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Cumulative effects in Mexico: legislation and practice

Abstract
Cumulative effects were introduced in Mexican regulations in 2000. This paper examines the legal framework and practice of EA in Mexico to determine to what extent they consider CE. The paper concludes that both the legal framework and practice have gaps that allow the occurrence of CE unaccounted for. This results in low effectiveness of EA as a tool for sustainable development. Changes to the environmental legislation and the review process are recommended, for instance, considering CE for particular EAs and not only for regional EAs as it is now. Another is to elevate the relevance of CE as a criterion for planning regional land use.

Keywords: cumulative effects, environmental assessment, environmental governance, risk assessment, regional projects, Mexico.

Introduction

Environmental impact assessment (EA) was introduced in Mexico in 1988, when the first Mexican Environmental Law was passed by the Congress (Ley del Equilibrio Ecológico y Protección al Ambiente, LEGEEPA hereafter [GM, 1988; SEMARNAT, 2003a]). LGEEPA was reviewed in 1996 and has been amended on several occasions, most recently on 2007. Cumulative effects are not mentioned in LEGEEPA but on the LEGEEPA's Regulations for Environmental Impact Assessment (see GM, 2000).

In 2004, the author conducted a study on the use of EA as a decision-making tool for protected areas in Mexico and Canada (Mendoza, 2004). One of the findings was that in Mexico EA reports were weak tools for decision-making. This resulted from the poor quality of the content and analyses, insufficient time given to park staff for providing feedback on reports, and irregularities on the review process, among others. A second finding was that cumulative effects (CE) assessment was not used for decision- making. Another study by the author (Mendoza and Quinn, 2008) pointed to deficient environmental governance as one of the factors negatively influencing conservation success in Mexico. The purpose of this paper is to analyze a) how cumulative effects are considered in the regulatory framework and EA process in Mexico, and b) what the repercussions are on EA practice and on management of CE. In this paper, the assessment of cumulative effects is considered as both a best practice and integral part of EA (e.g. CG, 2003; Duinker, 1994; Sadler, 1996).

Methodology

For simplicity, in this document project refers to any activity, work, or project that needs to submit an EA report to get approval from the SEMARNAT regarding environmental impacts. Impact and effect are used interchangeably and mean adverse impacts. 'Art.' is used as abbreviation of 'Article(s)' of legal documents.

Three main information sources were used on this research:

- First, the author analyzed the regulatory framework for environmental assessment in Mexico.
- Second, she identified the main concerns regarding EA law and practice expressed by (56) interviewees between 2002 and 2004. The interviewees were executives of the National Commission of Protected Areas, of the Directorate of Environmental Risk and Impact, and staff and managers of protected areas used as case studies for the author's doctoral research (see Mendoza, 2004, 2008). Information on interviewees is not disclosed, respecting anonymity requests.
- Third, she reviewed four Regional EA reports (or MIA-Rb) for projects including risky activities. This EA category was chosen because it represents the highest level of detail by requiring risk assessment and consideration of cumulative effects (see types of reports below). The revision of Regional reports was complemented with an overview of the type of projects submitted during 2008 on the other categories of reports (available at the website of the SEMARNAT; SEMARNAT, 2008).

The EA reports reviewed were submitted during 2008. There were 14 projects in the MIA-Rb category, 13 of them had the whole EA Report available as pdf document. Each submission on the online registry of the Directorate could have available any or all of the following documents: Executive Summary, Whole EA Report, Request for Additional Information, Additional Information Requested, and Resolution. Only those projects in evaluation or that had a resolution were used for the selection (12 projects, Table 1).

Table 1. Number of Regional EA reports that include risky activities (Regional –B) per economic sectors and stage on the review process, 2008 * One not available, $^{+}$Not considered because of discharge.

Sector	**Status**					**EA selected and reference**
	In Review	**Extension to review**	**Resolved**	**Discharged**	**Total**	
Airports	*1*				**1**	Construction of a new airport (CAH, 2008)
Roads			*1*		**1**	Modernization and extension of a highway (DGCF, 2008)
Oil and Gas	***5**	*1*	*5*		**11**	Infrastructure for an oil development (PEMEX, 2008)
Mining			*1*		**1**	Expansion of a mining operation (MP, 2008)
Energy				$^{+}$*1*	**1**	

Three reports selected corresponded to different activity sectors: a new airport, the modernization of a road, and the expansion of a mining operation. The fourth report (infrastructure for an oil development) was randomly chosen among the ten available from oil and gas. The review focused on: consideration given to cumulative effects on identification of impacts, results, discussion, and conclusions. This included mitigation measures, follow-up and management of impacts. The following sections include both relevant findings and (when possible) recommendations to improve the quality and usefulness of EA reports and of professional practice (EA consultants).

