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### ADDRESSING STRATEGIC ENVIRONMENTAL ASSESSMENT OF MEXICO'S TRANSITION TOWARDS RENEWABLE ENERGY.

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The transition to environmentally sustainable societies entails a significant shift in the field of planning process strategy. Strategic Environmental Assessment (SEA) applied to Policies, Plans and Programmes, i.e., planning tools that precede the Project in the decision-making process and surpass it in terms of spatial and subject scope and level of abstraction involved, is recognised internationally as an instrument which is strategic in nature, and is conceived as a flexible framework of key elements, acting strategically in a decision process to enable a facilitating role, ensuring an added-value to decision-making. From this perspective, and taking into consideration the current state of environmental assessment in Mexico as a basis of knowledge and understanding, this work attempts to develop a novel methodological approach for the appraisal of infrastructure project planning on renewable energy, addressing SEA and looking upon the current transition process as a matter of interest, as well as the strategies and public policies proposed by governmental bodies; all towards creating mechanisms that allow the effective execution of policies in the field of green energies, acknowledging energy development as a valuable opportunity for improving transparency in strategic decision-making as well as the quality and level of public participation.

**Keywords:** *Strategic Environmental Assessment; decision-making process; renewable energy; Mexico*

### ABORDANDO LA EVALUACIÓN AMBIENTAL ESTRATÉGICA DE LA TRANSICIÓN DE MÉXICO HACIA LAS ENERGÍAS RENOVABLES.

La transición hacia sociedades ambientalmente sustentables implica un cambio estratégico importante en el campo de los procesos de planificación. La Evaluación Ambiental Estratégica (EAE) aplicada a Políticas, Planes y Programas, es decir a los instrumentos de planificación que preceden al Proyecto en los procesos de toma de decisiones y le superan en nivel de abstracción y en amplitud de los ámbitos espacial y temático comprendidos, es reconocida internacionalmente como un instrumento de carácter estratégico que garantiza un valor añadido para la toma de decisiones. Desde esta perspectiva, y tomando en consideración el estado actual de la evaluación ambiental en México, este trabajo busca desarrollar un enfoque metodológico novedoso para la planificación de proyectos de infraestructura en materia de energías renovables, abordando la EAE y considerando el actual proceso de transición energética como cuestión de interés, así como las estrategias y políticas públicas propuestas por los organismos gubernamentales; todo ello para la creación de mecanismos que permitan la ejecución efectiva de las políticas en el campo de las energías limpias, reconociendo el desarrollo energético como una oportunidad valiosa para la mejora de la transparencia en la toma de decisiones estratégicas así como del nivel y la calidad de la participación ciudadana.

**Palabras clave:** *Evaluación Ambiental Estratégica; proceso de toma de decisiones; energías renovables; México*

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## **1. Introduction**

Even though Strategic Environmental Assessment (SEA) has been neither formalised nor fully integrated into Mexican legislation, Mexico has been conducting Environmental Impact Assessment (EIA) practice for over twenty years. It could be argued that Mexico has been using practices and approaches which resemble the idea behind Strategic Environmental Assessment, but which are neither close enough nor sufficiently consolidated to convert SEA into a change enabler, and a valid mechanism for generating development under a doctrine of sustainability. Significant efforts have been made, including the development and introduction of government initiatives, proposals for amendments to relevant laws, and the initiation of pilot projects by governmental bodies.

Given the above, it is puzzling that there have been such delays and shortcomings in follow-ups after changes in administration, and that SEA has ultimately failed to materialise. The Federal Public Administration claims that progress has been made, but the societal and environmental benefits envisioned have not yet been realised. These benefits shall remain unrealised as long as there is no shift in focus, no promotion of structural reforms, and while the SEA formalisation process remains stagnant and constantly side-lined. Additionally, without discussion of SEA principles; a willingness to engage in constant dialogue and ongoing debate; and a consensus on the conceptualisation of SEA, its implementation mechanisms and explicit inclusion, neither a transformation in the approach to SEA project management nor the development of a true state vision towards sustainable development, and with it the sought after change of direction in the country, will be realised.

