environmental Management **40**: 516 - 530.
Cashmore, M., A. Bond and D. Cobb (2008). "The role and functioning of environmental assessment: Theoretical reflections upon an empirical investigation of causation." Journal of Environmental Management **88**: 1233 - 1248.
Cashmore, M., E. Christophilopoulos and D. Cobb (2002). "An Evaluation of the Quality of Environmental Impact Statements in Thessaloniki, Greece." Journal of Environmental Assessment Policy and Management **4**(4): 371-395.
Cashmore, M., R. Gwilliam, R. Morgan, D. Cobb and A. Bond (2004). "Effectiveness of EIA. The interminable issue of effectiveness: substantive purposes, outcomes and research challenges in the advancement of environmental impact assessment theory." Impact Assessment and Project Appraisal **22**(4): 295 - 310.
Clark, R. and D. Richards (1999). Environmental Impact Assessment in North America. Handbook of Environmental Impact Assessment. J. Petts. Oxford, Blackwell Science. **Volume 2:** 203 - 222.
Comisión Ambiental Metropolitana, SEMARNAT, Gobierno del Distrito Federal, Gobierno del Estado de Mexico and Agencia Alemana de Cooperacion Tecnica (2002). Bases conceptuales y de diagnostico del programa para la prevencion y manejo integral de residuos peligrosos. Zona metropolitana del Valle de Mexico, Agencia Alemana de Cooperacion Tecnica (in Spanish).
Commission of the European Communities (1991). "Council Directive 91/689/EEC of 12 December 1991 on hazardous waste." Official Journal **L 377**.

Congreso General de los Estados Unidos Mexicanos (2003). "Ley General para la Prevención y Gestión Integral de los Residuos." Diario Oficial de la Federación **8 de Octubre del 2003**: 9 - 39 (in Spanish).
Cortinas, C. (2001). Hacia un México sin basura. Bases e implicaciones de las legislaciones sobre residuos, Grupo Parlamentario del PVEM, Camara de Diputados, LVIII Legislatura (in Spanish).
Cortinas, C. and C. Mosler (2002). Gestión de Residuos Peligrosos. México City, UNAM Programa Universitario de Medio Ambiente (in Spanish).
Charmaz, K. (2006). Constructing Grounded Theory. A practical guide through qualitative analysis. London, SAGE Publications.
Chivers, G. E. (1983). The Disposal of Hazardous Wastes. Leeds, Science Reviews Ltd in association with H & H Scientific Consultants Ltd.
Christensen, P., L. Kørnøv and E. H. Nielsen (2005). "EIA as Regulation: Does it Work?" Journal of Environmental Assessment Planning and Management **48**(3): 393 - 412.
Da-Silva, C. E., A. E. Hoppe, M. M. Ravanello and N. Mello (2005). "Medical wastes management in the south of Brazil." Waste Management **25**: 600 - 605.
Dalkmann, H., R. J. Herrera and D. Bongardt (2004). "Analytical strategic environmental assessment (ANSEA) developing a new approach to SEA." Environmental Impact Assessment Review **24**(4): 385 - 402.
de Vaus, D. A. (2001). Research Design in Social Research. London, Thousand Oaks, New Delhi, SAGE Publications.
Deelstra, Y., S. G. Nooteboom, H. R. Kohlmann, J. van den Berng and S. Innanen (2003). "Using knowledge for decision-making purposes in the context of large projects in The Netherlands." Environmental Impact Assessment Review **23**: 517 - 541.
DGGIMAR. (2009a, August 4th 2009). "Residuos peligrosos." Retrieved August 16th 2009, 2009, from http://www.semarnat.gob.mx/gestionambiental/materialesyactividadesriesgosas/pages/residuospeligrosos.aspx.
DGGIMAR. (2009b, August 13th 2009). "Rubro 1 Manejo de residuos peligrosos industriales." Retrieved August 14th 2009, 2009, from http://semarnat.gob.mx/tramitesyservicios/resolutivos/pages/materialesyactividadesriesgosas.aspx.
Dirección General de Impacto y Riesgo Ambiental (2002). Guia para la presentación de la manifestación de impacto ambiental. Residuos peligrosos. Distrito Federal, Mexico, Secretaría de Medio Ambiente y Recursos Naturales (In Spanish).
Doberstein, B. (2004). "EIA models and capacity building in Viet Nam: an analysis of development aid programs." Environmental Impact Assessment Review **24**: 283 - 318.
DOF (1988a). Ley General del Equilibrio Ecologico y Proteccion al Ambiente. Diario Oficial de la Federal (Federal Official Docket). Mexico D.F. 28 January.
DOF (1988b). Reglamento de la Ley General del Equilibrio Ecologico y Proteccion al Ambiente en Materia de Residuos Peligrosos. Diario Oficial de la Federacion (Federal Official Docket). Mexico D.F. 25 November.

DOF (2003a). Ley General para la Prevencion y Gestion Integral de los Residuos. Diario Oficial de la Federacion (Federal Official Docket). Mexico D.F. 8 October.
DOF (2003b). Reglamento Interior de la Secretaria de Medio Ambiente y Recursos Naturales. Diario Oficial de la Federacion (Federal Official Docket). Mexico D.F. 21 January.
Dolk, H., M. Vrijheid, B. Amstrong, L. Abramsky, F. Bianchi, E. Garne, V. Nelen, E. Robert, J. E. S. Scott, D. Stone and R. Tenconi (1998). "Risk of congenital anomalies near hazardous-waste landfill sites in Europe: the EUROHAZCON stuy." Lancet **352**(9126): 423 - 428.
Elliot, E. and S. Francis (2005). "Making effective links to decision-making: Key challenges for health impact assessment." Environmental Impact Assessment Review **25**: 747 - 757.
Environmental Protection Agency, U. S. (1997, April 22nd 2004). "Sensitive Environments and the Siting of Hazardous Waste Management Facilities." Solid Waste and Emergency Response (5305W) Retrieved August 30th 2005, 2005, from http://www.epa.gov/epaoswer/hazwaste/tsds/site/sites.htm.
Environmental Protection Agency, U. S. (2000, April 22nd 2004). "Social Aspects of Siting RCRA Hazardous Waste Facilities." Retrieved August 30th 2005, 2005, from http://www.epa.gov/epaoswer/hazwaste/tsds/site/sites.htm.
Environmental Protection Agency, U. S. (2008, September 30th 2008). "Household Hazardous Waste." Retrieved August 18th 2009, 2009, from http://www.epa.gov/waste/conserve/materials/hhw.htm.
Etzioni, A. (1986). "Mixed Scanning Revisited." Public Administration Review **46**(1): 8 - 14.
European Commission (1999). Council Directive 1999/31/EC on the landfill of waste, Official Journal of the European Communities. **1999/31/EC**.
European Commission (2000). Council Directive on the incineration of waste, Official Journal of the European Communities. **Council Directive 2000/76/EC**.
Faludi, A. (1987). A Decision-centred View of Environmental Planning. Oxford, Pergamon Press.
Glasson, J. (1999). Environmental Impact Assessment - Impact on Decisions. Handbook of Environmental Impact Assessment. J. Petts. Oxford, Blackwell Science. **1:** 484.
Glasson, J. and N. N. B. Salvador (2000). "EIA in Brazil: a procedures-practice gap. A comparative study with reference to the European Union, and especially the UK." Environmental Impact Assessment Review **20**: 191 - 225.
Glasson, J., R. Therivel and A. Chadwick (1999). Introduction to Environmental Impact Assessment. London and New York, Spon Press.
Gottinger, H. W. (1993). "Economic modelling of hazardous waste management." Waste Management and Research **11**: 81 - 89.
Granados, A. J. and P. J. Peterson (1999). "Hazardous waste indicators for national decision makers." Journal of Environmental Management **55**: 249 - 263.
Hardy, M. and A. Bryman (2004). Handbook of data analysis. London, SAGE Publications.
Heuvelhof, E. t. and C. Nauta (1997). "The effects of environmental impact assessment in the Netherlands." Project Appraisal **12**(1): 25 - 30.
Hokkanen, P. (2001). EIA and Decision Making in Search of Each other. The final disposal of nuclear waste in Finland. EIA, large development projects and

decision-making in the Nordic countries. T. Hilding-Rydevik. Stockholm, Nordregio. **6:** 95 - 151.
Holliday, M. (2004). "Clinical Waste in Developing Countries." Waste Management **March 2004**: 26 - 28.
Ibitayo, O. O. (2002). "Public-private partnerships in the siting of hazardous waste facilities: the importance of trust." Waste Management and Research **20**: 212 - 222.
Ibitayo, O. O. and K. D. Pijawka (1999). "Reversing NIMBY: an assessment of state strategies for siting hazardous-waste facilities." Environment and Planning C: Government and Policy **17**: 379 - 389.
INE (2000). La evaluacion del impacto ambiental. Logros y retos para el desarrollo sustentable 1995-2000. Mexico, SEMARNAP (in Spanish).
Jarup, L., D. Briggs, C. d. Hoogh, S. Morris, C. Hurt, A. Lewin, I. Maitland, S. Richardson, J. Wakefield and P. Elliot (2002). "Cancer risks in population living near landfill sites in Great Britain." British Journal of Cancer **86**: 1732 - 1736.
Jay, S., C. Jones, P. Slinn and C. Wood (2007). "Environmental Impact Assessment: Retrospect and prospect." Environmental Impact Assessment Review **27**: 287 - 300.
Kobus, D. and N. Lee (1993). "The role of environmental assessment in the planning and authorisation of extractive industry projects." Project Appraisal **8**: 147-156.
Kørnøv, L. and W. A. H. Thissen (2000). "Rationality in decision - and policy-making: implications for strategic environmental assessment." Impact Assessment and Project Appraisal **18**(3): 191 - 200.
Kvale, S. (1996). Interviews. An introduction to qualitative research interviewing. USA, SAGE Publications.
Lawrence, D. P. (1997). "The need for EIA theory-building." Environmental Impact Assessment Review **17**(2): 79 - 107.
Lawrence, D. P. (2000). "Planning theories and environmental impact assessment." Environmental Impact Assessment Review **20**: 607 - 625.
Lee, N., R. Colley, J. Bonde and J. Simpson (1999). Reviewing the Quality of Environmental Statements and Environmental Appraisals. Manchester, EIA Centre, Department of Planning and Landscape, University of Manchester. **Occasional Paper 55:** 72.
Leknes, E. (2001). "The roles of EIA in the decision-making process." Environmental Impact Assessment Review **21**(4): 309 - 334.
Li, J., Q. Bai and Y. Nie (2002). "Future solutions for the Treatment and Disposal of Hazardous Wastes in China." Environmental Management **29**(5): 591 - 597.
Mari, M., M. Nadal, M. Schuhmacher and J. L. Domingo (2009). "Exposure to heavy metals and PCDD/Fs by the population living in the vicinity of a hazardous waste landfill in Catalonia, Spain: Health risk assessment." Environmental International **35**(7): 1034 - 1039.
Marshall, C. and G. B. Rossman (2006). Designing Qualitative Research. United States of America, SAGE Publications.
McGrath, C. and A. Bond (1997). "The quality of environmental impact statements: a review of those submitted in Cork, Eire from 1988 - 1993." Project Appraisal **12**(1): 43 - 52.

Mendoza-Durán, A. (2004). Environmental Impact Assessment as management tool for protected areas in Canada and Mexico. 24th Annual Conference. International Association for Impact Assessment, Canada.
Mitchell, G. D., Ed. (2007). A new dictionary of the social sciences. New Brunswich, USA and London, UK, Aldine Transaction Publishers.
Morris, P. and R. Therivel (2001). Methods of Environmental Impact Assessment. London and New York, Spon Press.
Nema, A. K. and S. K. Gupta (1999). "Optimization of regional hazardous waste management systems: an improved formulation." Waste Management **19**: 441 - 451.
Nilsson, M. and H. Dalkmann (2001). "Decision making and strategic environmental assessment." Journal of Environmental Assessment Policy and Management **3**(3): 305 - 327.
Nykvist, B. and M. Nilsson (2009). "Are impact assessment procedures actually promoting sustainable development? Institutional perspectives on barriers and opportunities found in the Swedish committee system." Environmental Impact Assessment Review **29**: 15 - 24.
Organisation for Economic Co-operation and Development (2003). Environmental Performance Reviews Mexico. Paris, OECD.
Orloff, K. and H. Falk (2003). "An international perspective on hazardous waste practices." International Journal of Hygiene and Environmental Health **206**: 291 - 302.
Owens, S., T. Rayner and O. Bina (2004). "New agendas for appraisal: reflections on theory, practice and research." Environment and Planning A **36**: 1943 - 1959.
Palerm, J. (2005). "Needs and opportunities for SEA in Mexico: a view through the Arcediano dam case study." Impact Assessment and Project Appraisal **23**(2): 125 - 134.
Palerm, J. and C. Aceves (2004). "Environmental Impact assessment in Mexico: an analysis from a "consolidating democracy" perspective." Impact Assessment and Project Appraisal **22**(2): 99 - 108.
Palerm, J. R. (2000). "An Empirical-theoretical Analysis Framework for public participation in Environmental Impact Assessment." Journal of Environmental Planning and Management **43**(5): 581 - 600.
Parfitt, J. F., J. C. Powell, P. C. R. Gray, J. S. Brainard, A. A. Lovett and L. E. J. Roberts (1993). The Risk Management of Hazardous Wastes, their transport and disposal. Norwich, Environmental Risk Assessment Unit, WHO Collaborating Centre on Environmental Health Risk Assessment and Communication, School of Environmental Sciences University of East Anglia.
Persson, J. (2006). "Theoretical reflections on the connection between environmental assessment methods and conflict." Environmental Impact Assessment Review **26**: 605 - 613.
Petts, J. (1999). Handbook of Environmental Impact Assessment. Environmental Impact Assessment: process, methods and potential. Oxford, Blackwell Science.
Petts, J. and G. Eduljee (1994). Environmental Impact Assessment for Waste Treatment and Disposal Facilities. Chichester, John Wiley & Sons.
Pinho, P., R. Maia and A. Monterroso (2007). "The quality of Portuguese Environmental Impact Studies: The case of small hydropower projects." Environmental Impact Assessment Review **27**: 189 - 205.