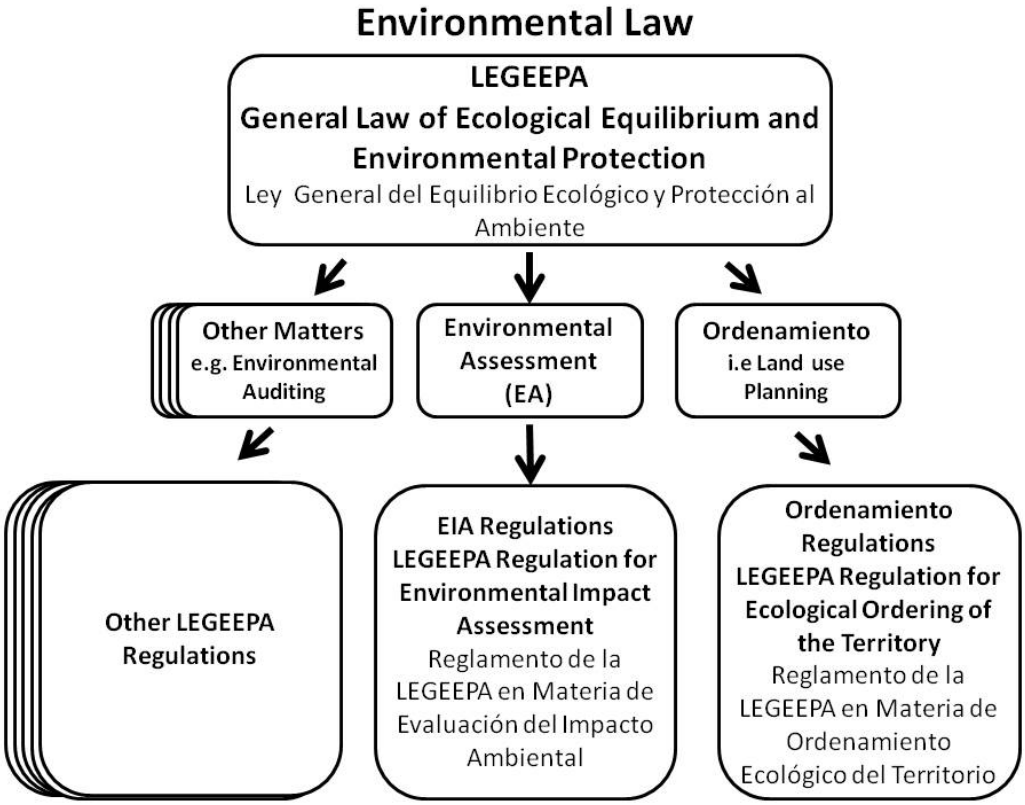
Results, discussion, and suggestions

Regulatory Framework

In Mexico, the General Law of Environmental Protection and Ecological Equilibrium (LEGEEPA as per its Spanish acronym [GM, 1988; SEMARNAT, 2003a]) is the statue that specifies the principles and scope of the environmental policy. Environmental assessment, one of the various matters included in LEGEEPA, is related to other environmental matters such as environmental auditing and land use planning (Figure 1).

Land use planning influences the type of EA report required for a project.It is based on a zoning procedure called Ordenamiento Ecologico del Territorio (Ecological Territorial Ordering, ordenamiento hereafter). Ordenamientos are land use plans that identify zones for different uses based on existing uses, land aptitude, and disturbance trends (GM, 1988; SEMARNAT 2004). Ordenamiento is promoted as the main tool for planning land use, managing natural resources, and preserving and restoring the quality of the environment (SEMARNAT, 2003b, 2004). Other matters in the environmental law include protected areas, pollution control, and environmental prosecution. There are published regulations derived from the LEGEEPA that expand on administrative procedures and sanctions for some of the matters. The LEGEEPA Regulation for Environmental Impact Assessment (SEMARNAP 2000b; GM 2006b; EA regulations hereafter) are the main document guiding the EA process and practice.

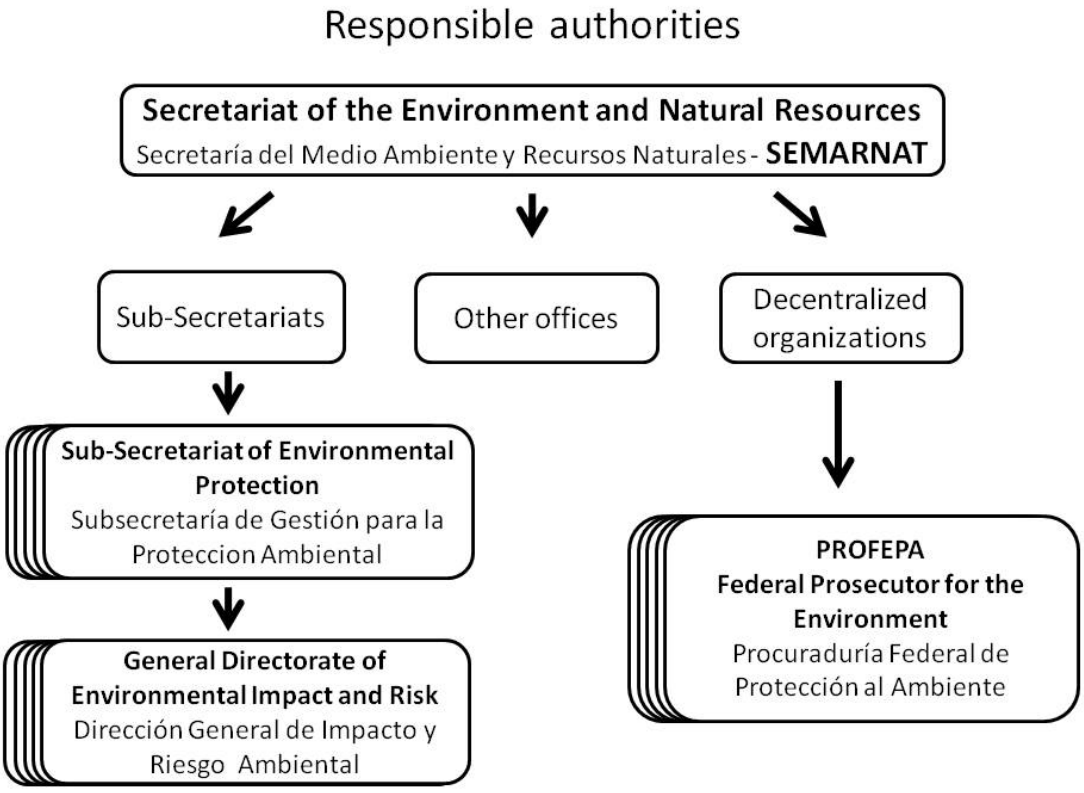
Figure 1. Regulatory framework for environmental assessment in Mexico.