It should be pointed out, however, that there are strong foundations from which to move towards a new approach to Environmental Assessment in Mexico. The country has considerable experience in the field, consolidated institutional structures, a defined environmental legal framework to host it, as well as the acknowledgement in the country that environmental considerations must be taken into account at the same level as economic and social issues, and be part of all public policies formulated and established in Mexico (Ahumada, 2011).

## **2. Objectives**

Through this work seeks to contribute to the development of an adaptable, repeatable, logical, systematic approach, for the appraisal of infrastructure project planning on renewable energy in Mexico, adopting Strategic Environmental Assessment (SEA) philosophy as a tool for boosting sustainability. In addition, is intended to carry out a systematic decision support process, aimed at ensuring that environmental and sustainability aspects are considered in Plan, Policy, and Programme (PPP) development for the Mexican renewable energy sector, as well as providing a basis for a structured decision framework, aimed at supporting more effective and efficient decision-making, and improving governance in terms of energy transition and the sustainable exploitation of energy.

## **3. Case study**

### **3.1 Setting the scene: Environmental Assessment in Mexico**

An increasing number of countries and institutions require SEA, as it has become a useful and timely tool to reduce social and environmental impacts of PPP's (Ahumada, Espejel, & Arámburo, 2011). Among the first countries to implement SEA were the United States in 1970, Canada in 1990, and New Zealand in 1991.

The European Community was revolutionised with the adoption of the Directive 2001/42/EC on the assessment of the environmental effects of certain plans and programmes, and with the Protocol on Strategic Environmental Assessment, formalised in 2003. The application of SEA has also been increasing in developing countries and the member countries of the Central American Commission on Environment and Development (CCAD, 2007). The World Bank has been using SEA for over twenty years, and the Canadian International Development Agency, the Asian Development Bank and the Inter-American Development Bank have been working in this field about ten years. These agencies, as well as The Paris Declaration on Aid Effectiveness -issued within the framework of the Organisation for Economic Cooperation and Development and signed by Mexico and more than one hundred other countries in 2005- have added further impetus to SEA design and implementation. Under the Declaration, donors and partner countries commit to strengthening the implementation of the EIA and to "develop and apply common approaches for SEA at national and sectoral level" (OCDE, 2005). These efforts to reduce global poverty focus on the Millennium Development Goals adopted in 2000, where Mexico together with 189 countries signed the Millennium Declaration (UNDP, 2000). The SEA provides a practical mechanism to move towards achieving MDG 7 on *ensuring environmental sustainability*, which seeks to integrate the principles of sustainable development into national policies and programmes.

However, despite having acceded to various international agreements, SEA has neither been formalised nor fully integrated into Mexican legislation, and it can be argued that at present Strategic Environmental Assessment *per se* does not exist in Mexico. In Mexico, the Secretary responsible for the environment sector (SEMARNAP from 1994-1999; SEMARNAT from 2000 to the present) has recognized the limitations of EIA for more than ten years, and has considered SEA a complementary instrument to the EIA, as well as a preventive mechanism of growing importance to stimulate sustainable development. It is noteworthy that under a federal administration initiative during the 1994-2000 administration, the current Secretary (SEMARNAP, 2000) stressed the importance of taking firm steps for the development and adoption of this philosophy; acknowledged its scope and the potential areas of application; and stressed the urgent need for Mexico to create an SEA instrument of its own, taking into account international experience in the field and configuring this instrument according to Mexico's own circumstances.

Furthermore, this same authority anticipated that it might be difficult to design a unique model of SEA, because of, among other things, the complexity of the dynamic processes of decision making. However, while recognizing this complexity in the design of one or more models, it was deemed essential that progress be made in this area through an approach that overcomes limitations of the current method of analysis and project-based EIA. At the end of the six-year term from 2000-2006, SEA did qualify as a valuable tool, albeit a highly complicated one to use (SEMARNAT, 2006). It argued that in order to apply SEA it might be necessary to modify the General Law of Ecological Equilibrium and Environmental Protection (LGEEPA) and its regulations. It was also stated that a development of methodologies and progress towards their implementation through various pilot projects was expected (neither of which materialised, however). It also acknowledged that sufficient progress was not achieved, and it was suggested that this work be continued into the next administration, hoping for better conditions for its development. In this regard, the Environment and Natural Resources Sectoral Programme (SEMARNAT, 2007) established that SEA should be adopted, and in its objective 7.2.3 pledged to develop the methodology for its implementation, as well as running further workshops on this matter.