Pischke, F. and M. Cashmore (2006). "Decision-oriented environmental assessment: An empirical study of its theory and methods." Environmental Impact Assessment Review **26**: 643 - 662.
Pölönen, I. (2006). "Quality control and the substantive influence of environmental impact assessment in Finland." Environmental Impact Assessment Review **26**: 481 - 491.
Presidencia de la Republica (2007). Plan Nacional de Desarrollo 2007 - 2012, Gobierno de los Estados Unidos Mexicanos**:** P. 324.
Presidencia de la República (2006). Reglamento de la Ley General para la prevención y gestión integral de los residuos. Mexico, Diario Oficial de la Federación**:** 44.
Randolph, J. (2004). Environmental Land Use Planning and Management. Washington, Covelo, London, Island Press.
Renn, O. (2006). "Participatory processes for designing environmental policies." Land Use Policy **23**: 34 - 43.
Richardson, T. (2005). "Environmental Assessment and planning theory: four short stories about power, multiple rationality, and ethics." Environmental Impact Assessment Review **25**(4): 341 - 365.
Rushbrook, P. E. and E. E. Finnecy (1988). "Planning for future waste management operations in developing countries." Waste Management and Research **6**: 1 - 21.
Saarikoski, H. (2000). "Environmental Impact Assessment (EIA) as collaborative learning process." Environmental Impact Assessment Review **20**: 681 - 700.
Sadler, B. (1996). International Study of the Effectiveness of Environmental Assessment. Canada, International Association for Impact Assessment.
Sager, T. (2001). A planning theory perspective on the EIA. EIA, large development projects and decision making in the Nordic countries. T. Hilding-Rydevik. Stockholm, Nordregio. **6:** 197 - 222.
Sandham, L. A. and H. M. Pretorius (2008). "A review of EIA report quality in the North West province of South Africa." Environmental Impact Assessment Review **28**: 229 - 240.
Sarantakos, S. (2005). Social Research. China, Palgrave Macmillan.
Scholz, R. W. and O. Tietje (2002). Embedded case study methods: integrating quantitative and qualitative knowledge, SAGE Publications.
Schuhmacher, M., J. L. Domingo, J. Hagberg and G. Lindström (2004). "PCDD/F and non-ortho PCB concentrations in adipose tissue of individuals living in the vicinity of a hazardous waste incinertor." Chemosphere **57**(5): 357 - 364.
Secretaria de Desarrollo Social (1993a). NOM - 053 - ECOL - 1993 Procedimiento para llevar a cabo la prueba de extracción para determinar los constituyentes que hacen a un residuo peligroso por su toxicidad al ambiente. S. d. D. Social. Mexico, Diario Oficial de la Federación (Federal Official Docket)**:** p. 31 - 42.
Secretaria de Desarrollo Social (1993b). NOM - 054 - ECOL - 1993 Procedimiento para determinar la incompatibilidad entre dos o más residuos considerados como peligrosos por la Norma Oficial Mexicana NOM - 052 - ECOL - 1993. S. d. D. Social. Mexico, Diario Oficial de la Federación (Federal Official Docket)**:** p. 43 - 71.
Secretaria de Desarrollo Social (1993c). NOM - 056 - ECOL - 1993 Requisitos para el diseño y construcción de las obras complementarias de un confinamiento controlado de residuos peligrosos. S. d. D. Social. Mexico, Diario Oficial de

la Federación (Federal Official Docket). **NOM - 056 - ECOL - 1993:** p. 75 - 82.

Secretaria de Desarrollo Social (1993d). NOM - 057 - SEMARNAT - 1993 Requisitos que deben observarse en el diseño, construcción y operación de celdas de un confinamiento controlado para residuos peligrosos. S. d. D. Social. Mexico Diario Oficial de la Federación (Federal Official Docket). **NOM - 057 - SEMARNAT - 1993:** p. 83 - 89.

Secretaria de Desarrollo Social (1993e). NOM - 058 - ECOL - 1993 Requisitos para la operación de un confinamiento controlado de residuos peligrosos. S. d. D. Social. Mexico Diario Oficial de la Federación (Federal Official Docket). **NOM - 058 - ECOL - 1993**.

SEMARNAT (2000). Reglamento de la Ley General del Equilibrio Ecologico y la Proteccion al Ambiente en Materia de Evaluacion de Impacto Ambiental. SEMARNAT. Mexico D.F. 30 May, Diario Oficial de la Federación (Federal Official Docket)**:** 51 - 65.

SEMARNAT (2001). NOM - 133 - ECOL - 2000 Protección Ambiental - Bifenilos policlorados (BPCs) especificaciones de manejo. SEMARNAT. Mexico, Diario Oficial de la Federación (Federal Official Docket). **NOM - 133 - ECOL - 2000:** p. 11 - 19.

SEMARNAT (2003). Norma Oficial Mexicana NOM - 087 - ECOL - SSA1 - 2002 Protección ambiental - Salud ambiental - Residuos Peligrosos biológico infecciosos - Clasificación y especificaciones de manejo. SEMARNAT. Mexico, Diario Oficial de la Federación. **NOM - 087 - ECOL - SSA1 - 2002:** 23.

SEMARNAT (2004a). NOM - 055 - SEMARNAT - 2003 Que establece los requisitos que deben reunir los sitios destinados al confinamiento controlado de los residuos peligrosos excepto de los radioactivos. SEMARNAT. Mexico, Diario Oficial de la Federación (Federal Official Docket). **NOM - 133 - ECOL - 2000:** p. 11 - 22.

SEMARNAT (2004b). NOM - 098 - SEMARNAT - 2002 Protección Ambiental - Incineración de residuos, especificaciones de operación y límites de emisión de contaminantes. SEMARNAT. Mexico, Diario Oficial de la Federación (Federal Official Docket). **NOM - 098 - SEMARNAT - 2002:** p. 10 - 36.

SEMARNAT (2004c). NOM - 145 - SEMARNAT - 2003 Confinamiento de residuos en cavidades construídas por disolución en domos salinos geológicamente estables. SEMARNAT. Mexico, Diario Oficial de la Federación (Federal Official Docket). **NOM - 145 - SEMARNAT - 2003:** p. 53 - 68.

SEMARNAT (2006a). Norma Oficial Mexicana NOM - 052 - SEMARNAT - 2005. Que establece las características, el procedimiento de idenitficación, clasificación y listados de residuos peligrosos. S. d. M. A. y. R. Naturales. Mexico, Diario Oficial de la Federación. **NOM-052-SEMARNAT-2005:** 96.

SEMARNAT (2006b). Reglamento de la Ley General para la prevención y gestión integral de los residuos SEMARNAT. Mexico, Diario Oficial de la Federación (Federal Official Docket)**:** p. 6 - 43.

SEMARNAT (2008a). Estrategia Nacional para la Participación Ciudadana en el Sector Ambiental. Unidad Coordinadora de Participación Social y Transparencia. Mexico, SEMARNAT**:** P. 65.

SEMARNAT (2008b). Informe de la situación del medio ambiente en México. Compendio de Estadísticas Ambientales. Mexico, Gobierno Federal**:** 358.

SEMARNAT. (2009). "Impacto Ambiental. Autorizaciones de impacto ambiental otorgadas en 2002 - 2009." Retrieved August 23rd 2009, 2009, from http://www.semarnat.gob.mx/tramitesyservicios/resolutivos/Pages/impacto.aspx.

Silverman, D. (2005). Doing qualitative research. London, Thousand Oaks, New Delhi, SAGE Publications.

Sinclair, A. J., A. Diduck and P. Fitzpatrick (2008). "Conceptualizing learning for sustainability through environmental assessment: critical reflections on 15 years of research." Environmental Impact Assessment Review **28**: 415 - 428.

Stenstadvold, M. (2001). The role of EIA in the planning and decision processes of large development projects in the Nordic countries. The case of the Gardermoen project. EIA, large development projects and decision-making in the Nordic countries. T. Hilding-Rydevik. Stockholm, Nordic Centre for Spatial Development. **6:** 1-54.

Strauss, A. and J. Corbin (1998). Basics of Qualitative Research. Techniques and Procedures for Developing Grounded Theory. London, SAGE Publications.

Taylor, S. and R. Bodgan (1998). Introduction to Qualitative Research Methods". USA, John Wiley and Sons, Inc.

The Oxford English Dictionary (1989). Edited by R. W. Burchfield. Oxford, Clarendon Press.

Toro, J., I. Requena and M. Zamorano (2009). "Environmental impact assessment in Colombia: Critical analysis and proposals for improvement." Environmental Impact Assessment Review **In press**.

UNEP. (2009). "Guidance document on the preparation of technical guidelines for the Environmentally Sound Management of wastes subject to the Basel Convention." Retrieved August 17th 2009, 2009, from http://www.basel.int/meetings/sbc/workdoc/techdocs.html.

United Nations Division for Sustainable Development. (1992, August 11th 2005). "United Nations Conference on Environment and Development. Rio de Janerio, Brazil, 3 to 14 June 1992." Retrieved September 20th 2005, 2005, from http://www.un.org/esa/sustdev/documents/agenda21/english/agenda21toc.htm.

United Nations Environment Programme (2000). Methodological guide for the undertaking of national inventories of hazardous wastes within the framework of the Basel Convention. Geneva, UNEP**:** 61.

Vicente, G. and M. R. Partidario (2006). "SEA - Enhancing communication for better environmental decisions." Environmental Impact Assessment Review **26**: 696 - 706.

Vicente, G. and M. R. Partidário (2006). "SEA - Enhancing communication for better environmental decisions." Environmental Impact Assessment Review **26**: 696 - 706.

Visvanathan, C. (1996). "Hazardous waste disposal." Resources, Conservation and Recycling **16**: 201 - 212.

Webler, T., H. Kastenholz and O. Renn (1995). "Public Participation In Impact Assessment: A Social Learning Perspective." Environmental Impact Assessment Review **15**: 443 - 463.

Weston, J. (1997). Planning and Environmental Impact Assessment in practice. England, Longman.

Weston, J. (2000). "EIA, Decision-making Theory and Screening and Scoping in UK Practice." Journal of Environmental Planning and Management **43**(2): 185 - 203.
Weston, J. (2002). "From Poole to Fulham: A changing culture in UK Environmental Impact Assessment Decision Making?" Journal of Environmental Planning and Management **45**(3): 425-443.
Wilkins, H. (2003). "The need for subjectivity in EIA: discourse as a tool for sustainable development." Environmental Impact Assessment Review **23**: 401 - 414.
Williams, P. T. (2005). Waste Treatment and Disposal. Chichester, John Wiley and Sons.
Wood, C. (2003a). "Environmental Impact Assessment in developing countries." International Development Planning Review **25**(3): 301 - 321.
Wood, C. (2003b). Environmental Impact Assessment. A comparative review. England, Prentice Hall.
Wood, C. and C. E. Jones (1997). "The Effect of Environmental Assessment on UK Local Planning Authority Decisions." Urban studies **34**(8): 1237 - 1257.
Yates, S. J. (2004). Doing Social Science Research. London, SAGE Publications.
Yin, R. K. (2003). Case study research. Design and Methods. London, SAGE Publications.

Appendix 1. Quality of EISs for HWMF

Table 1.1 Quality within the review area 1 Description of the development, the local environment and baseline conditions. (Percentage of EISs)

Review area categories	Satisfactory (A, B or C)	Unsatisfactory (D, E, or F)	Good (A or B)	Borderline (C or D)	Poor (E or F)
1. Description of the development, the local environment and the baseline conditions	84	16	37	58	5
1.1 Description of the development	89	11	63	37	0
1.2 Site description	84	16	47	53	0
1.3 Wastes	48	52	16	74	10
1.4Environment description	90	10	53	47	0
1.5 Baseline conditions	85	15	32	63	5

Table 1.2 Quality within the review area 2 Identification and evaluation of key impacts (Percentage of EISs)

Review area categories	Satisfactory (A, B or C)	Unsatisfactory (D, E, or F)	Good (A or B)	Borderline (C or D)	Poor (E or F)
2. Identification and evaluation of impacts	37	63	5	84	11
2.1 Definition of impacts	74	26	32	68	0
2.2 Identification of impacts	95	5	74	26	0
2.3 Scoping	26	74	5	53	42
2.4 Prediction of impacts	26	74	5	47	47
2.5 Assessment of impact significance	31	69	5	63	32

Table 1.3 Quality within the review area 3 Alternatives and mitigation measures (Percentage of EISs)

Review area categories	Satisfactory (A, B or C)	Unsatisfactory (D, E, or F)	Good (A or B)	Borderline (C or D)	Poor (E or F)
3. Alternatives and mitigation measures	53	47	0	89	11
3.1 Alternatives	15	85	10	21	69
3.2 Scope and effectiveness	69	31	16	79	5
3.3 Commitment to mitigation	36	64	10	58	32

Table 1.4 Quality within the review area Communication of results (Percentage of EISs)

Review area categories	Satisfactory (A, B or C)	Unsatisfactory (D, E, or F)	Good (A or B)	Borderline (C or D)	Poor (E or F)
4. Communication of results	95	5	37	63	0
4.1 Layout	79	21	47	53	0
4.2 Presentation	100	0	63	37	0
4.3 Emphasis	74	26	64	26	10
4.4 Non-technical summary	95	5	53	42	5

Appendix 2 Contents of Final Statements

The following tables show the content of the nineteen Final Statements (FS).

