Challenges to implementing a sustainable strategic evaluation framework of industrial parks: Mexican case

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ABSTRACT

Industrial parks are essential in driving regional development, but how and how much do they benefit their regions? These questions motivated us to develop and implement a framework to evaluate the outputs of industrial parks (I.P.). Previous research developed the integrative framework Sustainable Strategic Evaluation Framework (SSEF) based on Managerial and Contextual Governance components. Relevant indicators for sustainability make part of the framework and can be adapted to match the availability of specific/local data. In this article, we report on implementing the Contextual Governance component of the SSEF to explain the dependency influence of contextual governance characteristics upon sustainability indicators for the regional impact of I.P. By analyzing the challenges during the implementation phase of the qualitative research, we bring new knowledge that can contribute to further developing sustainable strategic evaluation frameworks of I.P. We selected the case study approach to implement the SSEF, which includes an in-depth analysis. The industrial park Guanajuato Puerto Interior (GPI) in Mexico was chosen as sustainability principles have been embedded in this I.P. since its creation. The findings of this first SSEF implementation show that the Contextual Governance component was evaluated as RED restrictive in the criteria of Flexibility and Intensity of two governance dimensions: (i) Levels & scales and (ii) Problem perspectives & goal ambitions. The other criteria were evaluated as YELLOW modérative, and only in the criteria of Extent related to the governance dimensions Levels & scales and Strategies & Instruments was a GREEN enabling evaluation. The challenges identified during the SSEF implementation were directly associated with having a clear definition of the contextual governance factors and processes that simultaneously allow the identification of data to monitor the sustainability performance of the I.P.

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1. Introduction

Sustainable Development (S.D.) has been recognized as a multilevel, multifactorial challenge that implies complex negotiations through demanding decision-making processes. System thinking is one of the approaches used to cope with such complexity that comes down to analyzing different organizational levels, starting with the impacts derived from products, activities, and individual behaviors.

The most-known framework to specify sustainable development targets is the set of Sustainable Development Goals (SDGs) (United Nations, 2015), which stipulates interrelations among the SDGs as one of its distinctive aspects. These interconnections among the SDGs have enhanced such complexity that it requires coherent actions to achieve them individually or in clusters (Kanie et al., 2019; Pham-Truffert et al., 2020; Ding et al., 2018). The multilevel approach to address S.D. calls for finding solutions initiated top-down and streamed from bottom-up processes. Collaboration between the different societal sectors and flexibility in the governance schemes are crucial factors in allowing smooth and swift changes. Scholars indicate the weak interrelation between global, national, regional, and local levels (Spangenberg, 2019) and the challenges faced through their use for assessments (Ramos, 2019; Fuchs et al., 2020). Therefore, it is essential to establish adequate indicators and frameworks to describe the interaction processes.

The development of regional sustainability models has drawn

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researchers’ attention since 1982 and is presently reported with more than 3500 publications dealing with different aspects related to this area of research. The predominant focus of the research reported in these publications was defining suitable indicators and measuring how far the sustainability indicators were fulfilled (Mair et al., 2018), determining correlations between the indicators and constructing composite indicators (Ding et al., 2018), or establishing specific indicators for regional development as a region or related to urban development (Coelho et al., 2015; Graymore et al., 2008; Tiwari and Krishna, 2021; Yang et al., 2014; Rezende and Sinay, 2016). It was also recognized that a comparison between the performance toward sustainability goals is complex to be measured, and the results of an assessment should be interpreted depending on the context of the system (Zeijl-Rozema and Martens, 2010). This draws our research interest in Industrial Parks and these interrelationships, knowing that Industrial Parks (I.P.s) have been seen as regional development and growth hubs by attracting investments and creating jobs. Additionally, the I.P.s’ operations fulfill two critical roles in their regions: (1) they boost innovation and (2) contribute to regional sustainable development. Using the web of science 121 articles have been reported related to the assessment of eco-industrial parks since 2001. Nevertheless, we could not identify literature reporting on the relationship between the assessed contribution of I.P.s to the S.D. of the region where they are located and their contextual factors (contextual governance component) or an evaluation of the influence of these contextual factors.