As part of the activities related to this challenge, the SEMARNAT, through the Environmental Impact and Risk Directorate (DGIRA), conducted in 2007 the first national course on SEA, in order to establish the conceptual and methodological bases of SEA.

In 2008, as a result of the second SEA training event, a methodological proposal with the goal of implementation in a regional programme for the federal electricity sector was formulated. In 2009, in conjunction with the Federal Electricity Commission (CFE), and derived from a pilot programme, this proposal - applicable to the selection of alternatives and configuration of electrical networks (CFE, 2009) - was completed and implemented. In addition, and in order to reinforce previous attempts, the DGIRA itself developed a political-technical document to define and present Strategic Environmental Assessment as a new tool for environmental management in Mexico<sup>1</sup> (DGIRA, 2010). Subsequently, in this context Ahumada (2011) addressed the current state of the relationship between environmental assessment and development planning in Mexico, and proposed a methodological framework for conducting SEA of the National Infrastructure Programme 2007-2012 (SCT, 2007). This research work chose the National Infrastructure Plan as a case study due to its association with a portfolio of more than three hundred projects; and, given its political and strategic nature, its suitability for setting in context the scope and benefits of the implementation of SEA. It is worth mentioning that the development of the SEA process was hypothetical.

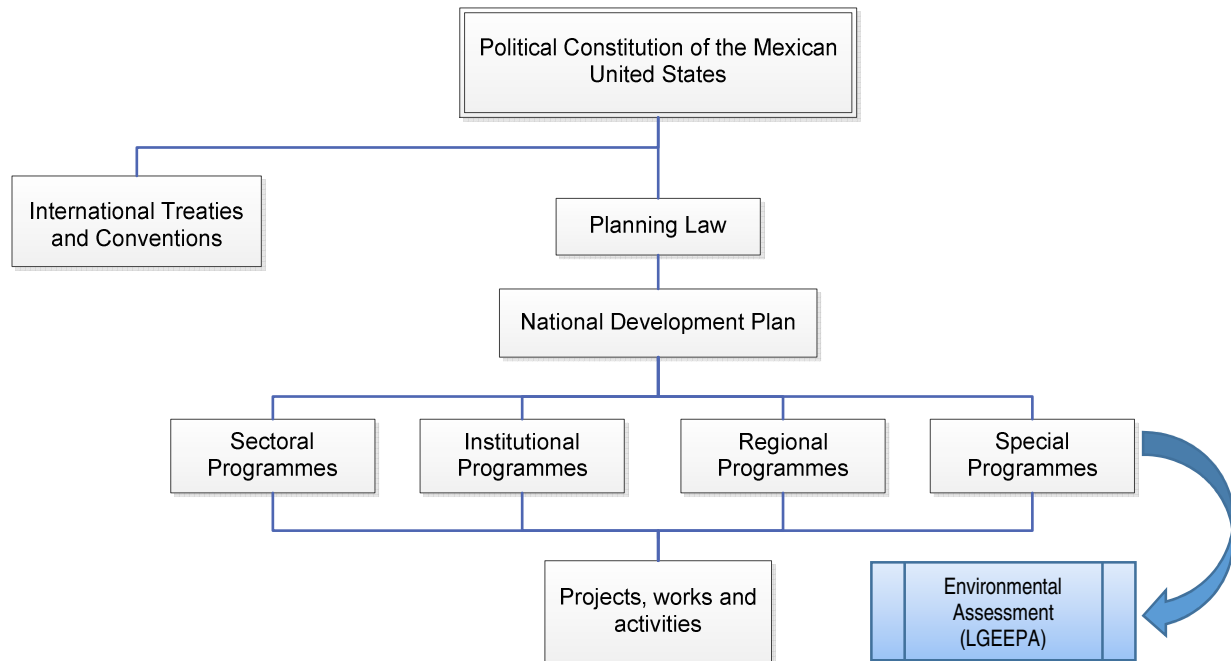
Ahumada et al., (2011) also suggest that formal and timely incorporation of environmental variables into development planning in Mexico requires an initial review and analysis of the process, which is supported by the Constitution of the United Mexican States (SEGOB, 2014) and the Planning Law (SEGOB, 2012). For the purposes of this law, democratic national planning can be defined as: the rational and systematic management of actions that lead to the transformation of the country's reality through the implementation and evaluation of the National Development Plan. This One Plan has to specify among other things: national objectives; strategy of and priorities for the comprehensive and sustainable development of the country; policy guidelines from which sectoral, institutional, regional and special programmes can be drawn up to meet such priorities; and the requirement to remaining in accordance with the provisions of the law.