Table 2.1 Landfills for containment

Final Statement	LC FS 1	LC FS 2	LC FS 3	LC FS 4	LC FS 5
Year	2002	2003	2004	2004	2005
Environmental permit	Rejected	Granted	Granted	Granted	Granted
Public consultation	Requested by the Municipal authority and members of the community. Public consultation was not undertaken because it was not requested on time (according to regulations)	Requested by the Municipal authority and organized by Ministry of Environment. Concerns expressed during public consultation: - pollution of underground water - pollution of the area - opposition because other facilities have been rejected in the country because they are highly risky and do not comply with regulations distance to water bodies regulation is not complied - people requested that more studies regarding the impacts should be undertaken - fear of accidents during transportation of hazardous wastes, and	Not requested	Requested by an NGO. Rejected by Ministry of Environment because it was not requested on time.	Not requested

		therefore impacts on the community			
Municipal authority consultation	Consulted	Consulted	Consulted	Consulted but did not respond	Consulted Response: - project is adequately located and technically feasible
State Government consultation		Consulted	Not consulted	Consulted but did not respond	Not consulted
Ministry of Environment State level consultation			Consulted Response: - the EIS does not have a detailed description of flora and fauna, and of the impacts on endemic species - the area is susceptible to flooding	Consulted	Consulted Response: - project agrees with the State Development Plan - the site is adequate for a LC
Other consultations		- Department of Management of hazardous activities (DGGIMAR) within the Min of Env - National Commission for Water Response: project site does not comply with regulations regarding the distance to water bodies. It is not viable to build a LC in the site. - Research centre for earth sciences of the University of the State Response: classification of soil is incorrect; experts	- Department of Wild Life within the Min of Env - National Commission for Water	- Department for Integrated Management of Hazardous Materials and Activities (DGGIMAR) within the Ministry of Environment Response: it is necessary a system for the containment of spillages; infrastructure explosion proof - Department of Forestry and soil within the Ministry of Environment - Department of Wild life within the Ministry of Environment	- Department for Integrated Management of Hazardous Materials and Activities (DGGIMAR) within the Ministry of Environment Response: a process for the treatment of lixiviates is needed - Department of Wild life within the Ministry of Environment Response: it is needed a program for the conservation of species, program for the recovery and relocation of species

		were not consulted when describing the geological baseline conditions - Research centre for geosciences from the National University Response: project site does not comply with regulations; geological aspects are partially analysed in EIA - Institute of Geology of the National University Response: The EIA ignored the impact on local water bodies; underground water is locally used		Response: it is necessary to undertake a program for the relocation and recovery of species (flora and fauna); and a reforestation program - Department of Air Quality, Air Emissions and Pollutants within the Ministry of Environment Response: necessary control of emissions in storing areas - A project site visit was undertaken together with those departments consulted - National Commission for Water Response: it is necessary to undertake further studies of the hydrology of the site	(flora and fauna)
Arguments for decision	- project does not comply with regulations: distance to the community, distance to roads and water bodies - EIS lacks of information regarding processes in the facility - the project will cause negative impacts on the ecosystem - risk to the community is	- Agreement with Land Use Planning - No endanger species occur in the site - Not within a natural protected area - No significant environmental impacts - Project site does not comply with regulations (distance to a water body, distance to a community,	- Project is located in an area which does not have a Land Use Planning. There is no Urban Development Plan either. – Not within a natural protected area - No significant environmental impacts - compliance with regulations	- Agreement with Land Use Planning - Not located within a natural protected area - Compliance with regulations - Guarantee or insurance to cover the costs of the compliance with mitigation measures - Program of mitigation and compensation of	- Agreement with Land Use Planning - Compliance with regulations - Program of reforestation - Program of conservation of species - Program of recovery and relocation of species (flora and fauna) - The project will not affect the significant

	high	distance to roads) but measures will compensate them. - Project is viable as long as mitigation measures and compensations are implemented		effects on flora and fauna - Project is viable as the significant impacts can be mitigated or compensated	environmental components
Conditions attached		- Report for Ministry of Environment to verify compliance of conditions attached - Plan for safety measures - Auditing of safety measures - Program for the prevention of accidents and record of accidents - Compliance with mitigation measures - Acquire an insurance or guarantee to cover the costs of the compliance with mitigation measures - Reforestation with native species - Fence around the facility with bushes - Another layer of geomembrane - Catchments of leachates - Waste water treatment - Program of maintenance of equipment - Monitoring program - Install censors of toxic	- Report for Ministry of Environment to verify compliance of conditions attached - Program for the mitigation and compensation of impacts on flora and fauna - Acquire an insurance or guarantee to cover the costs of the compliance with mitigation measures - Decommissioning phase program - Plan of Environmental follow-up - Program of mitigation and compensation of the impacts on flora and fauna	- Plan of Environmental management and auditing - Acquire an insurance or guarantee to cover the costs of the compliance with mitigation measures - Program of mitigation and compensation of impacts on flora and fauna - Program for the Decommissioning phase	- Acquire an insurance or guarantee to cover the costs of the compliance with mitigation measures - infrastructure for water diversion - Program of Environmental management and auditing - Program of reforestation - Program of conservation - Program of recovery and relocation of species - Implement a corridor for connectivity where animals are able to move from one unaltered area to another - Program for the decommissioning phase

		and explosive compounds - Safety measures -Impermeable floor and resistance to chemical compounds - Environmental management system to improve the facility constantly			

Table 2.1 Treatment facilities

Final Statement number	**T – FS - 6**	**T – FS - 7**	**T – FS - 8**	**T – FS – 9**	**T – FS - 10**
Year	2001	2004	2004	2005	2005
Environmental permit	Granted	Granted	Rejected	Rejected	Granted
Public consultation	Not requested	Not requested	Not requested	Not requested	Not requested
Municipal authority consultation	Consulted but did not respond	Consulted but did not respond		Consulted but did not respond	Consulted but did not respond
State Government consultation	Not consulted	Not consulted		Consulted but did not respond	Not consulted
Ministry of Environment State level consultation	Consulted Response: - Project agrees with Land Use of the area; - No protected species occur; - Project is viable; - More information should be requested regarding treatment process, waste water management, impacts on soil,	Consulted Response: - Project agrees with Land Use; - Not located in a protected area - HWMF are needed - No objection to the development		Not consulted	Consulted Response: - Project located in an industrial Land use - measures should be implemented to prevent water pollution

	landscape, flora, fauna, and mitigation measures				
Other consultations	Department for Integrated Management of Hazardous Materials and Activities (DGGIMAR) within the Ministry of Environment			Department for Integrated Management of Hazardous Materials and Activities (DGGIMAR) within the Ministry of Environment Response: - process description does not have scientific foundation; - equipment is not adequate for the types of hazardous wastes described - lack of information regarding wastes - project is not viable	Department for Integrated Management of Hazardous Materials and Activities (DGGIMAR) within the Ministry of Environment
Arguments for decision	Final Statement not available	- Agreement with Land Use Planning - No endangered species occur - Not within a Natural protected area - Not significant environmental impacts	- Disagreement with Land Use Planning - EIS lacks information regarding project location; project description; link with Land Use Planning; baseline conditions; impact identification and assessment, and mitigation measures	- EIS lacks information regarding description of processes; management of lixiviates; and impact assessment and mitigation measures	- Project is not located in an area with Land use Planning - No endangered species occur - Not within a Natural protected area - Not significant environmental impacts
Conditions attached		- Report for the Ministry of Environment to demonstrate compliance of conditions attached - Plan of Environmental management			- Program of Environmental auditing with indicators of effectiveness of mitigation measures - avoid spillages, build

		- Plan of Environmental auditing - storage and treatment areas should have floor made of concrete and diversion channels - oil wastes should not be pour into the sewage			diversion channels, containers of leachates, and geomembranes on the floor where hazardous wastes will be treated

Table 2.3 Recycling and reuse facilities

Final Statement Number	**RR - FS - 11**	**RR – FS - 12**	**RR – FS - 13**
Year	2001	2004	2004
Environmental permit	Granted	Granted	Rejected
Public consultation	Not requested	Not requested	Not requested
Municipal authority consultation	Consulted but no response	Consulted but no response	Consulted but no response
State Government consultation	Consulted but no response	Not consulted	Not consulted
Ministry of Environment State level consultation	Consulted Response: - EIS lacks information	Consulted Response: - EIS lacks information about identification and labelling of hazardous wastes, description of processes, description of control actions of emergencies, waste water management - Project does not agree with Land Use Planning	Consulted Response: - false information in the EIS - project is already built - against the project - risk of underground water pollution due to accidents - lack of information regarding the origin of wastes to be managed
Other consultations			
Arguments for decision	EIS not available	- Agreement with the Land Use Planning - No endangered species occur - Not within a natural protected area - No significant impacts	- Project breached regulations. - EIS provided false information - Facility was built without obtaining the Environmental permit first.

Conditions attached		- Program of environment auditing including a follow-up of environmental impacts and mitigation measures. It should be approved by the Min of Env. - implementation of diversion channels and geomembranes to prevent leachates and soil pollution - compliance with mitigation measures	

Table 2.4 Temporary storage

Final Statement Number	**TS – FS - 14**	**TS – FS - 15**
Year	2002	2004
Environmental permit	Granted	Granted
Public consultation	Not requested	Not requested
Municipal authority consultation	Response: - Project agrees with Land Use - project is highly risky for the community and industrial area - Municipal authority rejects the project	Consulted but no response
State Government consultation	Not consulted	Not consulted
Ministry of Environment State level consultation	Response: - EIS lacks information	Consulted but no response
Other consultations	- Department of Industrial sector within the Ministry of Environment	- Department of Environmental policy within the Ministry of Environment Response: Project agrees with the Land Use Planning as long as measures are implemented (e.g. avoid ground pollution, control emissions)
Arguments for decision	- Protected species are not affected - Not within a Natural protected area - No significant impacts - the project is viable as long as mitigation measures are	- Agreement with Land Use Planning. Project in an urban and industrial area - No endangered species occur

	implemented	
Conditions attached	- Report for the Ministry of Environment to verify compliance of conditions attached - Compliance with regulations - Adequate management of hazardous and municipal wastes - Plan for safety measures and verification of them - program for the prevention of accidents, keep record of accidents affecting the environment - compliance with mitigation measures - program for the maintenance of equipment - water diversion infrastructure; and measures to prevent ground and water pollution - inform local authorities regarding risk areas so that they are considered in the Land Use Planning of the Municipality	- Plan of Environmental management including a follow-up of impacts and mitigation measures - Report for the Ministry of Environment to verify compliance of conditions attached - Verification of safety measures Program for the prevention of accidents, record accidents - compliance with mitigation measures

Table 2.5 Industrial incinerator

Final Statement Number	**II - FS -16**
Year	2003
Environmental permit	Granted
Public consultation	Not requested
Municipal authority consultation	Not consulted
State Government consultation	Not consulted
Ministry of Environment State level consultation	Not consulted
Other consultations	
Arguments for decision	- Agreement with the Land Use Planning - No endangered species occur in the site - Not within a natural protected area - No significant environmental impacts
Conditions attached	- Report for the Ministry of Environment to verify compliance of conditions attached - Plan of environmental management - Compliance with regulations

	- Record of all hazardous wastes managed - Adequate management of hazardous and municipal wastes - Plan for safety measures - Auditing of safety measures - Program for the prevention of accidents - record of accidents that affect the environment - compliance with mitigation measures proposed in the EIS - water diversion channels - construction material not flammable - adequate storage area - indication of safety measures - fire fight system - inform local authorities about risks to the area so that they are considered in the Urban development plan of the Municipality

Table 2.6 Medical incinerator

Final Statement Number	**MI - FS - 17**	**MI – FS - 18**	**MI – FS - 19**
Year	2002	2004	2004
Environmental permit	Granted	Rejected	Granted
Public consultation	Not requested	Not requested	Not requested
Municipal authority consultation	Consulted but did not respond	Consulted but did not respond	Consulted but did not respond
State Government consultation	Not consulted	Not consulted	Not consulted
Ministry of Environment State level consultation	Response: - lack of information regarding washing containers; ash characterization; tests of incinerators	Consulted but did not respond	Consulted but not respond
Other consultations	- Department of risk	- Department of Management of hazardous activities (DGGIMAR) within the Ministry of Environment Response: Project site visit is suggested.	- Department of Environmental policy within the Ministry of Environment, consultation regarding the agreement with Land Use Planning

Arguments for decision	- Agreement with Land Use Planning - No endangered species occur - Not within a natural protected area - Not significant environmental impacts	- Regulations were breached. During a project site visit it was determined that the equipment was already installed in the facility without obtaining the environmental permit first.	- Agreement with Land Use Planning - No endangered species occur - Not within a natural protected area - Not significant environmental impacts
Conditions attached	- Report for the Ministry of Environment to verify compliance of conditions attached - Compliance with regulations - Adequate management of hazardous and municipal wastes - Plan for safety measures and verification - Program for the prevention of accidents - Compliance with mitigation measures - Program for auditing - promote the creation of green areas - program for maintenance of equipment - inform local authorities about areas with potential risks so that they are considered in the Land Use Plan		- Report for the Ministry of Environment to verify compliance of conditions attached - Compliance with mitigation measures - Adequate management of hazardous wastes

Appendix 3 Categories and empirical data from Environmental Impact Statements, Final Statements and stakeholders

Table 3.1 Developers and consultants' perceptions and use of EIA

Model of EIA	Category	Empirical data	Frequency
Information processing	Instrument which gives technical and legal foundation	"EIA should consider environmental aspects, as well as the aspects related to social and economic development of the area where the project will be located. So, if EIA is made in an integrative way, it gives a technical and legal foundation to the project, it also provides the necessary and accurate information to stakeholders" (LC Consultant#16).	Consultant: LC #16
	Used to report to the Ministry of Environment	"… the EIS can be divided in two parts, one part describes how the project is going to be done, and the other part describes the environment. The authority is interested on the description of the environment, what the air emissions are going to be, emissions to water, wastes, impacts… but I do not really think EIA was relevant" (TS Developer #3). "EIA is used to report volumes, the equipment that is to be used, processes… But in the planning, it does not influence" (RR Developer #2). "EIA provides the authority with information for the decision making regarding the environmental permit" (RR Consultant #9). "EIA is the mechanism in which the developer reports the effects on the environment" (RR Consultant #10). "EIA is very important. It is very useful as a tool to report how the project will be developed" (T Consultant #13). "EIA, and the EIS provided information and were used to report about the project site, details about the materials to be handled within the facility, wastes to be generated from the different activities (e.g. storage, transportation)" (T Consultant #14). "The authority had all the elements to make a decision regarding the project…I think EIA process is not achieving the protection of the environment, the authority is forgetting about it. I think the way the authority is managing the EIA process is making the authority to be overwhelmed with information…guidelines instead of helping, they are making things worse, for both the consultant and the authority. The guidelines request for too much information…	Developer: TS #3; RR #2 Consultant: RR #9, #10; T #13, #14; LC #19; MI #21

		the authority forces consultants to comply with the guidelines… but all that information is not going to be useful for the authority so as to make a decision focused on the protection of the environment" (LC consultant #19). "…EIA is useful to provide the authority with all the information about the likely impacts from the facility such as pollution, risk, environmental accidents" (MI consultant #21).	
	Design completed independently from EIA; thus, limited EIA influence	"During the planning of the project, I consider that EIA is not very influential because the design is made by the developer apart from EIA. EIA is used to report volumes, the equipment to be used, processes…But in the planning, it does not influence" (RR Developer #2). "However, in Mexico, developers hire consultants practically in 90% of the cases, when the site has been selected, or even when they already are building the facility" (RR Consultant #10). "…information in the EIS is very specialised when talking about the description of the environment… the study can be divided in two parts, one will describe how the project is going to be, and the other part describes the environment. The authority is interested on the description of the environment, what the air emissions are going to be, emissions to water, wastes, impacts… but I do not really think EIA is relevant for planning" (TS Developer #3). "After the authority had visited the facility, the developers realised they had to undertake the EIA process… they continued working until they obtained the permits; but EIA did not influence" (T Consultant #14).	Developer: RR #2 Consultant: RR #10; TS #3; T #14
	Consultants' participation	"EIA is specialised, therefore external experts have to be hired, consultants…regarding environmental regulations, auditing…" (TS Developer #3). "We started making the EIS, but since we do not have the expertise required we had to hire a consultant. He knew about the documents required and regulations" (T Developer #4). "Often, the developer hires the consultant when the facility is being built" (RR Consultant #9). "There was no participation during the planning of the project; developers hire you and tell you that they need an EIS and that they want to obtain the environmental permit, and that is all they ask" (RR Consultant #10). "We have to analyse the likelihood of the project to being approved… if we determine that the project is not going to be authorized we shall inform the developer" (RR Consultant #10).	