This gap in the literature motivates our research that studies the role of industrial parks as potential processes interconnected between sustainability frameworks at the company level and regional development performance indicators influenced by contextual factors. The basis for this premise is prior research conducted by Bastida-Ruiz et al. (2013), who developed a set of sustainability indicators based on surveys from around 180 industry representatives and industrial park administrations in Mexico.

Hence, this article centers on the research phases 4 and 5 described in Fig. 2 which aimed to identify the implementation challenges of the contextual governance component of a proposed Sustainable Strategic Evaluation Framework (SSEF) for I.P.s. We exemplified the implementation challenges through a showcase: an industrial park in Guanajuato (Mexico). The following sections describe the theoretical framework, the methodology applied, the description of the region and the industrial park itself, the first results from the application of the SSEF, and finally, the discussion and conclusions of this research.

2. Theoretical framework - regional context related to sustainable development

There are only a handful of studies defining sustainability indicators for I.P.s (Goethmann et al., 2015; Bastida-Ruiz et al., 2013) and processes to assess regional impacts of industrial parks (van Zeijl-Rozema and Martens, 2010; Bastida-Ruiz et al., 2013). In combination with the experiences related to the contextual aspects (Casano-Flores, 2017), these studies have contributed to the theoretical basis of this work.

In response to the lack of frameworks and indicators to evaluate I.P.s’ contributions to the S.D. of their regions, the framework Sustainable Strategic Evaluation Framework (SSEF) (Kreiner et al., 2015; Kreiner and Franco-García, 2019) was developed. The SSEF is based on two components: measurable quality criteria of I.P.s and the description of the contextual conditions. This last one is built on two interaction models: (i) the Contextual Interaction Theory (CIT) (Bressers, 2004; 2009) and; (ii) the Governance Assessment Tool (GAT) (Bressers et al., 2016). The CIT considers the policy implementation process not top-down but a multi-actor interaction process that directly depends on the involved actors’ characteristics. The Governance Assessment Tool considers five dimensions: (a) levels and scales; (b) actors and networks; (c) problem perspectives and goal ambitions; (d) strategies and instruments; and; (e) responsibilities and resources for their implementation. Moreover, GAT was selected because it allows the analysis and assessment of the alignment of various regional development policies with stakeholders’ perceptions throughout consultation strategies to pursue the regional sustainable development of industrial parks.

In a nutshell, it can be said that SSEF was developed to monitor management quality under the influence of contextual conditions. The SSEF tries to identify and analyze interrelations between the industrial park development and the region’s development where it operates and its contextual governance conditions. Moreover, the SSEF aims to serve as a strategic managerial tool for improving the sustainability performance of industrial parks. As a result, the SSEF integrates selected sustainability indicators in the respective domains with contextual assessment criteria (Fig. 1).

It is relevant in this section to summarize the two main components of this framework to guide its implementation through the Guanajuato showcase better. The framework consists of a) a set of GAT contextual criteria and dimensions focused on understanding the levels and scales, actors and networks, problem perspectives and goal ambitions, strategies and instruments, as well as responsibilities and resources, and b) a set of selected environmental, social, economic and managerial indicators for quality evaluation in reaching the planned impact of the industrial park in the region.

3. Methodology

Practical information was needed to test the theoretical soundness and applicability of SSEF. Therefore, the case study application was chosen as the primary research method because it combines research methods, e.g., semi-structured interviews with key informants and field experts (15 interviews) and desk research.

Mexico was selected as the showcase since it represents an emerging country with a still-young democratic regime that contrasts its society from advanced and modern industrial and urban sites to traditional handicraft industrial activities and urban poverty squatters.

The following figure illustrates the approach to obtaining information supporting the test of implementing the SSEF.