In turn, these programs are made up of a series of projects with potential impact on the natural environment, which are subject to a procedure of Environmental Impact Assessment considered in the General Law of Ecological Balance and Environmental Protection (LGEEPA). Figure 1 outlines the hierarchical relationship of development planning in Mexico and the current scope of application of the environmental assessment. However, after almost thirty years of its implementation in the country, the practice of EIA as a tool for environmental assessment has failed to halt environmental degradation trends. For this reason Ahumada states that SEA should be incorporated as preventive instrument in environmental policy, reinforcing arguments for a reform of the LGEEPA (SEGOB, 2013), given the importance of defining the relevant competences on this matter, determining which strategic decisions to focus on, establishing a reference procedure for application, and drawing up methodological frameworks or guidelines that permit its development.

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<sup>1</sup> It is noted that during the review of the study, a number of important inconsistencies and limitations were found in terms of content and structure. The beginning of the document suggested a promising work, but some approaches are diffuse, and final recommendations neither promote the breaking down of existing bureaucratic barriers, nor drive important changes in the laws and related regulations.

**Figure 1: Hierarchical display of development planning in Mexico and the current scope of application of the environmental assessment**



Source: adapted from Ahumada (2011)

### 3.2 SEA for renewable energy development in Mexico

Mexico stands out globally for ambitiousness of its alternative energy generation objectives. Its Law for the Use of Renewable Energy and for the Financing of Energy transition (LAERFTE) requires that by 2024, 35% of energy generation must come from alternative energy source (SENER, 2008). This calls for increased and accelerated use of renewable energy sources, leading to both greater energy security and environment sustainability. This also requires a diversification in energy sources and reduced consumption of fossil fuels, resulting in a reduced greenhouse gas emissions. Mexico is blessed with a high renewable energy technical potential which, properly used, makes achievement of this objective entirely possible. For example, over most of its territory, Mexico has the world's highest levels of solar irradiance: double that of Germany, the country with the highest installed photovoltaic power. Most of Mexico's geothermal power comes from an area known as "Cinturón de Fuego", making Mexico the world's fourth largest producer of geothermic energy, and this while using a mere 10% of its resources. Mexico's rivers provide huge potential for hydroelectric power, and solid waste and agroforestry potential remains largely untapped. In addition, Mexico has many regions with steady prevailing winds which are appropriate for high capacity factor wind farms.

As can be seen, technological and social evolution towards an economy based on alternatives to fossil fuels has become an issue of great importance in Mexico, since it is increasingly clear that the energy consumption model of last decades is completely unsustainable due to the exhaustion of non-renewable fossil energy resources and the effect of this consumption on climate change. We are undoubtedly witnessing an energy generation revolution with regards to both non-renewable and renewable sources (Koeppel & Fischer, 2013). Concerning this theme, Mexico, like several other newly industrialised nations, is steadily expanding its renewable energy capacity and building new facilities to meet its renewable energy goals.