		"Developers rarely consider consultants as someone who will help them in their decision making" (TS #11). "…developers hire consultants because they have expertise in regulations and know how to make an EIS according to the guidelines...Normally, we work on a project once it is designed… we identify environment issues that the developer did not consider. Thus, during EIA, those issues are made evident and the project is changed. But obviously they are not significant modifications; they are small changes" (T Consultant #13). "… developer hires the consultant when the project has been designed, we (consultants) inform the developer when the project is not convenient… we tell the developer about the scale of mitigation measures that will have to be implemented to convince them about changing the project, that is the strategy, we inform the developer about the consequences that can occur…" (LC Consultant #15). "If we determine that the project will not be approved by the Ministry of Environment we inform the developer that the project is not convenient" (LC Consultant #15). "We informed the developer how the project had to be changed. We had the opportunity to interact with the developer during the design of the project (LC Consultant #16). "… consultant should inform the developer that if he wants the project to be approved, the project may be changed as a result of EIA. If the project is not modified the probability of the project being approved will not be high" (LC Consultant #16). "For developers is difficult to change the design, because they often have already bought the project site, they have everything… and sometimes the developer have to inform them about the low likelihood of obtaining the environmental permit because of environmental issues" (LC Consultant #16). "Normally, the project is designed and then EIA is undertaken. However, some changes in the project can be made when EIA is undertaken" (LC Consultant #18). "… as a consultant I told the developer 'these regulations have to be complied as well as with these international agreements' and the design was made" (LC #19). "The consultant advised me regarding the EIA process, since the beginning, on how to the information should be prepared, the EIS and the procedure, as well as the arguments to defend the project" (LC #20).	

		"There are some developers that take the suggestions we (consultants) make regarding the project. Some do not take our suggestions; they want to obtain the environmental permit without making any change to the project. Others do take into account our suggestions as consultants" (MI #23). "I always request for all the information available regarding the project. That is how I can determine, for example, whether the project is located in a protected area. If the project is located in a protected area I advise the developer not to do it as I do not think it would be authorized. Unless it is compatible; otherwise, it is better to warn the developer" (MI #23). "I made some suggestions to the developer, and he took them into account for the construction of the project… then, some adjustments had to be made to the project" (RR #9). "We (consultants) suggested mitigation measures in the EIS, as it is evident that any project will have impacts on the environment… There are sites where impacts have been made, for example industrial areas. It is not the same if the project is located in a rural zone, where the impacts on the environment are significant…So, in those cases mitigation measures are suggested" (RR #10). "This is part of the service…the developer is told that the facility can not be built there, the project site has to be changed etc…So, all the technical arguments have to be used to make the developer consider these suggestions" (LC #16). "So, we have to provide the developer with all the technical arguments from the impact assessment point of view" (LC #18). "In general, if our suggestions are based on technical arguments the developer takes them into account" (MI #21).	

	Developers' lack of capacity	"I think that developer lacks planning…lacks training" (II #1). "Many times the developer realises about EIA and the environmental permit when he applies for the building permit. That is when they get stuck. Authorities request the environmental permit to the developer and then he gets in touch with consultants to make the EIS" (RR #9). "This is about training… PROFEPA visits the facilities and sanctions them (developers) because they are not complying with regulations. The developer argues 'I did not know, I was not informed', but that is not the real reason, it is because the developer is not really interested on protecting the environment" (RR #10). "Many times, the developer does not know about the regulations and what the project involves" (T #13). "The developer did not know about EIA until the authorities (PROFEPA) visited the facility. This is a sign of the lack of capacity regarding regulations, hazardous waste management facilities, and process to obtain permits… There is a lack of divulgation about environmental issues, the developer is not aware about their obligations" (T #14). "… the developer did not know about regulations, and therefore, did not have the elements to question himself whether the project was adequate… one of the problems we (consultants) realised was the lack of capacity in the developer" (LC #17). "The design of the project is usually made first. Rarely do developers have the capacity or are aware of their obligation to undertake EIA and the EIS for the project" (MI #23).	Developers: II #1 Consultants: RR #9; T #13, #14; LC #17; MI #23
Institutional model	Requirement of the authority to obtain the environmental permit	"EIA is undertaken at the end of the project, none of the developers undertakes a previous assessment, developers take EIA as a requirement of the authority at the end of the process" (II Developer #1). "EIA has many benefits for the society and for industries, for developers, it is a requirement that has to be complied…We know we have to undertake it" (TS #3). "EIA is a requirement that the authority requests to grant the permit, for this type of projects and for many others" (LC #6). "… the authority and the developer do not see EIA as a tool to protect the environment, they see it as a requirement that has to be complied with" (LC #19).	Developers: II #1; TS #3; LC #6 Consultants: LC #19; RR #9, #10; TS #11; T #13, #14; MI #21

		"Unfortunately, developers undertake EIA to comply with the requirement of the authority to obtain the environmental permit" (RR #9). "If there were no regulations about EIA, developers would not undertake EIA and I would not be hired. They undertake it because it is established in regulations" (RR #10). "…EIA has to be undertaken because it is a requirement in regulations" (TS #11). "What the developer wants is to comply with regulations… requirements are complied with because the developer wants to obtain the environmental permit to be able to work" (T #13). "I can tell you that EIA is an administrative tool in our country. EIA is seen in our country as a requirement to obtain the environmental permit, so that you can operate a facility" (T #14). "In the case of projects for hazardous waste management, I think developers undertake EIA as a study and requirement needed to obtain the environmental permit, but there is not a real interest on the impacts that will be generated…" (MI #21).	
	Means for the authority to control and regulate project development	"I think EIA is very important, it is a study that will show whether the facility can be built or not. Before EIA, anyone could build a facility anywhere, and the impacts on the environment were massive" (RR #2). "EIA can tell us about the environmental and technical issues that have to be considered…for example about the lists of hazardous wastes, risky activities…and we realised about issues such as waste management, equipment, materials…incompatibility with other wastes… the authority can establish changes in the facility such as the layout…" (RR #2). "If EIA was not a requirement, there would be uncontrolled development; lack of capacity; EIA at end of the day is useful for the authority to identify omissions, correct mistakes, make the facility adequate… if EIA did not exist, opportunities to improve the facility and prevent environmental pollution would not exist" (RR #2). "I think EIA helps a lot to on the regulation of projects" (RR #2). "EIA enables the authority to regulate any type of facility… and prevents uncontrolled development that took place before, when developers started building facilities without considering how the environment was going to be	Developers: RR #2; TS #3; T #4, #5 Consultant: MI #23

		affected. I think that is the greatest value of EIA" (TS developer #3). "EIA was really useful, to determine what we would have to do, to determine if we were in the right place to build the facility. To make sure that we were not polluting rivers, underground water…So, EIA is not only a bureaucratic requirement. The authority is concerned about the things that can be done and those that should not be done" (T #4). "EIA is a requirement that the Ministry of Environment has established to obtain the environmental permit, and I think it is correct as it establishes the data, safety issues, and environmental issues. I mean, in my opinion it is correct as it contains all the necessary data for these kinds of issues" (T #5). "In my opinion, EIA is useful for projects such as incinerators because they should be controlled; the sites where they are built should be controlled, and obviously their operation as well. Incinerators have emissions (air emissions, wastes)… So, the authority can control where those facilities should be built and therefore may monitor and verify they are being built according to regulations and conditions attached to the Final Statement…it helps to reduce pollution. If we consider that EIA regulates, I think it is quite effective (MI #23).	
	EIA creates 'environmental awareness'	"EIA is creating a culture around the environment. I think we are in that line, we just have to improve EIA, its procedures, application, assessment methods" (II #1). "Before, developers used to ignore environmental regulations, now they are starting to have a better awareness of them and of their compliance. Maybe because the authority is exercising its power, or because EIA is creating environmental awareness" (RR developer #2). "There are some cases in which the developer is environmentally aware and ask the consultants about environmental issues, they are aware and know that protected ecosystems exist and therefore want to know our opinion" (LC #15). "In this case, the developer has been environmentally aware and said 'I have similar facilities in other countries, and I do not want to have a HWMF in Mexico which is not operating adequately, I want it to be adequate, I want to make the most of the information generated by EIA, and I want to implement the mitigation measures' (LC #19).	Developers: II #1 RR #2 Consultants: LC #15, #19
	Developers should expand their knowledge	"I think the authority should make developers aware of their obligations, visit their facilities before granting the environmental permit, make the developer aware of his responsibility about the impacts of the project… review the regulations, because that will help us to comply with regulations" (RR #2). "… the authority should improve the capacity of developers… developers should be more interested, be willing to	Developer: RR #2 Consultants: RR #10; MI #23

		accept the capacity. It is very important" (RR #10). "There should be a mechanism to spread regulations regarding projects and for the construction and operation of facilities in the country. In my opinion, this should be done by the authority; probably universities could do it too" (MI #23).	
	Influence depends on the consultant	The consultant's duty is "to 'transmit' (explain) the developer how, through undertaking EIA and designing suitable mitigation measures, the environment is going to be protected" (T consultant #13). "It depends on how the consultant advises his client…the consultant has to inform about EIA's results to the developer, about modifications in the project…. If the consultant has the elements and capacity to convince the developer about the changes that are needed in the project, he will influence the project…If the consultant makes this, EIS and therefore EIA will be important and relevant" (LC #16). "In this LC case, I was able to participate in everything; that is the way it should be in all the projects. The consultant, since the beginning, should participate and be involved, even in the communication with the community; that is essential. It is very important that the consultant participate. That is how the consultant can tell the developer, as it was in my case, how to improve the design… In this way, it was important for the developer…" (LC #19).	Consultants: LC #13, #16, #19
	To solve the lack of capacity	"Guidelines can be well designed, but if a legal support is absent, then, it is not going to work. The legal support we have in Mexico at the moment is not bad, but it should be reviewed…If EIA is to have an influence it should be adequately endorsed by laws and regulations" (RR #2). "EIA regulations should be improved so that they instruct developers about EIA's concepts" (LC #20).	Developer: RR #2 Consultant: LC #20
Symbolic politics model	Just a requirement	"Many times the developer is already building the facility and therefore EIA is ignored…An impact has already been caused, and it could have been significant… Many times, unfortunately, developers undertake EIA to comply with a requirement and therefore obtain the environmental permit" (RR #9). "In 90% of the cases in Mexico, the developer hires consultants when the project site has been chosen, or even when the facility is already being built, or it is finished… Definitely, we would like the developer to be aware of the importance of EIA, but they see it as just a requirement… Developers do not have capacity and therefore see EIA as a requirement…Probably less than 5% of developers are aware that EIA is important to protect the environment… developers see EIA as a requirement because the authority has not made them aware of the importance of EIA…More capacity and training is needed (RR #10).	Consultants: RR #9, #10; TS #11; T #14; LC #18

		"Developers are still thinking that EIA is an obligation, and not a need, a need to preserve our environment; they see EIA as a legal and bureaucratic requirement" (TS #11). "I can tell you that EIA is an administrative instrument in our country. In Mexico, EIA is seen as just a requirement to obtain the environmental permit and therefore be able to operate the facility" (T #14). "There are many people that undertake EIA just to comply with the requirement… I know about a case in which the developer started building the facility without obtaining the environmental permit first" (LC #18).	
	Unnecessary requirement	"I think it is an unnecessary requirement to undertake EIA for the enlargement of projects as they are already built, and are operating, and the land use is not going to be changed…I do not think that it is necessary for enlargement of facilities, it should be a shorter application…if the project was assessed three years ago, why undertaking EIA again for the enlargement of the project" (TS #11). "I think EIA is less relevant in cases such as incineration and treatment of hazardous wastes, because these facilities are very similar to any other industrial facility. Actually, HWMF have the same risks as other industrial facilities. HWMF are usually sited in industrial areas, thus EIA is not necessary. The industrial site should have been assessed through EIA when it was created (MI #21). "In this case, EIA was not very relevant, because we already had a similar facility in the site; the project only involved the enlargement of the facility. Mitigation measures were the same that had been suggested for the original project…The environmental impact had been caused by the original project, and the mitigation measures that were implemented in the original project were enough (MI #22).	Consultants: TS #11; MI #21, #22
	Unwelcome expense	"How to make EIA not to interfere or delay projects? Because, we have to be aware that when building a facility, time means money. If I submit an EIS when the construction of the facility is about to start and the authority takes about 5 months to grant the environmental permit, I will not be able to wait, I can not wait for the authority to make a decision and not being able to build (RR #9). "Unfortunately, developers are in a rush. Costs are expensive, and that is the main problem in Mexico… developers say 'I want to start building the facility in three months, here is the money', and we (consultants) have to let him know about the time that the authority takes to make the decision, but the developer is under pressure because of the credits, and the facility is very expensive. So, developers need to start working immediately, otherwise their debt's rate increases. So, they prefer building the facility and then paying the fine for not having the environmental permit,	Consultants: RR #9; TS #11; MI #23

		than undertaking EIA" (TS #11). "For developers is hard to understand that their project and their investment is subject to EIA and an EIS which will be assessed during 60 days; and that they might not obtain the environmental permit. For them, they are losing their investment and paying more than expected, and their projects are subject to credits. So developers say 'no, I can not wait 70 or 80 days to obtain the environmental permit, EIS is an extraordinary expense, I will pay more in interests and I did not consider them (MI #23).	
	Developer's hidden agenda	"Some developers submit the EIS of a project, for example, warehouses. But these warehouses were built with the hidden agenda to change the land use of the area, and therefore facilitate the environmental permit of a later and different project" (T #14).	Consultant: T #14
	Developers prefer paying the fine	"Many developers calculate the cost of paying the fine, they say 'if I build the facility and start operating the facility without having the environmental permit, it will be cheaper to pay the fine for not having the environmental permit than undertaking EIA and waiting between 45 and 60 days to obtain the environmental permit'. So, developers calculate that cost, and prefer paying the fine" (TS #11).	Consultant: TS #11
Political economy model	Represents good image	"EIA is undertaken because "the developer is interested in having a good image… he is interested in showing that he is complying with regulations, that he will have a good environmental performance; environmentally friendly performance" (MI consultant #21). "I think EIA is undertaken because it brings benefits, for example from mitigation measures. Few years ago, for example, it was a requirement that industries have a good environmental performance to be able to compete with other countries. The industrial facility has to comply with regulations in Mexico" (MI #23).	Consultant: MI #21, #23