The Secretariat of the Environment and Natural Resources (SEMARNAT) is the authority responsible for environmental matters (Figure 2). Two of its offices have direct authority over the EA process. The General Directorate of Environmental Impact and Risk (Directorate hereafter) is responsible for Environmental assessment and environmental risk. The Directorate reviews environmental assessment reports (EA reports), which are called Manifestation of Environmental Impact (Manifestación de Impacto Ambiental, or MIA). It also authorizes or rejects the projects.

The Federal Prosecutor for Environmental Protection (PROFEPA) is a decentralized organization attached to the SEMARNAT. It is responsible for ensuring compliance with the LEGEEPA. Its many roles include vigilance, prosecution and enforcement in all environmental matters such as environmental auditing and pollution control (e.g. compliance with official environmental norms), environmental assessment, wildlife, natural resources, protected areas, national waters, and endangered species (PROFEPA 2008). Different offices within the SEMARNAT and PROFEPA will be involved with a project throughout its life cycle. Regarding the EA process, PROFEPA is responsible for ensuring that the approved projects are implemented and operate according to the conditions of the approval and to the environmental standards (Mexican Official Norms). PROFEPA verifies that mitigation measures and follow-up programs are working accordingly and imposes fines for non-compliance (EIA regulation Art. 55).

Figure 2. Responsible environmental authorities in Mexico.



The following sections discuss the topics from regulation and/or practice identified as more relevant to CE. Each section discusses the main findings and includes suggestions when it was possible to provide them.

Definitions

How environment and impact are defined determine the extent of the assessments and the management of impacts. LEGEEPA and the EA Regulation define the fundamental concepts for EA (Table 2).

Table 2.Definitions for environment and the types of impacts considered on the Mexican regulatory framework.

LEGEEPA Art. 3	EA Regulations Art. 3
Environment: The group of natural and artificial elements or induced by man that make possible the existence and development of human beings and other living organisms that interact in a given time and space.	**Significant environmental impact** : that [impact] which results from the action of man or nature, which alters the ecosystems and their natural resources or the health, obstructing the existence and development of man and other living beings, and the continuity of natural processes.
Environmental impact: the modification to the environment caused by action of man or nature.	**Cumulative effect:** the environmental effect that results from the increment [incremental accumulation] of impacts from particular actions that interact with other past or present [impacts].
	Synergistic impact: that produced when the simultaneous presence of a group of actions produces an effect larger than the sum of the effects of individual actions.

The definitions of environment and environmental impact focus on biophysical components. Not surprisingly, the four reports reviewed and other eight reviewed previously by the author (Mendoza 2004) show that EA focuses on environmental impacts and does not address properly other social, cultural, or economic impacts.

The inclusion of natural disturbances as cause of environmental impact raises three concerns.

1) Narrower vision of the assessments. Because neither the law nor the regulations specify to analyze only human-caused impacts, both human and natural impacts should be considered for the analysis and the determination of significance.

2) Greater complexity of required analyses. Because synergistic impacts shall be considered as well, EA and CEA (assessment of cumulative effects) should include a number of interactions among the project's and nature's components or elements so large that would

make most EA unfeasible, especially the regional ones. For instance, analyses would have to include natural phenomena or disturbances common in Mexico such as hurricanes, flooding and earthquakes.

3) Larger scope for the assessment. The temporal and spatial scope of the project's EA would need to be expanded to include the area of influence and time of return of the natural disturbances.

The definitions on the statutes could be updated to add clarity to the scope that EA should have. The changes could include the following:

- Define environment making explicit that both natural (ecosystems) and human systems (e.g. communities) are part of it.
- Expand the definition of environmental impact to include types of impacts not treated properly, for instance social, cultural, or economic impacts. Alternatively, make explicit that the analysis of impacts shall include these impact in addition to the environmental ones.
- Limit the definition of impact to the modifications to the natural or human environment caused by the action of man. Use natural disturbance to refer to the modifications to the natural or human environment caused by the action of natural phenomena.

Two definitions from the Canadian Assessment Act (GC, 2003; section 2) are given here as examples of a more comprehensive approach.

> "environment" means the components of the Earth, and includes (a) land, water and air, including all layers of the atmosphere, (b) all organic and inorganic matter and living organisms, and (c) the interacting natural systems that include components referred to in paragraphs (a) and (b).
>
> " environmental effect" means, in respect of a project, (*a*) any change that the project may cause in the environment, including any change it may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the Species at Risk Act, (b) any effect of any change referred to in paragraph (a) on (*i*) health and socio-economic conditions, (*ii*) physical and cultural heritage, (*iii)* the current use of lands and resources for traditional purposes by aboriginal persons, or (*iv*) any structure, site or thing that is of historical, archaeological, paleonto-logical or architectural significance, or (c) any change to the project that may be caused by the environment, whether any such change or effect occurs within or outside Canada;

Types of assessments

Three types of reports are mentioned in the EA Regulations (Figure 3). The last two (regional and particular) may include high-risk activities. If that is the case, a risk analysis has to be attached to the EA Report.