Decentralised energy generation such as wind farms or solar plants, although beneficial for climate protection, can however result in unavoidable impacts on other natural resources (Bagliani, Dansero, & Puttilli, 2010; Chiabrando, Fabrizio, & Garnero, 2009; Johnson, Perlik, Erickson, & Strickland, 2004; Tsoutsos, Frantzeskaki, & Gekas, 2005). As a means of consideration of environmental effects of renewable energy expansion, Mexico employs impact assessments. With the increase of existing and planned renewable energy generation facilities in the country, the call for strategic-level impact assessments becomes louder; in particular as cumulative effects of many individual projects need to be considered to ensure a sustainable development of renewables (Jay, 2010; Stemmer, 2011). Strategic Environmental Assessment enables such cumulative impact assessment (Athanas & McCormick, 2013; Canter, 1999; Dalal-Clayton & Sadler, 2005) and furthermore allows for a broader discussion of alternative actions (Athanas & McCormick, 2013) and earlier public involvement in decision making (Eales & Sheate, 2011) than current impact assessment on the project level.

Accordingly, it is recognised that climate change and security of energy supply are primary sustainability issues in current Mexican policy development, and an energy systems shift towards renewable energy sources is therefore urgent. However, unless environmental impacts of such a shift are carefully taken into account, imposed resource and land use changes may counteract other sustainability goals, such as preserving biodiversity and ecosystem services. Since both climate change and biodiversity are increasingly seen as being of highest priority, there is a need for an integrated approach for addressing these issues that can take both energy and environmental impacts into account (Pang, Mörtberg, & Brown, 2014). Strategic Environmental Assessment represents the window of opportunity for that straightforward approach, providing a comprehensive framework for PPP integration, and playing a key role in helping to achieve more environmentally sustainable practices and processes related to the aforementioned transformation.

#### 4. Methodology

The following methodological proposal is intended to organise, assemble and put into context the main concepts and components that make up this research work. The tag cloud below (Figure 2), which depicts some keyword metadata obtained from different scientific sources, attempts to represent that significant challenge.

Figure 2: SEA as an evolving question



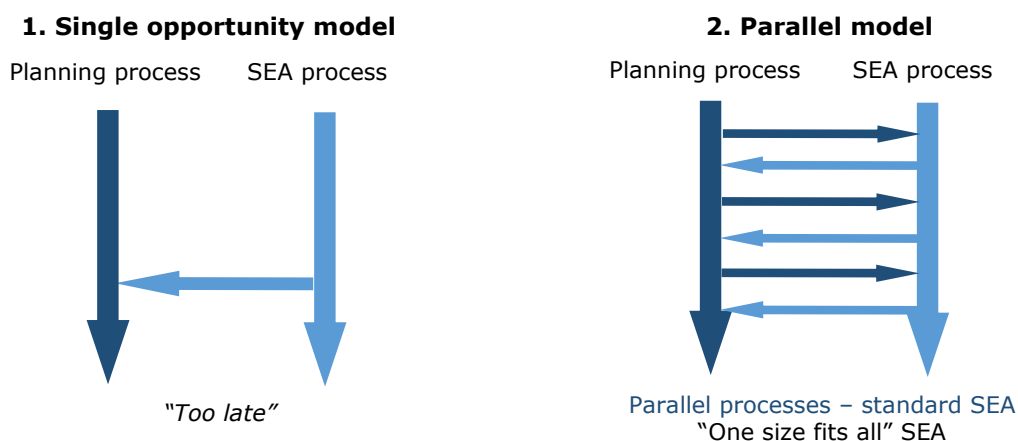
In order to have a deeper understanding of the research scheme proposed, the principal process elements are described below.