Table 3.2 Role of EIA during project site selection

Model of EIA	Category	Empirical data	Frequency
Information processing	Used to identify the environmental baseline conditions	"EIA definitely allows you to have a visualization of the environment where the Project will be sited, and it lets you identify preventive measures, and therefore it allows you to have a visualization of the planning" (T #13). "Before you make the EIS, you can determine the feasibility of the project which allows you to quickly evaluate the significant impacts. For example, through EIA you identify if there is a protected species in the project site, it allows you to make it evident and therefore let the developer know that the project is not feasible in that site… through this methodology we determine that it was not feasible, and to do that we used several methodologies, together with regulations…(LC #15). "I think there is a lot of information in the EIS which is not useful, however it really gives you a general idea about the region" (LC #18). "There was a protected species in the project site…we determined that the distribution of this species was restricted to some dunes located 15 Km. away from the project site, and that impacts from the facility on the species would not be generated. However, the authority requested a project to preserve the species. To do this, we asked an Institute for help to" (LC #18). "EIA was really useful, and it was useful for the developer as well, because EIA gave us a general view of the actual situation of the region" (LC #19). "We undertook flora and fauna studies, to determine the project site's compliance with regulations…There was a lot of information… about the weather, precipitation…we used that information to calculate and design the water catchments in the facility based on the data obtained. That is why these studies were involved in the design, we studied the region but we knew that the information obtained was going to be useful for the design of the landfill for containment (LC #19).	Consultants: T #13; LC #15, #18, #19

	EIA provided information regarding social baseline conditions	"We had to consider the social and political aspects as well. We had to analyze if social opposition had occurred in the project site; as well as the economic activities of the community. We needed that information because this type of facilities can be an opportunity for job generation. In our project we used EIA to obtain social information" (LC #8). "We determined social conditions, habits, economic situation of the community, employment, level of migration to other places, archaeological sites… (LC #8). "All these social issues were considered to determine whether the project was compatible with the community" (LC #8).	Developer: LC #8
	Inadequacy of information provided by EIA	"Definitely, for the developers EIA is not the best instrument, specially as we have detected that the information is obtained from books and everyone consults the same references… a thorough analysis in the field is not undertaken which would be more valuable (TS #3). "In large projects such as landfill for containment cases, if the project site is not visited EIA can not be undertaken. And I think that many developers in Mexico have that problem, they do not visit the project site, they only undertake a desk study, but that is not how EIA should be done" (MI #21).	Developer: TS #3 Consultant: MI #21

Table 3.3 Role of EIA during impact determination

Model of EIA	Category	Empirical data	Frequency
Information processing	Used to determine impacts	"I think EIA was very important because it helped to determine the impacts on the area where the project would be developed; in its flora, fauna, community, positive and negative impacts" (RR #2). "I think it is a right thing to do, as it analyzes how it is really going to affect the environment. And that is the objective of EIA…EIA's merit is the analysis of the impacts on the environment, it analyzes if the environment can cope with those impacts"… (LC #6). "During EIA, we decided to change the project three times, due to the results obtained from EIA and Risk Assessment; we discarded two processes that were going to be installed because they were going to cause larger impacts. And that is what EIA is useful for" (LC #7). "EIA is an instrument which uses several methodologies…the basic thing is that you have the expertise to identify the potential impacts…it is not only about evident impacts on the environment (soil, vegetation) but also about assessing processes, design, and long term impacts" (LC #15). "EIA determines how the environment system can be affected, as well as the mitigation measures, so that the region's environment is not deteriorated… That is why it is so important to undertake EIA… to determine how the environment will be affected by air emissions, water pollution, flora and fauna removal"… (LC #18). "EIA is very useful in landfills for containment and treatment facilities; it is a great tool to determine impacts and cumulative impacts" (TS #11). "In this case, EIA was useful to anticipate the environmental impacts"… (T #12). "EIA provides information related to air pollution, soil pollution, pollution caused by the activities in the facilities…"(T #14).	Developers: RR #2; LC #6, #7 Consultants: LC #15, #18; TS #11; T #12, #14; MI #21, #22

		"I think that EIA is very important in projects such as landfill for containment; it is significant because it will obviously assess the impacts from the facility in an area" (MI #21). "…at the end of the day, impacts are caused on the environment, but EIA helps to improve some issues, it prevents large impacts…" (MI #22).	
	Included experts from different disciplines	"Actually, we worked in a team. We are a multidisciplinary team in which each member made comments regarding the project, and all those suggestions were gathered…" (T #13). "EIA involves a thorough research, and if the area is sensitive, more detailed studies are needed; thus, if the client allows you (consultant) to work during a year, you have the opportunity to consult researchers who know the area and obtain more information from them. That is the commitment that we have, to obtain first hand and accurate information" (LC #15). "We undertook a social analysis, we hired sociologists to go to the area and talk to the community; they were in charge of identifying the needs of the community. Those needs were the first issues that had to be considered in the project" (LC #16). "We undertook EIA with different experts" (LC #17). "We hired different experts in each area to thoroughly study the region…" (LC #19).	Consultants: T #13; LC #15, #16, #17, #19
	EIA used to determine if the project could be approved by the Ministry of Environment	"EIA is very relevant, because, according to the land use of the area determined by the government, we can determine if the facility is viable in the region. There are areas where incinerators can not be built, or areas where highly risky facilities such as HWMF can not be placed; HWMF can only be built in industrial areas…EIA helps in HWMF cases to determine where the facility can be developed" (RR #2). "It took a while to select the project site. The project site had to comply with all the requirements in regulations, it took us about three years to select the project site. We analysed different places, the first thing we did was a geological analysis, we determine the depth of the underground water; and therefore the impacts that could be caused"…(LC #6).	Developers: RR #2; LC #6 Consultant: LC #15

		"Lately, developers have asked consultants about their opinion regarding the project. Even before undertaking the whole EIA, we analyse the feasibility of the project…it allows you to quickly assess the significant impacts. For example, if it is determined that a protected species is located in the project site, we inform the developer and let him know that the project is not convenient in that area and therefore a full EIA should not be undertaken… So, through EIA, we can analyse and conclude if the facility is feasible or not; together with the consideration of regulations, land use plans, etc. (LC #15).	
	EIA led to changes in the design	"During EIA, we changed the project three times, due to the results obtained from EIA and Risk Assessment we discarded two processes to be installed because they generated large impacts. That is what EIA is useful for" (LC #7). "In some occasions we have concluded that the project has to be changed; for example, the access road because the implementation of mitigation measures would be expensive. That is part of planning…We discuss wit the developer and make him realize that mitigation measures would be very significant and therefore convince him to make the changes suggested, we have to be very honest with the developer and tell him about the long term consequences of not making the changes on time" (LC #15).	Developer: LC #7 Consultant: LC #15
	Inadequate information provided by EIA	"Guidelines should be more concise, make them more practical… To be honest, I did not read all the information provided by EIA…(LC #6). "We made a summary of the relevant information from EIA and gave it to the developer in a more understandable and concise way… I knew that the developer would not have read all the information, because it was too much, that is why I made a summary (LC #19).	Developer: LC #6 Consultant: LC #19
	Low quality of EIS	"I think, the guidelines should be made according to the type of Project… guidelines should be classified or grouped to have just one, and this guide should be more simple per type of Project…there are some guidelines but they are not simplified… Guidelines should be restricted to impacts and mitigation measures; as for the results from EIA should be presented in a concise way" (RR #9). "Sometimes, we, as developers, make very large EISs and think that by adding more information the document is more acceptable… EIS has too much information which may not be useful for the authority,	Consultants: RR #9; TS #11; LC #19; MI #21

		and might make the decision more complicated" (RR #9). "EIA, for industrial projects to be located in an industrial area, should be simplified" (TS #11). "Unfortunately, competition between consultants causes EIS to be made at a very low price; and therefore to make a cheap EIS consultants copy sections of other studies similar to the project to be built or located in similar areas. That is a real problem in Mexico… Since EIA is be cheap, consultants undertake a low quality assessment (TS #11). "Sometimes, the developer asks consultants to include a lot of information, even if it is not relevant, to give the false impression of a complete EIS" (LC #19). "There are developers who copy information from other EISs (of similar projects); they do not hire consultants to undertake a thorough EIA, to determine the conditions of the region. Also, many consultants copy information from books or studies obtained from regions close to the project site but do not undertake a thorough field work. They just want to comply with the requirements in the guideline (LC #19). "I think that many consultants do not have the capacity to undertake a thorough and detailed EIA" (MI #21). "Some consultants copy information which other people generated, and do not visit the site where the project would be located, and therefore their analysis are not thorough… For example, those consultants copy the description of the baseline conditions in other EISs (MI #21).	
	Improve impact assessment methods	"It is hard to define the area that will be affected by the project. How to define it? How to set the limits in the area that will be affected by the project" (RR #9). "I do not think EIA is a bad tool, but there is uncertainty about the impact assessment methods that should be used" (LC #7). "… impact assessment methods should be less theoretical, they should be more practical and focused on	Developer: LC #7; Consultant: T#14; LC #16, #15; RR #9;

		the relevant positive and negative impacts on the environment, and on the social and political aspects" (LC #7). "…the authority should update impact assessment methods with international ones. The methodologies that are used at the moment are not updated" (T #14). "EIA in Mexico is limited in time and space, it should evolve to SEA" (LC #16). "…impact assessment methods should be quantitative, assessments are still very subjective, EIA should consider synergistic impacts, impacts from other facilities in the region should be considered and the resilience of the environment should be determined (LC #16). "EIA should be multidisciplinary, different methods should be combined according to the type of project, and also use updated methods" (LC #15). "During EIA, different experts should be involved such as Biologists, Engineers, Architects; depending on the type of project, so that they can detect issues in the project and make the necessary changes… the team should be a multidisciplinary group, there is no other way, it should be integrative" (LC #15). "What is needed in EIA is an analysis made by a multidisciplinary team; one person can not know everything. EIA needs different points of view (LC #16). "Consultants need training and capacity building" (RR #9). "Consultants should increase their expertise in EIA, for example, consultants should become experts in specific types of projects…consultants should be certified, tested, and approved by the Ministry of Environment and EMA. Consultants should test their expertise and take different courses…" (T #13).	T #13

Table 3.4 Role of EIA during determination of mitigation measures and monitoring

Model of EIA	Category	Empirical data	Frequency
Information processing	Useful to determine mitigation measures	"all the information generated during EIA is important as it is useful to correct, modify, and to develop infrastructure to compensate or mitigate…" (LC #7). "During EIA you can use different methodologies, but the main thing is that it permits the identification of impacts, their magnitude; and consequently, it allows the determination of the mitigation measures" (LC #15). "EIA determines how the environment will be affected, but it also determines the mitigation measures that will prevent the deterioration of the environment where the project will be located" (LC #18). "EIA is very useful…especially all the mitigation measures that were proposed…the mitigation measures were proposed and the project's design was changed… (LC #19). "EIA is a mechanism to report the Ministry of Environment how the project is going to affect the environment, but the most important aspect of EIA is that it is used to propose mitigation measures (RR #10). "EIA allows you to have a general view of the environment so that you can consider, well in advance, the preventive measures, and therefore it may help to have an overview of the project's planning" (T #13). "…EIA helps you to determine the likely impacts and therefore propose mitigation measures to be considered during the construction and operation of the facility" (MI #22).	Developer: LC #7 Consultants: LC #15, #18, #19; RR #10; T #13; MI #22
	To anticipate conditions attached in the	"EIA is very useful… all the mitigation measures proposed when undertaking EIA were useful…at the end of the day, the conditions attached by the Ministry of Environment were easy to comply with (LC #19).	Consultant: LC #19

	Final Statement		
	To have an overview of the cost of the project	"EIA helps you to have an overview of the costs. The information generated during EIA can be considered when making a program regarding the project's application to obtain the environmental permit, construction and operation…and therefore have an adequate management of the project (T #13). "We (consultants) have told the developer, for example, to change the access route to the facility because the mitigation measures that would have had to be implemented would have been very expensive, and that is part of planning… sometimes we have arguments with the developer but we make the developer realize that if these changes are not made, the mitigation measures needed would be very significant and expensive; and therefore convince the developer of making them" (LC #15). "The Ministry of Environment requested a calculation of the indemnity costs (i.e. to cover the environment's damage), but it is really difficult to calculate, because we do not know what the damage could be. How to evaluate and calculate that?... However, EIA makes you think of the likely impacts from the facility and therefore allows you to calculate the indemnity cost (LC #18). "For each of the impacts identified, a mitigation measure cost is determined, in that way we also made an economic analysis for the developer, to know how much the developer would have to invest to implement the mitigation measures; based on those analysis we determined the indemnity cost of the project to be stated in the EIS for the Ministry of Environment" (LC #19).	Consultants: T #13; LC #15, #18, #19
	Inadequate recommendations from consultants	"Consultants' recommendations are not well grounded in technical arguments and therefore are not taken into consideration by the developer" (MI #21)	Consultant: MI #21
	Lack of consideration of social aspects and impacts	"The social and economic aspects of the project site are only described in the EIS but an adequate assessment, as in the other environmental aspects, is not undertaken during EIA. The participation of a sociologist is absent, the analysis of the social aspect is not part of decision making… the aspect which is considered in the last place is the social aspect, and that is why many conflicts are caused, many good projects are not undertaken because they did not consider the social issues (LC #15). "EIA in Mexico does not consider the impacts on the community, and when they are considered it is in a limited manner. Developers propose mitigation measures which are not effective (e.g. build a school	Consultants: LC #15, #17

		or hospital), and this is not correct… In Mexico, there is an attachment to the land, of their resources, to their heritage, and these should be considered…at the moment, the way EIA is undertaken in Mexico does not consider these social issues, the impacts and benefits on the community… I think the poor consideration of the social aspects and impacts by the developers is damaging EIA" (LC #17).	
Political economy model	Mitigation measures represented economic benefits or increase in public acceptance	"When you approach a developer and tell him how the mitigation measures will, for example, reduce emissions and consequently save money, then they become interested… they take it into account because it represents economic benefits" (RR #10). "Some times, we have convinced the developer to change, for example, the project's access route because the impact would be larger and therefore the mitigation measures would be very expensive…" (LC #15). "I told the developer that he needed to implement a thicker liner. He told me that it was going to be more expensive. That is why I asked him what he would prefer; something more expensive now, or have the community opposing the project because the liner was too thin" (LC #18).	Consultants: RR #10; LC #15, #18