Preventive reports

Documents that explain the general characteristics of a project to determine if it requires an EA. Many projects may only present a preventive report if it includes mitigation measures and if the projects

- are built, carried out, or perform within the standards established on official norms;

- have been considered in a program for urban development or an approved ordenamiento; or
- are located in industrial parks previously approved by the Secretariat.

Regional Reports

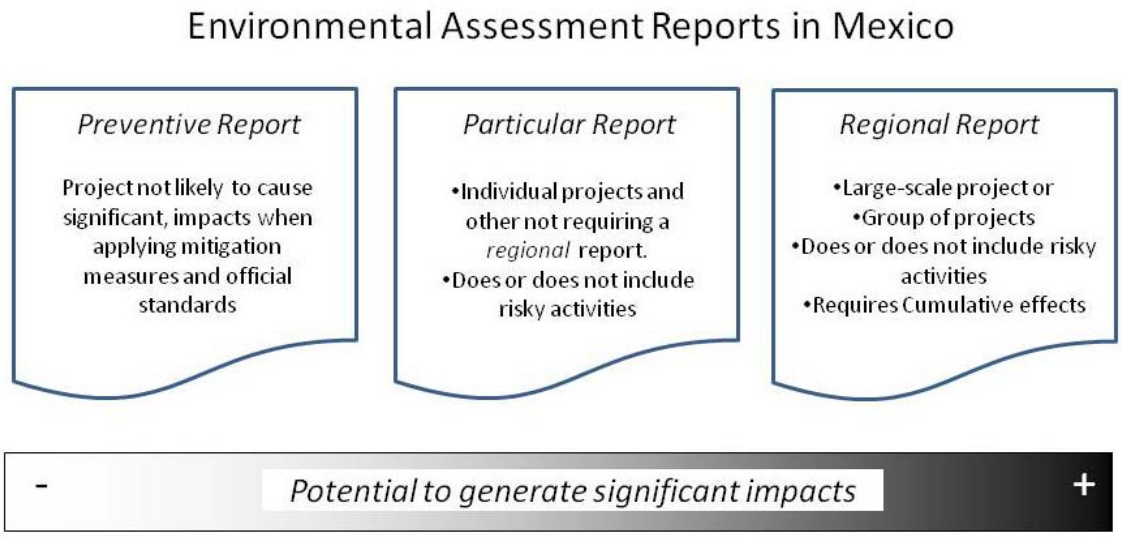
EA reports for large-scale projects or groups of projects (Art. 11, EA Regulations). This is the only EA category that requires considering cumulative effects. The reports should provide a description of the region's environment and development and deterioration trends. Regional EAs apply mainly to the following cases:

I. For Industrial and aquaculture parks larger than 500 hectares, roads and railroads, energy projects, dams, and projects that can change watersheds.
II. A group of projects included in a partial urban development plan or an ordenamiento that has been turned back by the Secretariat because of insufficient information.
III. A group of projects to be carried out in a particular ecological region.
IV. Projects to be carried out in places where the interaction with other regional environmental components could lead to foresee cumulative, synergistic, or residual impacts that could result on the destruction, isolation or fragmentation of ecosystems.

Particular reports

These are EA reports for all the projects not specified under regional reports (Art. 11 EA Regulations). Particular reports apply mainly to single projects.

Figure 3. Types of reports for environmental assessment studies in Mexican EA regulations.



Regional Reports

The specification of projects that require regional reports, and the use of the term regional itself bring two concerns. Regarding projects that require regional reports, categories III and IV are defined too broadly that any project could fit into them and would require assessing CE.

In addition, it is not clear if the regional applies to the project itself or to the EA. The reports reviewed failed to address impacts at a regional level, especially social, cumulative, and

transboundary impacts. These situations were observed on the provision of information about the region in which the project would be carried out:

- The study area was usually defined by coordinates that set a quadrangular area containing the location of the project; however, the boundaries of the region were not specified. In one case the region was a group of municipalities but the analysis focused on the surface to be directly affected by the construction of a project (a new airport).
- The temporal scope of the EA was not specified. The analysis of impacts focused on the construction of the project.

To improve on the characterization of regions in EAs, the reports should explain the criteria used to define the temporal and spatial boundaries of the study. In addition, SEMARNAT or the Directorate could produce a guideline for conducting regional EAs. This could include for example:

- Difference between the area where a project will be carried out and the area of study required for an EA.
- Evaluation of CE at regional level - e.g. methods and criteria to define the region's boundaries.

Exemptions

Article 5 of the EIA regulations lists, organized by economic sector, the projects that require an EA and the exemptions. The exemptions fall under four main categories. Below are some examples taken from the EA Regulations.