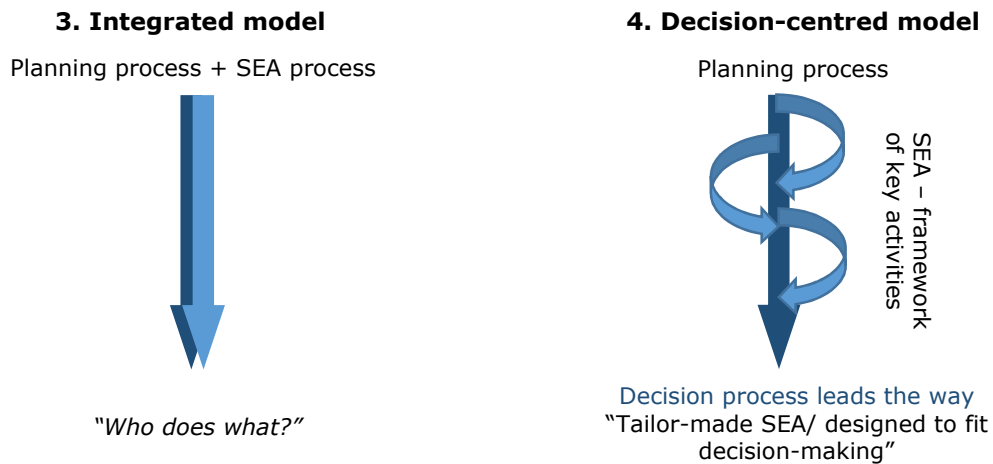
Firstly, being aware that the practice of SEA requires an earlier analysis of the general legal framework within the context of the study, a framework concerning the relevant law is settled up. Here are some of the main instruments that are taken into account for the identification of such framework. It should be clarified that the legal instruments listed below may include, but are not limited to:

- Political Constitution of the Mexican United States.
- Kyoto Protocol.
- Agenda 21.
- United Nations Framework Convention on Climate Change (UNFCCC).
- United Nations Conference on Sustainable Development (UNCSD Rio+20).
- Intergovernmental Panel on Climate Change (2014 IPCC report).
- Planning Law.
- National Development Plan.
- General Law of Ecological Balance and Environmental Protection (LGEEPA).
- National Infrastructure Programme.
- National Programme of Protected Areas.
- National Strategy on Climate Change.
- Environment and Natural Resources Sectoral Programme.
- Energy Sectoral Programme.
- National Strategy for Energy Transition and Sustainable use of Energy.
- National Energy Strategy.

Secondly, a SEA approach is applied. Different models on how SEA and the policy-making/planning processes may link were identified some years ago (Partidário, 2004). Figure 3 serves as an illustration of possible linkages. The first two models (1 and 2) relate more closely to the EIA-based SEA approaches, the parallel model (2) being the most frequently used. Models 3 and 4 relate to more integrated and strategic approaches in SEA. While the integrated model (3) may eventually represent the best SEA model in the long-term, the decision-centred model (4) seems to be the most flexible and adaptable. Decision-centred SEA is viewed as a facilitator of decision-making rather than a technical assessment that satisfies an assessment process. It is also a conceptual framework that helps identify development opportunities that are environmentally sustainable. In this model, SEA can be tailor-made to, and aligned with, the processes of decision-making. According to Partidário, for decision makers, SEA works like an *aide-memoire* which must be considered when making decisions. The decision-centred model (model 4 in Figure 3) is adopted in this research project.

**Figure 3: Models of SEA**





Source: Partidário (2007)

Finally in this regard, a methodological framework is structured in three interrelated stages in a cyclical process. This is not a recipe that applies to all cases, but a number of key driving elements for conducting SEA; hence that should be considered as an interactive, flexible and adaptive process (Ahumada et al., 2011). This methodological structure is outlined in Figure 4, indicating the main strategic steps and key process activities per phase, considered suitable to carry out a SEA for the transition towards renewable energy in Mexico. It should be highlighted that the methodological framework suggested attempts to follow the policy planning strategic-based school (discarding the EIA-based school), and is based on the strategic thinking model supported by Partidario (Partidário, 2007), adopting the United Nations guidelines on mainstreaming sustainability into policymaking (UNEP, 2009), as well as considering the Impact Assessment Guidelines of the European Commission (Commission, 2009).