Table 3.5 Role of EIA during the review of the EIS

Model of EIA	Category	Empirical data	Frequency
Information processing	Decisions considered the compliance of the EIS with regulations	"The most important thing is to check that the EISs comply with the requirements. I mean, the EISs have to comply with all the requirements, they should include all the information requested, and then we analyse more specific issues… "(Min of Env #36). "We have rejected projects because the quality of the information provided is not adequate, it does not comply with regulations… sometimes consultants copy information from other EISs of similar projects, that is why we have to pay attention and check each of the chapters included in the EISs. According to regulations, chapter 3 must include the description of the environment, how the project is related to the land use of the region; and if protected areas are located in the region. Chapter 4 must describe the environment, baseline conditions of the area based on fieldwork, data collection…we want specific information of the project site…we check all the information provided. If the information is not complete, we request additional information. We have had cases in which the project was rejected because complete or additional information was not provided by the developer, because they did not comply with regulations. Regulations establish what must be included in each of the chapters of the EISs, and that is the criteria we use to make a decision" (Min of Env #37). "It depends on how the information is presented, if the information provided is not complete, we can not make an assessment; if the EIS does not comply with regulations, additional information is requested"(Min of Env #38). "…regulations are the criteria to make a decision at the Ministry of Environment; if the EIS is not complete, the Ministry of Environment can not undertake the assessment, and therefore it can request additional information to the developer regarding the EIS… the additional information will facilitate the assessment and therefore the decision making" (Min of Env #39). "…we check that the EIS is complete; if it is not, we request for additional information immediately. EIA process at the Ministry of Environment can be stopped if the information is not provided (Min of Env	Ministry of Environment officers: #36, #37, #38, #39, #41

		#41).	
	Decision considered the adequacy of impact assessment	"… the information provided in the EIS should be obtained using the best techniques and methodologies available, and this should be born in mind by the consultants… the EIS should describe how the data collection was undertaken, how the fieldwork was done, how many samples they made, the species identified and their status. It is not only about consulting published information, consultants must visit the project site, they should describe the environmental baseline conditions, limit the area that the project will affect…we need that information so as to know what the baseline conditions are in the area, how the project is going to affect the region…(Min of Env #37). "The EIS is the document through which the developer presents all the results from EIA; it should be based on technical grounds, adequate references, expertise, and adequate definition and identification of impacts" (Min of Env #37). "We (Ministry of Environment officers) are interested on the quality of information…I pay a lot of attention to Chapter 2 which describes how the project is going to be undertaken, how it is going to be built and operated…Chapter 4 must be based on a thorough study of the region, regarding the geology, hydrology, biology, etc. Many times we have to request for additional information because the biological aspects of the region such as fauna is not described…guidelines request the identification of residual, cumulative and synergistic impacts, but this area is a weakness in most of the EISs… In addition, EISs do not describe the identification of impacts, and therefore the mitigation measures suggested are not adequate for those impacts…"(Min of Env #38). "…basically chapter 2, we need to know exactly how the project is going to be, what it involves, all the technical aspects, the environmental aspects of the region, their limits, so that we can identify how the project will interact with the environment and therefore the impacts. An impact which is not identified is not going to be assessed, so, we identify the impacts, then assess them and decide whether the project is viable, as well as the mitigation measures needed" (Mino f Env #39).	Ministry of Environment officers: #37, #38, #39
	Low quality of EIS	"Guidelines request for the description of the alternatives considered. This is useful for the decision at the Ministry of Environment; however, not many projects include this…very few project present the	Ministry of Environment

		alternatives considered" (Min of Env #37). "The LC cases I have analysed describe the project site but do not describe the alternatives, for example, of the project site. Developers rarely present alternatives in the EISs" (Min of Env #39). "EISs include a lot of information; however, relevant conclusions regarding their impacts are not presented… they (developers) do not analyse the information they are describing and do not make a conclusion" (Min of Env #36). "EISs, in their chapter 4, describe the social aspect of the project site, but they do not describe the environmental aspects in relation to the social and economic aspects…EISs lack an economic, social and environmental analysis" (Min of Env #36).	officers: #37, #39, #36
	How to improve EIS	"The information provided in EISs should be technically well grounded, people who undertake EIA should be expert in impact assessment and should not provide information just to comply with the guidelines" (Min of Env #37). "The identification of environmental impacts should be improved. Guidelines request the description of cumulative, residual, and sysnergistic impacts; but this is a weakness in Mexico. The identification of impacts in Mexico is weak, and therefore developers can not explain the mitigation measures. These should be improved by the developer, so that we can make an adequate assessment and have all the arguments to make a decision" (Min of Env #38). "The description of impacts and mitigation measures is not complete; for example, some EISs mention that hazardous wastes will be neutralised, but they do not fully explain how they are going to do it, or what they are going to need to do it…they just describe the type of wastes that they will have in facility, but do not describe how the wastes will be treated before being placed in the landfill for containment, and that is fundamental" (Min of Env #38). "Impact assessment is subjective, we have learned that, it depends on how the impact assessment is made, how the magnitude and significance were assessed. Sometimes they (developers) forget about the impact on the environment and focus on the benefits that will be obtained from the facility (i.e. job generation)"	Ministry of Environment officers: #37, #38, #39

		(Min of Env #38). "It is not about more information, but about adequate information that we really need to assess. Developers think that the more information is included in the EIS, the better the EIS will be. But we (Ministry of Environment of Environment officers) think that a lot of information is just a window dressing. A lot of information may be used to hide weaknesses in the EIS such as incomplete information or inaccurate information. Some times EIS include irrelevant information to hide environmental problems in the region. We think suspiciously about long EISs, because EISs do not have to be very long. EISs should present an adequate impact assessment, concise and focused to the relevant aspects…To make a better a decision at the Ministry of Environment we need good quality EISs (Min of Env #39).	

Table 3.6 Role of EIA during consultation with local authorities

Model of EIA	Category	Empirical data	Frequency
Information processing	Statutory consultation to determine agreement with local land use plans	"We (Ministry of Environment officers) have to inform local authorities regarding the project and ask them for their opinion based on their local land use plans…We have had cases in which the local authorities are against the project but do not have legal arguments. In those cases, we can not consider their opposition when making a decision…In some cases, local authorities respond to our consultation stating that the project does not agree with their local land use plan and therefore the project should not be approved. In those cases, we review the information, corroborate it and make a decision" (Min of Env #37). "There are many municipal authorities which do not have land use plans, I do not know the reason why, but any way, they have to make a decision. We tell them that we have complied with regulations by informing them about the project, and that they have to determine whether the project is viable" (Min of Env #38). "For HWMF, we (Ministry of Environment officers) have to inform and consult local authorities. They	Ministry of Environment officers: #37, #38, #39; #40 Statutory consultee: RR #42

		(local authorities) have to base their opinion on their land use plan and have to inform us whether the project agrees with their local land use plan" (Min of Env #39). "… during the decision-making process at the Ministry of Environment, the local authorities are informed about the project, we (Ministry of Environment officers) take into account the local authorities' opinions based on their local land use plans. If the local authorities are against the project because of environment impacts, we do not consider their opinion because that is our decision and our assessment. We expect from local authorities an opinion based only on their local land use plans" (Min of Env #40). "We, as State government, do not assess the impact of HWMF facilities; that is the Ministry of Environment's duty. They are very clear to us, our opinion should be limited to the agreement of the project with the local land use plans. They are the ones who undertake EIA…We identify in our maps where the project is going to be located and make our opinion regarding its compliance with the land use plans" (RR #42).	
	EIA used to identify issues to be considered in land use plans	"…in areas where there are only some indications of urban development and suddenly you have an application of a development in the area, for us the EIA has been useful to realize the issues that have to be taken into account in that area, for the future Land Use Planning, the validation of those indications or urban development… it has been useful for us, but it is not very common. Most of the land use plans are already made" (RR #42)	Statutory consultee: RR #42

Table 3.7 Role of EIA when making the decision regarding the environmental permit

Model of EIA	Category	Empirical data	Frequency
Information processing	Used to determine the functional integrity of the ecosystem	A good quality EIA "means demonstrating that the project is legally viable; technically possible; administratively complete; complies with regulations; preserves the functional integrity of the ecosystem; has mitigation measures that guarantee the conservation or restoration of natural resource" (Min of Env #35). "…the consideration of the functional integrity of the ecosystem and the environmental impact identification of the LC project provided evidence that the impacts could be reduced to both satisfy the legal framework and keep the ecological equilibrium" (FS LC #3, #4, #5)	Ministry of Environment officer: #35 Final Statements: LC #3, #4, #5
	Used to determine the compatibility of the project with the environment	"In Mexico, EIA is used to determine if the project is compatible with the environment, and if the project's impacts can be mitigated, prevented or compensated (Min of Env #35). "…EIA was applied by the authority to determine the compatibility of the project's activities with the environment. No environmental impacts were identified which would affect the environment in a irreversible way…what has been discussed earlier makes evident that the state of the environment will not be affected in a relevant way under the conditions established in this Final Statement" (FS #3 p. 82) (Note: very similar paragraphs were identified in FSs #4 and #5).	Ministry of Environment officers: #35 Final Statements: LC #3, #4, #5
	Used to determine feasibility and viability	"We (Ministry of Environment officers) have to be sure, in technical and environmental terms, that the project will not have an impact either on the environment or on health…The project has to be environmentally and socially viable" (Min of Env #39). "The main thing is that EIA allows you to evaluate the viability of the Project site that is proposed for the Project, on environmental terms, both biotic and non biotic aspects; for example, protected species, underground water…" (Min of Env #40). "Based on all the arguments described above, as well as on the regulations and land use plans applicable in this project, this Department…determines that the project, which was assessed through the EIA	Ministry of Environment officers: #39, #40 Final Statements: T #7, #10; RR #12; TS #14, #15;

		instrument, is environmentally viable, therefore this Department has decided to AUTHORIZE IT UNDER CONDITIONS… (FS #7 p. 15) (Note: very similar paragraphs were identified in FSs T#10; RR #12; TS #14, #15; MI #17, #19; LC #2, #3, #4, #5)	MI #17, #19; LC #2, #3, #4, #5
	Used to determine the mitigation measures	"EIA gives you information regarding the impacts that can be caused by the project, but the most important thing is that it is possible to establish measures to mitigate, compensate or prevent those impacts" (Min of Env #39). "This Department, complying with regulations…evaluated the impacts on the ecosystem…as well as the validity of the analysis presented in the EIS by the developer regarding impact identification, and the technical feasibility of the mitigation measures proposed (FS #4 p. 66)…as a result of undertaking EIA, and analysing the EIS, this department determines that mitigation measures proposed by the developer are: 1) viable, 2) environmentally useful to reduce the negative impacts on the environment…3) these mitigation measures complemented with regulations, will reduce to the minimum the negative impacts on the environment (FS #4 p.72) (Note: similar paragraphs were identified in the FS: LC #2, #5; T#7, #10; RR #12; TS #15; MI #19).	Ministry of Environment officers: #39 Final Statements: LC #2, #4, #5; T #7, #10; RR #12; TS #15; MI #19
	Used to determine the conditions to be fulfilled	"EIA enables the assessment of projects or activities to establish conditions for their development. Conditions that guarantee that an ecological disequilibrium will not be caused; and that regulations are respected; and furthermore, that guarantee that the ecological functional integrity of the ecosystem is kept" (Min of Env #35). "According to regulations, EIA is the process through which the Ministry of Environment establishes the conditions to which the project will be subject…to protect and preserve the environment, and minimize the negative impacts on the environment. Based on what has been explained above, and after undertaking the analysis and assessment of the environmental impacts, this Department establishes the conditions attached for the prevention and mitigation of impacts, to avoid, ameliorate, or compensate the environmental impacts caused by the project during its different phases"…(FS #4 p. 78) (Note: very similar paragraphs were identified in the FS: #3, #5, #7, #8, #9, #10; RR #12, #13; TS #15; MI #18, #19)	Ministry of Environment officer: #35 Final Statements: LC #3, #4, #5, #7, #8, #9, #10; RR #12, #13; TS #15; MI #18, #19

	Consultants' lack of capacity	"Consultants lack capacity, I am very critical with consultants at a national level…It is outstanding how consultants have never read regulations, they do not understand that EIA is a multidisciplinary tool, it should include biologist, lawyers, environmental engineers…Developers decide the market for consultants, there is a lot of competition amongst consultants, and developers pay consultants a very low wage which promotes very low quality EIA. Consequently, EIS have very low quality, and that does not help the project" (Min of Env #35). "It happens very often, consultants copy sections from other EIS of similar projects, it does not matter if they are located in different States (locations)…" (Min of Env #37).	Ministry of Environment officers: #35, #37
	Inadequate impact assessment methods	"EIA is more than just gathering information and analysing the environmental impacts; it should consider the impacts that occur outside the project site…There are projects where significant impacts will occur during the operation of the facility, and other projects such as landfill for containments where significant impacts appear after the facility is closed" (Min of Env #36). "EIA, as it is undertaken at the moment, it does not consider cumulative and synergistic impacts… Since they do not describe all types of impacts, the mitigation measures suggested are not adequate. These should be improved, so that we can undertake a better assessment of the project and have more arguments when making the decision, that is what we are lacking at… evaluations during EIA are subjective, it depends on how the impact assessment was undertaken, how the magnitude and significance was assessed, developers usually forget about environmental impacts and focus on the economic impacts such as job generation, but do not analyse the environmental impacts" (Min of Env #38). "…EIA can be improved by using more accurate information obtained from field work, and site visits; EIS should include enough information to determine changes in time; environmental data should be collected during one or two years for a better establishment of the impacts that would be caused by the project and therefore propose adequate mitigation measures" (Min of Env #40).	Ministry of Environment officers: #36, #38, #40

	Uncertainty in EIA practice	"If you analyse previous regulations, you will realise that, in Landfill for containment cases, complying with all regulations was almost impossible, that obstructed development of this type of facilities…Regulations for landfill for containments were changed and became more flexible… However, landfills for containment designed following the new regulations and assessed through EIA are not operating yet. And therefore we do not know whether the mitigation measures suggested were adequate… Min of Env #37).	Ministry of Environment officer: #37
	Time pressure	"EIA process and the decision are made within sixty days, that means a lot of pressure for us (Ministry of Environment officers) (Min of Env #35). "We (Ministry of Environment officers) need a larger team. We need to change the time span to make the decision… When we make teams to assess projects such as landfills for containment, each team has its own work load aside from the project, and therefore undertaking a thorough analysis is difficult. The period of time is not enough to analyse all the project and analyse its impacts, we are always in a rush…"(Min of Env #38). "In Mexico, we undertake the EIA process in a very quick way compared to other countries. In other countries such as US and Canada, it takes years to make a decision, whereas in Mexico we have to make it between sixty to one hundred and twenty days. It is enough time; however, we have a massive work load. I mean, we need more time. We assess five projects at the same time and consequently sixty days are not enough (Min of Env #39).	Ministry of Environment officers: #35, #38, #39
	Decision considered regulations and environmental aspects	"…at the end of the day, if the project demonstrates that it complies with regulations, it is environmentally viable, and it is legal, we (Ministry of Environment officers) have to grant the environmental permit" (Min of Env #35). "…whether the project complied with the regulations NOM 052 and NOM 055 regarding the Landfill for containments; if it considered the environmental aspects. And, well, the most important aspects such as type of soil, permeability, water, close water bodies, risk of flooding, flora, fauna… also pay attention to what the final stage of the landfill for containment is going to be and the hazardous wastes stored… (Min of Env #36).	Ministry of Environment officers: #35, #36, #37, #38, #39, #40, #41