1. *Previous authorization* (e.g. modifications, maintenance). Changes to existing projects: Renovation, modification, expansion, and maintenance of infrastructure related to the activities listed in Art. 5 if they
   - had a previous authorization,
   - did not need one;
   - the projects are not related to the production process that required the EA approval; and
   - the actions do not imply increasing the level of impact (e.g. approved limits on official norms) or the size of the footprint. In that case, the proponent only needs to notify to Secretariat in advance.
2. *Size.* Agricultural or urban water infrastructure for instance, do not require an EA if they
   - are not larger than 100 hectares,
   - do not increase the surface used for production,
   - do not surpass established (urban/city) limits (including urban development within protected areas).
   - are changes to land use for housing, commercial, or service installations in parcels no larger than 1,000 square meters (m^2) and that do not involve removal of 500 m2 of trees or the fragmentation or elimination of protected species.
3. *Location*. Projects such as power and communication lines, oil and gas pipelines, agriculture, and mining, are exempted from EA if they
   - take place outside the boundaries of protected areas
   - are carried out in the right of way zone of transportation corridors or on the right of way on agricultural lands

- are plants for manufacturing products from different materials (e.g. iron and steel, plastics, rubber, paper, paints, sugar and sugar cane derivates) or storing, canning or distributing chemicals, if the plants are not integrated to the production process of the raw materials.
- Are exploration works such as gravimetric prospection, geological (on the surface), geo-electric, drilling or blasting if they are carried out in agricultural zones, or in areas with xerophilous vegetation, tropical dry forest, oak or pine forest located outside protected areas.

4. *Type of activity*. Some activities do not require EA; examples:
   - Recreational activities on coastal areas that do not require building infrastructure,
   - Agricultural and ornamental projects that use native species,
   - Single-family housing developments,
   - Forestry activities by local communities –for self consumption- that do not use protected species.

The different exemptions and the number of preventive and particular reports, which do not address cumulative or residual impacts, suggest the existence of multiple sources of cumulative effects that are unaccounted for under the current legislation. Recreational activities (category 4), for example, may severely impact coastal ecosystems because there is not definition of infrastructure. In the metropolitan area of Mexico City, for instance, non-planned, irregular settlements are a problem many cases houses are built without the required permits (personal observation). This observation does not seek to require an EA for single houses, it just points out to a common cause of CE.

Taking 2008 as an example, exemptions are related to the fact that only 6.7% of the reports (180/2649) are required to analyze cumulative effects (Table 3). The nature of particular projects submitted shows two situations: a) the majority are a part of a larger project, and b) other are one of a group that would require a Regional EA (e.g. projects in an industrial park; however, they are submitted individually with particular reports. This eliminates the need to address CE.

Table 3. Number of EA reports, per category, submitted to the review process in 2008 (until December 22). The activities falling into each type are defined in the regulations. The modality indicates whether the project does not (A) or does (B) include risky activities.

Type/modality	**A**	**B**	**Total**
Preventive	212		212
Particular	2,185	72	2,257
Regional	166	14	180
Total	*2,563*	*86*	*2,649*

Any of the exemptions can potentially contribute to the generation of CE. The exemptions based on size and location were of great concern to the interviewees.

Size

The preventive report is intended to expedite the EA procedure for projects likely to not generate significant impacts, especially when mitigation measures are considered. This is a good alternative to reduce the bureaucratic burden for proponents of small projects. However, it is likely that some proponent may take advantage of it. For instances, an operation may start within the size that do not require an EA. It may grow through small expansions that do not require EA either and/or that are authorized at municipal level. The impacts generated by small projects are unaccounted. Small projects are an important source of cumulative impacts (e.g. CEQ, 1996).

Piece-meal approach. EA reports are used to submit as projects what in reality is are fractions of larger developments. This was noticed by going through the types of projects listed under 'particular reports' at the on-line registry (SEMARNAT 2008). One of them, for example, evaluated the1st. phase of a geo-thermoelectric project and another for works associated to the construction of a new dam, but did not include the dam. The regional reports reviewed also were fractions of larger developments:

- A 41 km section of a 101 km highway (SCT, 2008).
- A 40% increase in the surface of an open-pit mining operation (MP, 2008).
- The infrastructure of an oil development that was adjacent to another. Both were owned by the same proponent. The Regional EA for the adjacent development had been submitted and approved in 2005 (PEMEX, 2008).
- The construction of the first of three phases of an airport complex to be completed in 20 years (CAH, 2008).

Correspondingly, the analysis of impacts was limited to the fraction submitted for approval and not for the entire projects. This, added to the poor quality of the analyses and a bias of to emphasize the benefits of the projects, may have contributed to the reports concluding that the projects would not have significant cumulative effects.

Location

The exemptions based on location also have implications for CE. Many of the activities listed (Art. 5 EA Regulations) are exempted if they are located outside protected areas or built in the right of way set for the activity (e.g. pipelines, roads, energy projects). This exemption does not consider that projects may have different types of impacts –including cumulative- in areas away from the source. The dispersion noise, gas emissions, or toxic substances are a few examples. This, added to the no consideration of CE for the majority of projects, leaves unaccounted an unknown amount of impacts that affects everything (human populations, protected areas, ecosystems, endangered species, water, the atmosphere, etc).

These actions, among other, could help to prevent a piece-meal approach:

- Include in the regulations definitions of terms such as project, work, activity, and risk together with specifications to distinguish among them.
- Especially for modifications to existing operations, make more explicit that the EA should be done not for the entire finalized project, note mere phases.
- Use the database of the registry to identify projects that are additions to a larger project or development and require them to submit the corresponding type of report and risk analysis if needed.

- Integrate the on-line registry with state and municipal databases of environmental and development authorities to build a sort of verification system. Use it to identify proponents and/or projects that may be using a piece-meal approach.