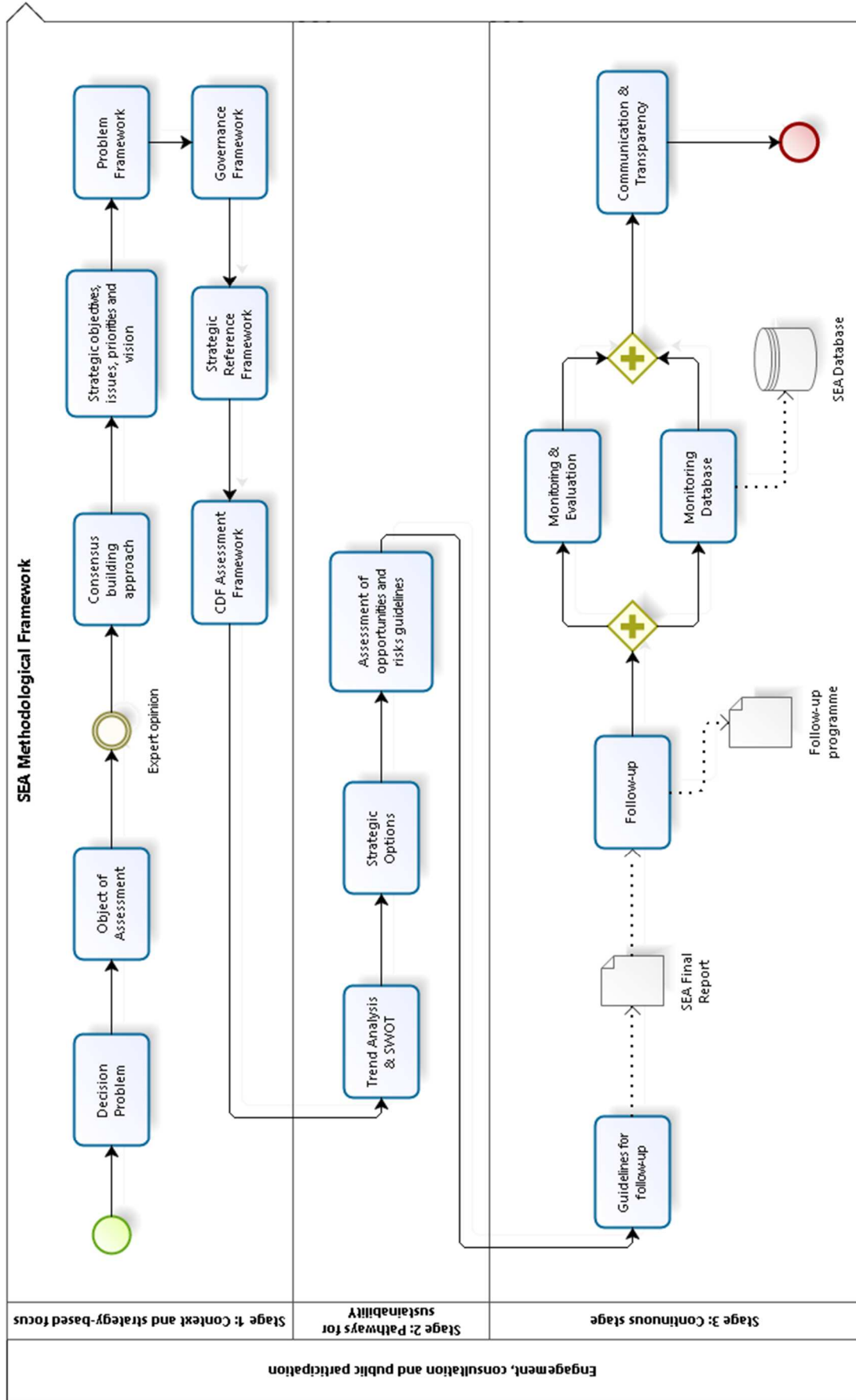
Among the aspects of this work to be highlighted, it is worth mentioning the introduction of a consensus process as one of the most distinctive features, which in turn is intended to permeate key phases of the assessment procedure. It is well known that consensus-based decision making can result in informed decisions that are better, more fully supported, and more easily implemented. In particular, it is actually proposed the adoption of an interdisciplinary approach which integrates knowledge and tools from Collective Intelligence, Complexity Theory, and Geoprospective, via the implementation of a technological Group Decision Support System-Spatial Decision Support System (GDSS-SDSS) type application so-called SIGIC (Castillo Rosas, Jiménez Vélez, Díez Rodríguez, Monguet Fierro, & Núñez Andrés, 2015), capable of generating spatio-temporal scenarios for infrastructure project planning on renewable energy, through future trends obtained from an interdisciplinary *geo-consensus* of a multidisciplinary group of experts, and without strict dependency on a spatial analysis based on a single cognitive stance as well as the availability of geospatial data (Castillo Rosas, Núñez Andrés, Monguet Fierro, & Jiménez Vélez, 2015).