		"EIA is very important, it is the base on which the decision is made considering regulations, technical, and environmental issues…So it is very relevant because we need to guarantee that the project complies with both the objectives established by the Ministry of Environment and regulations… it is a decision about a project, based on environmental issues and on regulations…" (Min of Env #37). "We focused on environmental issues only…We focus on regulations which establish all the conditions and characteristics for landfills for containment (e.g. project site, geology, operation), and the project has to comply with all those regulations). There should not be any doubt that the project complies with regulations…We analyse the project, and analyse that it complies with regulations (Min of Env #38). "We base our decision on the impact assessment of the project, we determine if it affects the functional integrity of the ecosystem…It involves a technical analysis of the project, and the local environment…We focus on the sensitive aspects of the project's site environment such as protected species…the project site is analysed, together with the environment, the design, and the environmental components… if the project is environmentally viable, the project is approved…if the project does not comply with the land use plan, or can damage a protected species, the project is rejected… if the developer includes false information in the EISs, the project is also rejected (Min of Env #39). "We (Ministry of Environment officers) consider the environmental aspects that can be affected, the project site…the compliance with regulations regarding the project site, the design of the facility, the characteristics of the project site… types of wastes…Projects are rejected if they do not comply with regulations, if the project causes a species to become endangered, and if the EISs presents false information. Those are the three reasons why the project can be rejected" (Min of Env #40). "Facilities are analysed from the environmental point of view, based on regulations. We analyse the buffer zones, the neighbouring infrastructure, the environmental impact…" (Min of Env #41).	
Participation model	Decision considered social concerns	"… All the information generated by the society during the public consultation is taken into account…if it is regarding environmental issues… it is not considered if it is regarding the economy of the area for example" (Min of Env #36). "In case social opposition occurs, their concerns are taken into account, and we try to respond to them	Ministry of Environment officers: #35, #36, #40

		based on technical arguments" (Min of Env #36). "One characteristic of EIA is that it involves social participation…EIA and therefore the environmental permit is the only permit that considers social participation…We make a decision within a legal and technical framework, considering the community and its concerns. Concerns that are regarding environmental aspects" (Min of Env #35). "Social concerns are considered during public consultation if those concerns are based on technical grounds and environmental aspects" (Min of Env #40).	
Institutional model	EIA as a learning resource	"… we (Ministry of Environment officers) reviewed the EIS; information was obtained, bibliography…we had to involve biologists… and I even learned that the type of ecosystem where the lizard is distributed is a dune, and the project site was not located in a dune, therefore it gives you the evidence to identify the impacts on the environmental aspects…"(Min of Env #37).	Ministry of Environment officer: #37
	EIA as an instrument of environmental policy	"EIA in Mexico is an instrument of environmental policy because it is referred to in a Law, that is the LGEEPA; is an instrument that enables, as the law establishes, to assess the project and activities, and establish the conditions for their development" (Min of Env #35).	Ministry of Environment officer: #35
	Land use planning has not been put into practice	"To improve EIA, the complementary instruments of public policy such as land use planning, and regulations should function…to define where we want to go as a country regarding landfills for containment and wastes in general" (Min of Env #35). "At the end of the day, it is about Strategic Environmental Assessment, that involves the assessment of programs, of land use plans…Regional and local land use plans should be assessed…at the moment it is up to the local authorities to undertake an assessment of their land use plans, and therefore not many authorities have undertaken it" (Min of Env #36). "National land use plans are not put into practice at the local level…Many times, the municipal authorities want to make their land use plan based on the State land use plan, but the State has not made its land use plan either…" (Min of Env #36).	Ministry of Environment officer: #35, #36

		"Land use plans have a high political cost for municipal authorities such as the president, as well as for the State government. Making a decision regarding land use is a very big problem and no one wants to cope with it" (Min of Env #36). "Landfills for containment are located in places away from the communities, but in those places there are no land use plans" (Min of Env #36).	

Table 3.8 Role of EIA during public consultation

Model of EIA	Category	Empirical data	Frequency
Information processing	Used to inform the community	"We have to give information to the community…and EIA is restricted to public participation regarding technical aspects of the project. We can not go to the community and discuss the project regarding alternatives. We are not going to discuss the project. I only show the project to the community… (LC #20). "The value of public consultation is reporting what the Project is about, it works in some cases and in some others it does not…" (LC #7).	Developer: LC #7; Consultant: #20
	Information source	"Public consultation can be requested by anyone…it is a public gathering which helps us (Ministry of Environment officers) to make a decision, to identify issues that were not considered in the EIS and therefore we can request for more information to the developer" (Min of Env #38).	Ministry of Environment officer: #38

	EIA means to access information	"We (NGO) used the EIS to determine whether the project complied with regulations, that was our main concern (LC #26). "We determined that the project complied with regulations… that was the main issue for the community" (LC #27). "We were really interested on the EIS because through it we can get to know which impacts were going to be generated during the preparation and construction of the project…the mitigation measures that would have to be implemented by the developer…It allowed us to assess the risks that could be caused by the facility; the types of hazardous wastes to be managed; if they were listed in regulations; if the amounts of wastes stated are accurate; if the species to be affected were adequately identified and listed; the impacts on water...The EISs include environmental aspects such as water, biodiversity, geology, safety; and we focus on those issues…The EISs are useful to identify the impacts and mitigation measures to be implemented and therefore we can review them and make sure that they are thorough…(LC #28). "Through EIA we can determine if the project agrees with the land use plan of the region, with the policies of conservation and use…We review the Final Statements of projects and make sure that the conditions attached and the project comply with regulations…If the project does not comply with regulations, or regulations are not complete…we make comments to the Ministry of Environment or the adequate authorities to suggest changes on the project" (LC #28).	NGO: LC #26, #27, #28
Participation model	EIA, process with social participation	"EIA is the only decision-making process in Mexico which requires public participation…and therefore it should be able to consider the interests of stakeholders and concerns of the society regarding environmental issues" (Min of Env #35).	Ministry of Environment officer: #35
	EIA, means to approach the Ministry of Environment and developer	"EIS is a tool to have access to information, to approach and make links, to review the information and therefore make comments to the authority (Ministry of Environment) and developers and be able to make suggestions to change the project" (LC #28). "We asked the developer to take into consideration the location of the facility; the risks that it involved due to the characteristics of the project site. We made the developer aware of the characteristics of the project site, that many endemic species were located in the area, and that the project site had a high	NGO: LC #27, #28

		ecological value for the State…that the leachates from the facility could reach a dam which provides water to the community, that the project was located close to a protected area and therefore the facility was a risky activity…We made comments to the study of the geology presented in the EIS, because it was not adequate, and it did not consider the risk of earthquakes in the area and therefore it did not consider the impacts of such situation. We asked the developer to fully describe the conservation policies that were going to be implemented…The developer requested a meeting with the NGO, it was a thorough meeting and we discussed the project…" (LC #28). "The EIS helps you to approach the developer and establish a respectful dialogue. You can make comments regarding the technical aspects of the project, and the developer can give you technical answers" (LC #28). "We reviewed the EIS and made comments to the Ministry of Environment regarding mitigation measures, and reasons why the project should or should not be approved…" (LC #27). "During public consultation the developer had to answer the questions formulated by us. That was something very important, because the community had the opportunity to express their concerns. We use public consultations to let the Ministry of Environment and developer know the strengths and weaknesses of the Project…In this case, the public consultation had really good observations and important issues were indicated to be changed in the project such as water catchments, safety issues, biodiversity…the community had the opportunity to express, make evident, and improve the project…" (LC #27).	
	Informative session to express concerns and discuss	The public informative session in EIA was "…used to discuss the project…is an opportunity that the public consultation gives… it allows you to be face to face with the developer and indicate the things that are wrong in the project…the objective is to make strong questions; to make evident the problems in the project; since the Ministry of Environment is there it can realise those issues and consider them as well" (LC #27).	NGO: LC #27

	Discussion depends on level of education	"For us (consultants), it depends on the information stated by the community…for example, in areas of the country where there is a large concentration of postgraduates, where the community has a higher capacity and training, the discussion about the project can be undertaken…" (LC #20).	Consultant: LC #20
	Community is not informed	"Neither the Ministry of Environment, nor the developer inform or consider the community's opinion. They just try to convince them with the benefits on the economy… From my point of view, developers submit the EIS to the Ministry of Environment without informing the community, because it is more convenient for them (LC #26). "The developer was not in touch with the community. I think they distributed some leaflets with very basic information, but the leaflets focused on just defining hazardous wastes and their management…"(LC #27). "The community was not informed about the project…only the president of the municipal authority and people who were going to sell the land were the ones who knew about it. The project was close to obtaining the environmental permit and we did not know anything about it. The president of the municipality did not let us know" (LC #29). "The developer did not come to the community. Yesterday, I invited the developer to come to the community, but he was rude to me…The community does not trust the authority. I am very doubtful because we know how things work in Mexico, how everything is done under the water, hidden from the community which is going to be affected, and how everything is agreed only by people who will obtain an economic benefit. I think that the fact that the hosting community and neighbouring communities were not informed is alarming (LC #30). "We were not informed about the project. We did not know about the requirements…the municipal authority had been informed about the project, but it did not inform the community" (LC #31).	NGO: LC #26, #27, Members of the community: #29, #30, #31

	Limited access to the EIS	"It is very difficult to consult the EIS, even if it is supposed to be public and available to everyone. At the Ministry of Environment's website the EIS appears as 'not available'. We do not have access. Public consultation is a joke because these projects are usually located in rural areas where the community does not have access to the Internet. The project is published in a Newspaper, but the community does not get to read it, the access to the EIS is therefore very limited. In addition, you will have to commute to get the closest Ministry of Environment office, and the people from the community may not be able to afford it. Many times, people manage to get to the Ministry of Environment but the access to the EIS is denied" (LC #26). "We could not have access to the EIS; when we asked for a copy to the Ministry of Environment, the Ministry of Environment officers told us that the copy would have a cost of one million pesos, we obviously could not afford that" (LC #29). "We are asking for the EIS as we want to use it to make a decision. But we have not got it yet. We are asking for the complete file as well, but we are struggling a lot, neither the Ministry of Environment nor the developer is letting us see the complete file. And this is very important for us. We are interested on seeing the EIS…We have tried the Ministry of Environment's website, but all the file is not available; and this is worrying us" (LC #30). "We requested for the EIS to the Ministry of Environment and they said yes; but when I went to the Ministry of Environment office they questioned me. They said that if I wanted a copy of the EIS I would have to pay for it. That we had to pay the right of consulting the footprints of the project…We asked the developer for the EIS, we asked him to come and make presentations regarding the project but he never came…We never had access to the EIS, neither through the developer nor through the Ministry of Environment…Then, we learned that the municipal authority had been informed regarding the project but he never let the community know. So, when we wanted to oppose the facility and inform the Ministry of Environment about our rejection and opinion, the Ministry of Environment told us that it was too late, that we should have done it within the first fifteen days after the municipal authority was informed" (LC #31).	Members of the community: LC #29, #30, #31 NGO: LC #26
	Technical jargon	"If you read the EIS you will realise that it is not easy to understand it. The document has many terms, abbreviations, regulations…if people read it they will be very disappointed, they would have to ask for help to translate those terms" (LC #30).	Consultant: LC #20

		"During public consultation, we (members of the community) tried to discuss issues with the developer and authorities, but they made fun of us, because we did not have information. They asked us if we were crazy, what we were talking about. They said that we did not have any idea about the project'. They gave us the opportunity to speak, but they laughed at us because we did not know about the project, and did not have accurate information about the project and what it involved. They took advantage of that" (LC #31). "The EIS has a very technical jargon…I read the EIS, and I struggle to understand it. I am a lawyer, and I focus on the legal aspects. Through the years and after reading several EISs, I have learned some aspects, I try to understand it, but it is still very difficult. In this project, the community members were farmers, they could not understand the EIS (LC #27). "Public consultation requires an informed participation; people should be able to understand the information. When the community does not have the capacity to understand the information provided it will not be able to participate" (LC #20). "If you see the EIS, it has technical terms; it is a large document which you can not understand, and you can not afford an expert to translate the terms for you and determine whether the information is accurate or not" (LC #29).	Members of the community: #29, #30, #31 NGO: LC #27
	Short period of time to request public consultation	"The period of time to request public consultation is very short, if you miss it or the community gets to know about the project two months later, there is no way to request a public consultation" (LC #26).	NGO: LC #26
	Lack of a standardized public consultation	"EIA process includes public consultation, but each developer undertakes in a different way. Some developers undertake it and others do not. Public consultation is not well established, it is not clear how to undertake it, what it is…In addition, undertaking public consultation is not compulsory, and therefore it is not undertaken by some projects…" (LC #7). "Another problem in public consultation is that regulations state that the Ministry of Environment may undertake it according to some requirements, but it is really up to the Ministry of Environment…but it is not a compulsory. It is not the Ministry of Environment's obligation… In addition, regulations do not	Developer: LC #7 NGO: LC #27, Member of the community:

		state how public consultation should be undertaken…The way public consultation is undertaken at the moment does not encourage a constructive discussion about projects, it is just a confrontation with the developer…" (LC #27). "Since there is nothing structured or established on how public consultation should be undertaken, both, authorities and developers manipulate it and undertake it according to their objectives and benefits" (LC #31).	LC #31
	Biased public consultation	"I do not remember any public consultation which was requested due to people supporting the project. Public consultations are requested because people are already against the project, someone who does not want the project requests for it, he is usually advised by an NGO…People's concerns during public consultation are not related to environmental issues. For example, landowners usually complain about the payment for their land; but that is not an EIA issue, it is out of our scope. This is recurrent, every time a project becomes conflictive it is not because of environmental issues but about landownership, rights over the land, payments, indemnity payments, but it has nothing to do with the environment. Hardly in any public consultation have the community expressed concerns about the environment, maybe in four or five cases the priority has been the environment…But the right to participate is there, people have access and have the right to express during EIA procedure" (Min of Env #35). "EIA includes public consultation, but each developer undertakes it in a different way. Some developers undertake it and others do not. There is not a clear way to undertake it, a structure on how it should be, and that makes it a political issue…people from the community are not interested on EIA, they just want to use EIA's results to use them as arguments. If public consultation is undertaken in the wrong way, as it was for us, it destroys the project. Opportunistic people attend public consultations, they are paid by a third party to oppose… Instead of using public consultation to inform the community about the project, it is used to destroy the project…people who support the facility do not express their opinion, whereas opposing people attend public consultation express their opinion and make other people oppose as well. In this case, people were paid by a third party to oppose. I can not believe the authorities are not aware of this…public consultation was out of control…If public consultation is not undertaken adequately, it gives arguments to opposing people who are not truly interested on the environment (LC #7). "When a project is conflictive there are always economic interests involved. Opposing people were paid	Ministry of Environment officer: #35 Developer: LC #7 Consultant: LC #16