The reviewed literature covered several topics of the SSEF: (i) application of GAT to identify data that will have to be collected in our case study (20 articles related to different contexts about water, energy, and land use), and; (ii) governmental information on the region and its context (100 documents: official reports, academic publications, grey literature during the period 2017 and 2020). The keywords used for the literature review for (ii) were typed in a cascading approach, starting with the broader terms such as sustainable industrial parks in Mexico, sustainable development policies in Mexico, regional development in Mexico, and policies related to regional development, public consultation processes in Mexico, stakeholder involvement in Mexico.

The first step related to the case study, identifying the most suitable industrial park in Mexico to test SSEF was performed. The selection criteria were: (i) Sustainability Performance; (ii) Public disclosed in Mexico sustainable industrial parks in Mexico, sustainable industrial parks in Mexico; (iii) Location; and; (iv) Accessibility to potential informants. Criteria applied to a list of 5 industrial parks publicly claimed in 2014 to be either sustainable parks, socially responsible, eco, or green parks (AMPiP, 2014). Industrial parks based in the Central region of Mexico were preliminarily
studied. This region includes Mexico City, the State of Mexico, Querétaro, Puebla, Tlaxcala, and Guanajuato. Few parks located in those States provided information about some of the SSEF performance indicators, which to some extent, could qualify for monitoring the sustainability level of industrial parks (Bastida-Ruiz et al., 2013). All the selection criteria were relevant, but the one related to the open disclosure of the governance model of the industrial park, in practice, became the most critical to carrying on this research. We also identified different corporative governance structures by going through the selection process; some industrial parks have strong private governance, while only a few have mixed private-public governance. In a few cases, governmental authorities’ involvement was also considered in the operation of the industrial park; the government could influence the planning, promotion, and operational phases of those parks. Hence, for the application of the SSEF in the Mexican context, we decided to study a park with a hybrid governance structure under the hypothesis that type of structure could also enable more open information among stakeholders. This latter is also based on the assumption that the
governmental presence could steer the I.P. management towards SDGs. Due to the involvement of public authorities within the parks administration, the chosen industrial park for this study was the Guanajuato Puerto Interior (GPI). This park and its regional context are described further in this section.

Further, the first desk research during 2015 centered on finding publications related to Guanajuato’s state (the industrial park’s location used here as a case study), state and municipal plans, and documentation about the consultation processes used during policy elaboration. This facilitated understanding of the contextual factors related to the industrial park.

In the second step of the case study, relevant key actors in the GPI were interviewed in a semi-structured way. The interviews took place during the period 2015 and 2020. During the first round of interviews, the objective of conducting them was to check whether enough information could be identified to apply the quality indicators of the SSEF and if the selected indicators were considered the right ones. Further data were collected through desk research and the mentioned interviews. In this round, the interviewees were representatives from several sectors: 3 critical stakeholders from state and federal governmental authorities, two industrial park developers and one industrial park administrator, and 2 consultants related to the I.P. topic.

Further interviews at the regional level were conducted to understand and obtain contextual information that answered questions related to the second component of the SSEF (see Fig. 1) (governance and participatory processes). This part of the SSEF tries to explain the success factors in reaching: firstly, the I.P. quality criteria, and secondly, the alignment with and contribution to achieving the regional sustainability goals. As described in previous work (Kreiner and Franco-García, 2019), guiding questions addressed the four qualities of the governance context, allowing for the evaluation of the Extent, Coherence, Flexibility, and Intensity of the five governance domains. The five persons who were willing to answer those questions were in this phase representatives of (i) the park administration; (ii) the Guanajuato State Secretary of Sustainable Economic Development; (iii) one of the tractor companies4 in the park; (iv) a company outside the park; (v) an employee of the most impacted municipality; (vi) consultants, and; (vii) former state employees of the regional development unit that included the development of the industrial park understudy. Complementing desk research during 2017–2019 was necessary to review publications on public policies related to the regional development of the GPI Park and its context. The gathered information responded to the contextual governance criteria, which facilitated the evaluation to a large extent.

It is not the intention in the presented qualitative research to obtain an objective measurement. Therefore, after assessing the collected data, a color code was implemented to make the assessment more visible limited to three values. The red color was allocated when restrictive conditions were observed, e.g., minimum fulfillment as asked by law or not fulfilled. YELLOW indicates moderate or partially fulfilled conditions for a specific GAT criterium. The green color was appointed when positive actions towards sustainable development were stated in the evidence, e.g., GREEN corresponds to enabling conditions of the context towards sustainable development or completely fulfilled targets.