Guides for EA Reports and EA practice

SEMARNAT is responsible for the preparation of guides to facilitate the preparation of EA reports according to the type of project (EIA Regulations, Art. 4, 9, 18, and 32). Practitioners elaborate the EA report using the guides that specify the information required based on

- Type of project by sector: e.g. oil developments, forestry, electric energy, and mining;
- Type of report: preventive, particular, or regional; and
- Risk analysis: four levels, from 0 to 3.

However, the reports reviewed for this is research and those reviewed previously (Mendoza, 2004) show a misuse of the guides that results in reports of poor quality that diminish the effectiveness of EA as a decision-making tool. Following are some of the reasons.

Analysis of impacts and cumulative effects

The revision of the reports shows critical deficiencies in EA practice. Of relevance to this research is the poor analysis of environmental impacts, including cumulative effects, and the conclusions of the reports consequently. In addition to the focus on the direct impacts from the projects mentioned previously, the following issues should get more attention from responsible authorities and EA consultants to improve the contribution of EA to sustainable development.

Arbitrary discrimination of impacts. The analyses were based on a biased selection of impacts. Previous to the analysis, several of the likely impacts were deemed no significant and excluded; the posterior determination of significance focused on direct impacts. Below are two examples of impacts excluded from the analyses:

- The highway EA
    - Impact the highway would have on wildlife such as mortality and movement.
    - Impact of noise on adjacent human populations and wildlife once the road would be in operation.
- The airport EA
    - It dealt with the first of three phases and focused on the construction of the airport.
    - It excluded additional infrastructure to be build in the same phase.
    - It assumed emissions were not of importance because they would be dispersed by the wind to other areas.
    - It assumed the impact of the airport complex on the already overexploited aquifer would not be significant.

The analysis of impacts in all reports did not use quantitative methods and was speculative. The only field method reported was a survey to verify the presence of wildlife. However, the report did not include any information on how the survey was conducted. The reports used a combination of Leopold ‘s matrix and a formulae developed by Luis Bojorquez-Tapia (called Bojorquez’ Matrix) for determining the significance of impacts. One report indicated having used a modified version of the last one although did explain what the modification was. Formulae designed to be used with quantitative data obtained from geographical information

systems or other sources (e.g. Bojorquez' matrix) were used with subjective estimations made by the practitioners that were converted into quantitative values. Values were given to criteria such as controversy around the project without having conducted surveys or other form of public consultation.

The reports provided a conclusion about the appropriateness of the projects. However, the method used ignored the significance of the predicted impacts. After classifying the impacts as adverse or beneficial, significant or no significant, and mitigable or not mitigable, practitioners used only the difference between beneficial and adverse impacts to determine the overall impact of the project. In addition, the determination of beneficial impacts was also very subjective, activities that were part of ordinary operations, such as 'transit of vehicles' were counted as beneficial impacts without explanation. In all reports, the discussion about the overall impact of the project overemphasized the creation of temporal employment during the construction phase as a beneficial impact. The discussions disregarded cumulative impacts and did not address likely negative social impacts. None of the reports included in the analysis other past, present, or foreseeable future activities.

Separation of risk from impact. The analysis of impacts on the reports is deemed insufficient. Only one risk assessment was available for revision because it was included in the EA report (airport). This report was also the only one that included results from the risk assessment into the analysis. This risk assessment was very narrow in scope. Even when the project included the operation of the airport, the assessment was limited to the construction of one part of the airport complex, on fuel spills, and on possible fires. The risk assessment had major omissions related the operation of the airport. One of the most noticeable was not considering the possibility of an airplane crash or other likely emergency situations, even less their consequences on human settlements and the environment. Most aviation accidents occur during takeoff and landing. For emergency landings, aircrafts dump fuel wherever they can before getting ready for landing. Normally, the final approach for landing a commercial plane requires 15 miles. Take off may require up to 40 miles. An airplane crash may result on the dispersal of pieces of material or radioactive, biological, or chemical substances over a large area. Fuel dumping contaminates the air and potentially the water and soil. In any case, the area affected usually covers several miles depending on factors such as wind and weather. This poses threats to human populations, wildlife, and ecosystems (Rodney Gair, commercial pilot, personal communication, December 30, 2008). This was not mentioned on the risk assessment. It is worrisome that one of the recommendations of the report considered it safe to allow human settlements only 500 m from the runway (CAH, 2008, p. 64).

Risks involve potential impacts; therefore, risks should be integrated into the analysis of impacts (e.g. CEA Agency 2007). The requirement of presenting the risk analysis as a document separated from the EA works against the proper analysis of impacts and cumulative effects. The airport assessment had the most detailed analysis of all and included the assessment of risk. Still, it is an example of the inadequate consideration of cumulative effects in regional reports. One point to stress here is that conducting an analysis based on a biased selection of impacts or an incomplete risk assessment can be considered unethical and against the standards of good EA practice. It may actually increase the risk of exposing human populations and other elements of the environment to impacts that are preventable.

Mitigation measures and follow-up

The failure to address cumulative effects also diminishes the effectiveness of mitigation measures and follow-up programs. The mitigation measures that were provided in the reports were non-specific and the majority consisted of statements of good practice such as 'do not spill fuel on vegetated areas' (airport) or 'avoid obstruction of drainage" (highway). In addition, the mitigations are inadequate to control and manage cumulative effects because of the bias on the analyses and the unsupported disregarded of identified cumulative effects.