		by a third party whose economic interests were being threatened by the project… In addition, NGOs are interested on economic benefits as well, they check the Ministry of Environment's website constantly to identify projects in which they can get involved and obtain benefits from opposing (LC #16).	
	Confrontation during public consultation	"…the way public consultation is undertaken does not encourage a constructive discussion about the project; instead, confrontation occurs between the developer and the community and NGOs (LC #27).	NGO: LC #27
	Lack of public support	"When people were opposing the facility and questioned the Ministry of Environment, the Ministry of Environment did not support its decision regarding the authorization of the project before the community; the authority did not do its duty" (LC #7).	Developer: LC #7
	Public consultation should be undertaken by the Ministry of Environment	"Public consultation should be undertaken by the Ministry of Environment, it should have people working at the project site, undertake an assessment of the project site with local universities, local NGOs, it should gather the opinion of the different sectors of the population…the Ministry of Environment should approach the local authorities and have a better communication and link with them about the project" (LC #8).	Developer: LC #8
	Public consultation should be undertaken by developers	"We (Ministry of Environment officers) have tried to change regulations to make public consultation a compulsory stage for the developer before the EIS is submitted to the Ministry of Environment. In many other countries, the decision is faster because the developer undertakes public consultation and reaches an agreement with the community before submitting the EIS" (Min of Env #35). "Developers do not involve the community early in the planning, and leave that to the authority. That is one of the greatest problem of EIA in Mexico, everything starts once the EIS is submitted…It is in the interest of the developer if social opposition occurs to facilities such as landfills for containment, it is the developer's business, and it seems that the authority has to take part and support either the society or the developer, but the developer and the community never interact well in advance" (Min of Env #35). "The application to obtain the environmental permit starts when the developer submits the EIS, but the project starts when it is presented to the community, when the community is informed about the project. The developer should be in touch with the community well in advance and tell them 'this is my project, it is going to have impacts on the environment, the project has some risks but they are very low. I can help	Ministry of Environment officers: #35, #39, #40

		the community, maybe through the implementation of infrastructure as part of the project, the facility will have benefits on the community'…The developer has to engage the community early in the process; since the beginning of the project's planning. The developer should go to the community, inform them, because they have the right to be informed, this would benefit the project. That is the developer's responsibility; it is somehow stated in regulations. Developers do not engage the community because it is not established in regulations and therefore is not an obligation" (Min of Env #39). "Public consultation should be more open, it should be undertaken before the EIS is submitted, so that the different opinions can be described in the EIS. Public consultation should not be undertaken after the EIS has been submitted and as part of the EIA process at the Ministry of Environment. Regulations should be changed to establish public consultation before the submission of the EIS (Min of Env #40).	
	Improve public participation	"One of the main things is to improve the way people are involved…people should be involved early in the planning, since the beginning, so that the community can take part of decisions. Developers should involve the community, and in that way it might be a successful project, instead of having social opposition, the community would support the project…a point should be reached where the community obtains benefits from the project, impacts are not caused, and the project can be developed…People have the right to express their opinions…opinions should not only be filed but they should be taken into account and negotiations should occur, but this is not happening…Public consultation is just an informative session where discussion does not occur" (LC #26). "Projects are rarely published in well read newspapers. I would say developers never do it. The period of time to request a public consultation should not start when the project is published in the Ministry of Environment's magazine and on its website. Because people from the community are not able to read the magazine, have access to the Internet, or let alone go to the Ministry of Environment's office to have access to the EIS. The community does not get to know that the projects is affecting their community...Public consultation should change, it should be more constructive. I know it would be almost impossible, but somehow public consultation should bring the developer and the community closer. At the end of the day, the developer and the community will be neighbours and their relation should be healthy and not conflictive…During public consultation the Ministry of Environment should be able to listen to the community before making a decision" (LC #27).	NGO: LC #26, #27, #28 Member of the community: LC #29

		"There should be a mean through which the developer could spread the word about the EIS; maybe supported by the local authorities. The developer could use leaflets, or understandable information for the community. Leaflets should introduce the developer, the EIS, and how the project is going to be undertaken…Somehow the developer should engage the community, be transparent about the activities that will be undertaken within the facility. The developer should involve the community and the community should have the opportunity to evaluate the project and express their concerns and make a decision regarding supporting the facility…Consultation should include the community as well as experts in the field. Consultation should not be restricted to experts…Consultation should include the community; the community should be able to express what they expect to have in their environment, how they would like to develop their community, and how that development could be linked to the project…(LC #28). "The developer should have undertaken public consultation before even talking to the local authorities…the community should have been given information regarding the project…The project should be approved by the community specially in cases such as landfills for containment…The community should be given understandable and adequate information, so that the community can be aware of the impacts and risks from the facility. Thus, the project will be accepted if the project complies with regulations, protects the environment, and its acceptance occurs through a democratic process" (LC #29).	
	EIA should conciliate interests	"…EIA should have an element of negotiation and engagement with the community, with the different sectors, so that a synergy is reached with stakeholders and affected community…stakeholders should know about the project…Negotiation should occur with the community, with social groups, NGOs, and local authorities. Therefore, EIA should conciliate all the different interests involved in a project. All stakeholders have interests, they have a need…Negotiation should be undertaken to conciliate the interests involved, shared interests should be identified, and the project should try to satisfy those interests and consequently stakeholders would support the project" (LC #16).	Consultant: LC #16
	Early involvement of the community	"All projects should be published in well read newspaper, not only contentious projects such as landfills for containment…we (Ministry of Environment officers) think that people should be informed, that would be the ideal situation" (Min of Env #35). "Engaging the community and public consultation should start early in the project's planning, the	Ministry of Environment officers: #35, #39, #40

		developer should approach the community, inform them. The community has the right to be informed. All these will benefit the project. It is the developer's responsibility …"(Min of Env #39). "Public consultation should be more open, it should be undertaken before the EIS is submitted, so that the different opinions can be described in the EIS. Public consultation should not be undertaken after the EIS has been submitted and as part of the EIA process at the Ministry of Environment. Regulations should be changed to establish public consultation before the submission of the EIS (Min of Env #40).	
Symbolic politics model	EIA represents a guarantee	"Unfortunately, at the public consultation, the Ministry of Environment was trying to be a guarantee that the EIS was going to be studied, that the study would be technically grounded, and that conditions would have to be met by the developer because local authorities would be auditing the facility but it did not work…" (LC NGO #27). "…EIS is an important instrument that will enable us (NGOs) to guarantee that the facilities are not dangerous, but we need to strengthen the EIS with environmental performance records, with instruments that enable us to conduct permanent monitoring of the facilities and therefore give certainty to the community that nothing is going to happen…" (LC NGO #28).	NGO: LC #27, #28

Table 3.9 Role of EIA during social opposition

Model of EIA	Category	Empirical data	Frequency
Symbolic politics model	EIA used as a proof that everything is done in the right way	"… it is a project which is good for everyone. However, there is a group with hidden interests that I do not know, and we have to prove to them through EIA that everything was done in the right way, that there is no reason to be against the facility" (LC developer #6).	Developer: LC #6
	EIA is perceived as an endorsement	"EIA is an important requirement…EIA endorses that the project will not damage the ecosystem. And if it is going to be damaged, how it is going to be damaged, and how feasible the project is… EIA is a requirement to make the project according to the environment" (LC member of the community #31).	Member of the community: LC #31
	EIA used to obtain arguments to oppose the facility	"…this NGO is against facilities such as incinerators and landfills for containment of hazardous wastes, we reject them, because they do not encourage the use of alternatives for waste management that already exist…Therefore, I think that in this NGO we use EIA as a tool to identify faults in the project and the process, all the EIA process is very important for us. We have to be alert about the deadlines for example to request public consultation. That is the most important thing" (LC #26).	NGO: LC #26
	EIA is a way for developer to legitimise projects	"EIA is valid if it states the truth. But, how to know if it is saying the truth? It is difficult. But we can know it in a way, not from the EIS though. Not through the EIS because it has technical jargon which is impossible to understand…but through the EIA process, the administrative process, how it was undertaken, who was involved in decision making, background of the developers and political leaders. We consider the developer's background, who are the shareholders of the company, if it has undertaken similar projects and the impacts they have had. We have to research the developer thoroughly. The developer and government make decisions and we have to analyse their moral quality. We have to consider their moral quality. It is very important…EIA is used by them to legitimise project, for good or ill" (LC #29).	Member of the community: LC #29
Institutional model	EIA as a learning	"…after reading many EISs, I have learned about the technical aspects and I have been able to understand, for example, about wetlands…" (LC #27)	NGO: LC #27

	resource		
	EIA is a mean for triggering good environmental performance	"…if things are done as they should be done we will reach a point in which we'll get used to doing things in the right way. If developers see that resources are available, but that if they take care of the environment it will produce more, of course they are going to do things in the right way…" (LC #30).	Member of the community: LC #30
Information processing	EIA is an instrument to identify and analyse impacts	"EIA is a study which analyzes all the likely impacts from the facility…taking into account the baseline conditions of the area; it gathers all the factors…impacts and benefits that it can have, the costs and risks to the community, the impacts on social and economic aspects" (LC #29). "EIA for us is a study to analyse how our environment is going to be damaged by the facility, how it is going to pollute the soil, the underground water, the air, and the community and its lifestyle…If the study is undertaken using an adequate technology and the conditions attached are respected, then, the outcome will be wonderful for the community. Through the EIA we can identify if the project is going to modify or have a negative impact in our environment; and thus we can use EIA as a preventive measure. If the facility has a positive impact. Good for us!" (LC #30).	Members of the community: LC #29, #30
Participation model	Means of exercising the community's rights	"EIA is useful for everyone, to community, to national developers and even international developers. EIA definitely helps a lot, it also helps the community to get used to exercising their right of being informed" (LC #30).	Member of the community: LC #30

Table 3.10 Role of EIA when engaging local authorities

Model of EIA	Category	Empirical data	Frequency
Symbolic politics model	EIA used as a confidence endorsement	"…all the results from the studies undertaken by experts from universities were seen by the Municipal authority, they were a confidence endorsement, and finally when we did all the presentations we described how EIA was undertaken and the assessments made" (LC developer #38). "We (consultants) gave the municipal authority a copy of the EIS and of the Final Statement. He (municipal authority) was doubtful about the operation and risks from the facility and hesitant of giving the building permit because his administration was finishing. We (consultant) told him that nothing was going to happen in the facility; that he had the EIS and he could corroborate it" (LC consultant #18).	Developer: LC #8, Consultant: LC #18

Table 3.11 Role of EIA during the building permit decision making

Model of EIA	Category	Empirical data	Frequency
Information processing	Source of information	"The EIS is an important requirement because it informs us what the Project is about, what is going to happen, and the commitments that the developer will have. It describes the impacts that will be caused, how the impacts will be mitigated, how the developer is going to undertake the decommission phase of the project…" (LC #33).	Municipal authority: LC #33
	Used for auditing facilities	"We will audit the facility…the EIS informs us how the project will be undertaken, and therefore we are going to be able to stop the facility if it is not complying with the Final Statement and the conditions attached…We need EIA, EIS, and risk assessment to be able to audit the facility" (LC #33). "…We use the EIS and FS to verify that the project is adequately undertaken; and that mitigation measures are complied with…" (LC #33).	Municipal authority: LC #33, #34

		"Our (municipal authority) duty is to make sure that the facility complies with regulations based on the EIA…" (LC #34).	
	Uncertainty in EIS	"There is uncertainty within EIA, we do not know exactly which hazardous wastes are going to be stored in the landfill for containment, their quantities, and for how long. Not even the developer knows it for sure. The developer is still looking for clients. Thus, we have to make a decision based on something that we are not sure about, something that might happen…" (LC #33).	Municipal authority: LC #33
	Lack of expertise	"…We (municipal authority) acknowledge that we are not experts, that is a reality. No one really knows where the hazardous wastes will come from, how they are going to get here, or how they are going to interact with the environment. We do not know everything about the project. We can hire experts who can have the expertise in the matter and they could explain us if the project is being undertaken adequately" (LC #33). "Many municipal authorities do not have the expertise to interpret EIA" (LC #34). "EIA should be simpler, like a technical summary adequate to the kind of person who is going to read it. Not everyone is an expert in the municipal authority. Different people have to be able to understand it, and usually people within the municipal authority can not understand EIA. Municipal authorities do not have the expertise to interpret EIA. It should be clear, concise about the studies that involved, and how the impacts will be prevented...EIA should use a simpler language so that people in the municipal authority can understand what the project is about, the developer should hire consultants with the ability to communicate with people who are not experts" (LC #34).	Municipal authority: LC #33, #34
Institutional model	EIA is an institution	"EIA can not be ignored, it is an official requirement, it is an institution" (LC #33). "EIA was taken into account; it was relevant because it had been reviewed by experts in the Ministry of Environment" (LC #32).	Municipal authority: LC #32, #33

	Disagreement between Ministry of Environment and local authorities	"Developers had complied with all the requirements, and therefore the building permit was granted by the municipal authority. However, social opposition and conflicts started. The project was viable, we still had to make some changes, but it was definitely viable. We applied for the environmental permit, and it was rejected, we could not believe it (LC #17). "In legal terms, the municipal authority is the one who has the power, and the municipal authority was the one who rejected the building permit even though we had obtained the environmental permit. There was social opposition, negotiation was not undertaken, and the community had not been engaged" (LC #16).	Consultants: LC #16, #17
Participation model	EIA lacks the consideration of social opposition	"It is very hard to deal with all the opinions, it is very difficult for us (municipal authority) to say 'of course we need a landfill for containment', but we do not want to damage our environment or the people. How to conciliate that? Where is the limit in which we can say 'yes' or 'no'? Decisions are very hard for us, and EIA does not consider such matters" (LC #33). "EIA should be able to conciliate interests, it should not be restricted to technical aspects only, it should involve a communication process as well. If this is not undertaken, I do not think that Landfills for containment will be accepted in the short term. If I (municipal authority) had not been as involved as I have, the project would have never advanced and the building permit would not have been granted. I had to face social opposition…EIA focuses on the simple things, the technical aspects which are quantitative, or you can attach conditions and that is it. But it does not consider the social aspects; it is a completely different thing. EIA should definitely consider social aspects" (LC #34).	Municipal authority: LC #33, #34
Symbolic politics model	EIA as a guarantee	"The problem is that we (municipal authority) do not have the certainty. We would like to be certain that everything in the facility will be fine; that they (developer) will comply with what it is stated in the EIS and FS; and that the municipal authority will be auditing them; but we do not have the certainty, and that is why the community is scared" (LC municipal authority #33).	Municipal authority: LC #33