In Table 1, the authors describe the main regional characteristics of the GPI to understand the context under the S.D. perspective.

<table>
<thead>
<tr>
<th>Aspects</th>
<th>Characteristics of Guanajuato State</th>
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<tr>
<td>Environmental aspects</td>
<td>Location: 30,607 km² in the Center of Mexico. Climate: dry and semi-dry; the average annual temperature of 18 degrees Celsius, and the total annual rainfall of 650 mm. Main Environmental challenges: Water scarcity (major consumers: agriculture and growing population), Air pollution and reducing the emission of greenhouse gases in the urban centers, Continuous threat of deforestation, and loss of biodiversity (IEEE, 2010; Tagle Zamora et al., 2017).</td>
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<td>Social aspects</td>
<td>Population in 2006: 5.02 million; in 2018: 5.8 million; 70% urban population. In 2008: 44.1% of the population was classified as poor7 7.9% as extremely poor8 2018: 43.4% poor and 4.2% extremely poor. (CONEVAL, 2019)</td>
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<tr>
<td>Economic aspects</td>
<td>Traditional industrial sectors are leather, mining, agriculture, and pig farming; new sectors are automotive, chemical, food, and textile. In 2009 Guanajuato contributed 3.5% to the annual national GDP (IPANE,M, 2019), and in 2018 4.4%. (INEGI, 2019d)</td>
</tr>
<tr>
<td>Governance</td>
<td>“Partido Acción Nacional” is about 25 years the ruling party. First strategic plan for the region “Guanajuato Siglo XXI” (Caraza Tirado et al., 1993) followed by State Development Plans “Plan Estatal de Desarrollo Guanajuato 2005” (Gobierno del Estado de Guanajuato, 2012) and “Guanajuato 2040” which strengthened citizen participation and established a broad public citizen consultation process in the national and state legislation.</td>
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</table>

The industrial park “Guanajuato Puerto Interior” (GPI) is located in the State of Guanajuato in the Center of Mexico, between the cities of Guanajuato, Silao, and Leon. Guanajuato Puerto Interior, S.A. de C.V. (GPI), in charge of the I.P.’s administration related to its strategic infrastructure, logistic, commercial, and industrial services. This entity has majority participation from the state. The industrial park project was created around 1995 in response to a strategic study, Guanajuato Siglo XXI, which considered sustainable development principles (Caraza Tirado et al., 1993). It was planned to be a dry port and started its construction in 2006 and aligned with the state development plan (GPI, 2012).

In 2019, the park had a surface of 1277 ha consisting of several features: the industrial area, the dry port, community services, educational services as a technical school, innovation services through university collaborations, emergency services, governmental services, and a commercial area. Sixty-five companies from diverse industrial sectors, such as automotive and metal fabrication, chemical products, and cardboard products, are located in the industrial park offering employment for more than 18,000 people.

4. Findings during the SSEF implementation

The results for the five dimensions of the GAT implementation in the case of GPI are described in the following sections.

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4 “Tractor company” is defined here as a company which brings in companies from its supply or value chain.

5 CONEVAL defines a person in poverty situation when this person presents at least one social deprivation from six and not enough income to satisfy his or her needs. https://www.coneval.org.mx/Medicion/Paginas/Glosario.aspx.

6 CONEVAL defines a person in an extreme poverty situation when this person presents at least three or more social deprivations and not enough income to buy the food basket to have sufficient nutrients for a healthy life.

4.1. Levels and scales

GPI was created due to the strategic planning studies that involved public consultancy meetings under the support of visionary business people and was boosted by the former governors during the administrative period from 1993 to 1999 (Caraza Tirado et al., 1993).