The steps of this process are essentially composed as follows:

- *Identification of sustainability considerations for an efficient transition to renewable energy, their relationships, and acknowledgement of the complexity involved.*
- *Generation of prospective scenarios of spatio-temporal locations of renewable energy infrastructure, using the SIGIC application.*
  - a. Expert panel selection.
  - b. Building and mapping out scenarios through the platform.
  - c. Evaluation of renewable energy planning alternatives.
  - d. Analysis of results and drawing conclusions.



Figure 4: SEA diagram



## 5. Discussion

The implementation of an integrated SEA approach in the national energy transition process will enable the development of a comprehensive framework for assessing future energy scenarios, integrating main policy concerns when appraising renewable energy options, thus leading to increased sustainability, and enabling:

- A more systematic and effective consideration of wider environmental impacts and alternatives at higher tiers of decision-making, leading to more effective and less time-consuming decision-making and implementation.
- Proactive decision tools that support the formulation of strategic action for sustainable development.
- Better integration with EIA and thus the realisation of the full potential of Environmental Assessment (EA).

This research work is an ambitious attempt to raise the level of consideration given to sustainable development issues on strategic documents such as plans, programmes and strategies, identifying significant impacts on environmental and sustainability that are likely to result from the implementation of the plan, or alternative approaches to the plan, in the context of Mexican renewable energy. Furthermore, it is expected to provide support for the development of more transparent strategic decisions. It will strive to provide relevant and reliable information for those involved in timely and effective PPP (Policies, Plans and Programmes) making.

The proposed approach openly envisage a shift in focus under a philosophy of strategic thinking, and a coherent, consistent, transparent and sustainable management of environmental impacts sustained over time through the SEA. Accordingly, it can be stated that there are interesting proposals to face the dilemma and the questions posed by sustainable development. One of the most important perhaps (Strategic Environmental Assessment) implicitly includes a number of important measures that can be taken to address the problem once and for all at its root, which goes beyond the traditional concept of Environmental Impact Assessment of projects (approach of independent evaluation, and hence, usually limited and isolated under certain circumstances). Besides, SEA also gives particular attention to indirect environmental impacts and the cumulative effects of multiple successive projects within the context of study. Likewise, it does provide a further analysis, making the approval of the plans and programmes conditional upon concepts of public consultation, environmental sustainability, analysis of alternatives, and mainstreaming of sustainability into decision-making.

Nevertheless, it is essential to remember that the Strategic Environmental Assessment itself, represents a special way that precedes and does not replace the practice of Environmental Impact Assessment (Orea, 2007) that in each case shall be undertaken for each of the projects and actions considered within the plans and/or programmes. Finally, it can be argued that the conduction of a comprehensive Strategic Environmental Assessment will lay the foundations for a review not only of the environmental model, but also the economic, social and geopolitical model of the nation, and those regions where it is carried out. This in turn will enable to achieve other solutions more prospective in nature, e.g., boosting and consolidating certain productive sectors as key drivers of regional and national economy; and in parallel promoting greater independence from the traditional exploitation of sources of energy and natural resources; likewise, leading to the gradual transition *-yet accelerated and sustained-* towards renewable energy, and the ultimate goal of sustainable development.

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