Monitoring and Emphasis of land use planning

The environmental policy of the previous and present administrations has promoted ordenamientos as the main tool for planning land use, managing natural resources, and preserving and restoring the quality of the environment (GM, 2003; SEMARNAT, 2004). However, ordenamientos may indirectly contribute to the generation of cumulative impacts because they determine several of the exemptions in the EA Regulations. For example, industrial projects can submit only a preventive report if they are carried out in zones that have approved ordenamientos. It would be convenient to conduct a strategic assessment for determining to whether and/or to what extent ordenamientos contribute to a better management of cumulative effects and to restoring environmental quality. These are some of the characteristics of ordenamientos that may contribute to the generation of unaccounted cumulative effects:

- They are often done for political entities (e.g. communities, municipalities, or states). Thus, they do not account for long-range or transboundary impacts or cumulative effects. In addition, nor the LEGEEPA or the EIA Regulations deal with transboundary effects.
- They are based on existing land uses and land potential for developing economic activities, for instance tourism, industry, or agriculture.
- They consist mainly of suggestions about the location of specific economic activities. It is always possible to apply for changes on approved land uses.
- They should promote the implementation of monitoring programs to ensure that the quality of the environment does not decline. However, The Ordenamiento Regulations (GM, 2003) do not specify time frames to do so.
- There should be and evaluation of the effectiveness of the ordenamiento and the compliance with it. However, the Ordenamiento Regulations does not specify how this should be done or time frames.

Three ordenamientos already approved were randomly chosen from SEMARNAT's website (GECO, 1997; GECH, 2004; GEV, 2008). None of them contained information on how such evaluations would be carried out, indicators, or time frames for implementing monitoring programs. Evaluation and monitoring are supposed to result from the partnerships or collaborations created after the ordenamientos are made official. While that happens, projects continue to be approved in the absence of frameworks to evaluate ordenamientos' effectiveness or of monitoring programs to determine the quality of the environment.

Monitoring. The monitoring systems to be developed for regions with ordenamientos are likely to be designed based on current and planned land uses and current degradation trends. Unlike the EIA Regulations, the EIA Regulation in Mater of Ordenamiento does not mention synergic impacts (SEMARNAT 2003b). The Ordenamiento Regulations state that cumulative

effects are to be considered during - but will not be a limitation for- the development of the model for ordenamientos (SEMARNAT 2003b, Article 44, section V). That means that cumulative effects cannot be used as factor to set limits to limit present of future use. An interviewee expressed frustration because cumulative effects are not a legal tool to stop or slow down the authorization of projects in areas that have reached their capacity for development such as tourist developments in coastal areas. Ordenamientos are a useful tool for land use planning. However, they will be more effective if, for their design, more attention is given to cumulative effects.

EA Consultants

The examination of EA reports in this study and the previous one (Mendoza 2004) raises concerns about the knowledge EA consultants have about the EA process. Numerous examples question whether the consultants had the basic knowledge to perform the EA and/or are practicing according to a code of ethics. Major deficiencies were observed in the methodologies used to identify environmental impacts, the familiarity with the theory on cumulative effects and methodologies to evaluate them, and procedures used to assess the significance of impacts. These are a few examples:

- confusing cumulative effects with residual impacts;
- excluding potential impacts based on assumptions and not objective analysis;
- considering that the wind dispersion of air pollution caused by the project is a mitigation measure *per se*;
- considering, without analysis, that the likely impacts an airport may have on air quality are not a cause of cumulative effects;
- centering the assessment of the area directly affected by a project;
- overemphasizing the generation of temporal employment as a benefit of the project and no analyzing the negative social impacts it will generate;
- using information from a different site to describe the site where the project will be located (expressed on the response of the office to one of the reports submitted, see SGPA, 2008).

Readability of reports

The experience and knowledge of the consultant likely influences the simplicity and legibility of the reports. The content of EA reports has an inherent degree of complexity because of the multiple interactions that have to be analyzed. Thus, writing them succinctly would make them understandable and helpful for general public, stakeholders, reviewing staff, and decision makers. All reports reviewed here and previously (Mendoza 2004) were full of jargon and information nor relevant to the EA review process. Authorities, proponents, and consultants should pay more attention to redact the reports succinctly. Following are three suggestions to improve clarity, reduce length, and highlight the results and conclusions of EA reports.

- <u>The reports are good examples of verbalism</u>. More text does not mean better quality. Write the report in lay-person terms; simple and direct language improves clarity.
- <u>The reports contain unnecessary information that increases their volume and shadow what is relevant</u>. Eliminate the following ; if deemed necessary, provide selected references to the readers

    - The history and development of environmental impact assessment worldwide and in Mexico.
    - Environmental international agreements. If they apply, just explain how.
    - Theory. Use appendices to provide only basic theory that readers may need to understand the report.
    - Basic concepts. Use glossaries to define concepts such as protected area, impact, or types of reports.
    - Operations and Production. In the sections that require description of the project, focus on the aspects that have potential to generate impacts y why. Use appendices to describe the technicalities and characteristics of the project, operation procedures, production processes, equipment or machinery.
- The amount of space used to explain methods to identify impacts is much larger than the one used to explaining the impacts and their characteristics.
    - Include in the body of the report the fundaments of methods and models used, assumptions made, and criteria together with their justification. Use appendices to expand on scientific theories and technical details such as calculations or descriptions of models.
    - Explain in the body of the report the process used to collect field data and sampling procedures. If needed, put in appendices explanations of field methods and lists of equipment used during the surveys.
- The reports use much more space to insert entire sections of applicable laws and regulations than to explain how they apply to the project. The EA guides require explaining what will be done to comply with the laws, regulations, and official standards that apply to the case. Rather than including the legal text of the statutes, the reports could just
    - Cite the corresponding regulation (e.g. law and article), briefly indicate what it is about, and expand on how or why they apply to the case.
    - Explain the measures to be implemented for compliance.

Environmental Governance

Many of the deficiencies observed in the reports may be related to governance issues at various governmental and corporate levels. Informants commented that the EIR Directorate does not have enough personnel to properly review all the reports within the time established by law. Thus, some projects may go on without careful analysis of the potential impacts or with inadequate mitigation measures. Interviewees that were given EA reports to comment on complained about the little time given to return comments. This prevented them from gathering the necessary information or advice from experts to do a good job. Responsible authority needs to address at least three key points:

- The gaps in the environmental laws and regulations that allow proponents to take shortcuts along the EA process.
- The flaws in legislation and administration that allow the approval of projects piece-by-piece.
- The irregularities on the EA process that influence the approval of projects and /or the conditions for approval. Interviewees mentioned situations they observed at different of the government and/or the administration that represent corruption practices. This was a concern for most interviewees.

The previous situations are common and contrary to the objectives sought by environmental policy and regulations. To improve the effectiveness of the EA process in Mexico is necessary to change the environmental legislation to cover the gaps identified in this research. It is also necessary to improve governance and public participation. Having an independent organization in charge of auditing and evaluating the effectiveness of the environmental policy would be helpful for both purposes. The organizations should be independent from the government and integrated by representatives of different stakeholders groups. Its main function could be to oversee the proper application of the LEGEEPA regarding environmental assessment. i.e. determine whether projects are submitted and evaluated appropriately. It also could lobby for the adoption of cumulative effects as a main criterion for planning land use, authorizing new development, and achieving sustainable development. Other tasks could include, first, to collaborate with other organizations to evaluate environmental governance and effectiveness of federal, state, and municipal departments. Second, the same organization could be in charge of, or participate on, evaluating the effectiveness of ordenamientos and their associated monitoring programs.

Conclusion

A proper analysis of cumulative effects is required to design effective mitigation measures and follow-up programs. This is the basis for an effective management of environmental impacts. It is difficult, if not impossible, to achieve sustainable development without considering cumulative effects when planning land use and evaluating the potential environmental impacts of projects. The consideration given to cumulative effects in the regulatory framework and in EA practice in Mexico is deficient. EA regulations include exemptions that can result on the occurrence of cumulative effects not accounted for. This is because exemptions can be used to get approval for projects piece-by-piece. If not supervised properly, exempted projects and activities are very likely to generate an unknown amount of CE that would affect human and natural systems. The regulations require considering cumulative effects only for EA reports done for groups of projects or for large-size projects with regional influence. In 2008, these regional reports were less than 7 % of total project submitted for EA evaluation and a sample shows that they fail to address cumulative effects. The revision of EA reports shows critical deficiencies and biases on the analysis of impacts. The analyses focus on the direct impacts that could result from the projects. Even though their scope should be regional, the EAs are limited to the area where the projects will be physically located. Cumulative effects are not addressed properly. In most cases, they are deemed no significant and excluded prior to the analysis based on unsupported assumptions. All types of EA reports should consider cumulative effects as much as possible.

The following points require immediate attention of the SEMARNAT to make EA an effective tool for sustainable development. First, the deficiencies observed on the reports reflect a poor knowledge on part of the consultants regarding methodologies to analyze impacts and a lack of knowledge about cumulative effects and how to assess them. Second, the EAs fail to analyze impacts on a regional context. Third, small and large-size projects are evaluated and approved in a piece-by-piece approach, which results in unaccounted cumulative effects. Finally, projects are approved based on mitigation measures that only address a fraction of the direct impacts likely to result from a project. The EA regulations should be updated to address the

previous points. In addition, there is need to put in place an auditing and verification system or organization independent from the government. This organization should be integrated by representatives of different stakeholder groups and would act as a watchdog to oversee improvements in environmental governance and effectiveness.

Cumulative effects have to be acknowledged as a legal argument to set thresholds to limit development. As it is now, cumulative effects can be used to develop land use plans but cannot be used as a limiting factor. The consideration of cumulative effects should be part of both particular and regional reports. CEA should be conducted to the best possible extent, given the available resources and information. Even if in the impacts cannot be quantified, having a mindset on cumulative effects would have several benefits. Among other things, that would help to identify information gaps. It also could help promote the involvement of interested parties on the design of the monitoring programs and strategies to improve environmental quality and achieve sustainable development.

It is acknowledged that the analysis of cumulative effects is a task beyond the resources of proponents of individual projects and even regulatory authorities. The current trend in Mexico is to promote land use planning (ordenamiento) as the main tool for managing land use and natural resources, and for preserving and restoring the quality of the environment. However, ordenamientos are not enough for identifying and managing environmental impacts, especially cumulative effects. Besides, ordenamientos lessen the EA requirements for projects. Authorities are already investing resources in developing ordenamientos and will have to develop regional monitoring systems too. Therefore, the final suggestion from this research is to acknowledge cumulative effects as a key the principle for land use planning and for designing systems to monitor environmental quality. The resources already allocated to ordenamientos and monitoring can also be used for designing databases (regional and federal) and information system to evaluate cumulative effects and transboundary effects at the levels needed.

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