Authorities at three levels were involved in creating GPI: National, State, and Municipal. Each level participated within its competencies and responsibilities to attract investment, authorizing the construction at the different departments (from the civil construction department to the national institute of archaeology and history), and providing connectivity infrastructures like roads and electricity. Regional industrial associations were involved in some of the planning activities. International companies attracted to the park required some of their providers to be located nearby in this region. These companies implemented in their facilities international standards related to energy efficiency, environmental criteria, and social criteria. The park developers responded to the expectations of the state authorities and companies involved in providing shared infrastructure and design of the park. From the start of the operation phase in 2006, other stakeholders were included, such as educational institutions and innovation service providers. This led to the establishment of a Polytechnic University (Instituto Politécnico Nacional) in the industrial park and recently to the establishment of the technical school CONALEP. It can be concluded that all required administrative authority and private sector levels were involved, as well as the required scales. Hence in the dimension of levels and scales and criterion of Extent, GPI was assessed GREEN (SSEF: Extent Green). During the interviews, it was indicated that the timely involvement of specific stakeholders was not always given (Evaluation SSEF: Flexibility-YELLOW), which led to delays in issues like having the infrastructure available on time. This indicated that the different actors involved in the policy did not show a productive and efficient interaction to provide a coordination capacity. One concrete example was the creation of educational services on-site, making difficult the definition and implementation of balanced and tuned strategies on a National, State, and Municipal level (Evaluation SSEF: Coherence-YELLOW). On the other hand, there was clear evidence showing how the park’s creation was dominated by a limited group of businessmen and politicians who strongly impacted its design and location. The involvement of a broader group of stakeholders might have influenced the further construction or amplification of the GPI park and related infrastructure, considering a more balanced development in the region (Evaluation SSEF: Intensity RED).

4.2. Actors and networks

During the regional planning phase, the actors and networks were different governmental representatives from the Federal, State, and Municipal governments, academia, and leading industry representatives.

During the application of the SSEF to the GPI, the evaluation of Extent of the actors and networks dimension was assessed YELLOW because some stakeholders were under-represented: unions and NGOs (Loera Ochoa, 2019). This was further based on the evidence showing that the stakeholder identification process during the planning phase was only partially documented and did not follow a defined methodology. Concerning Coherence, the evaluation was also YELLOW, as the strength of interactions between the stakeholders was limited, which followed existing power structures. Different industrial networks exist in the region, but their interaction is only partially institutionalized. Though no conflicting situations were reported within this industrial park by the interviewed persons. Flexibility was evaluated as YELLOW, as leadership cannot easily slip to other actors, even though more actors were included during the industrial park’s operational phase. Actors partially share social capital that enables them to support each other’s tasks but only within their respective sectors. The Intensity in this dimension was evaluated as YELLOW; this assessment was based on the lack of a management reform or behavioral change to create an impact further than the economy.

4.3. Problem perspectives and goal ambitions

The evaluation resulting from the dimension of problem perspectives and goal ambitions enables us to identify arguments to state that the involved actors consider that all their views were integrated. However, the reader should bear in mind that this was the conclusion from only four stakeholder groups, and their involvement was different in the planning and operational phase of the park. On the other hand, an evaluation of future environmental pressure due to the development of the GPI park and its regional value and supply chain was not found despite the official reports related to environmental stress in the region. Therefore, the evaluation for Extent is considered YELLOW. The Coherence in this dimension is evaluated YELLOW. The different problems, like transportation and trained human resources, are not addressed simultaneously to the industrial park development but independently at other moments, even though the impact on the region was positive over time.

Flexibility is judged RED based on the following findings: yearly reports on advances exist, but no process to adjust the goals, as only limited quantifiable goals were found, like the one related to filling up the park with tenants. In addition, no evidence could be found on the interrelationships between the different policies and the possibility to react flexibly and adjust to create sustainable development means in harmony without creating disequilibrium among them. Even though the State Development Plans did not show quantifiable goals, the region presented considerable growth (economic income, social welfare, or environmental benefits) in comparison to other areas of the country. Therefore, Intensity is evaluated as YELLOW, considering that the goal ambitions are slightly above the status quo or business as usual in a national context.

4.4. Strategies and instruments

There are laws to regulate the planning process at the Federal and State level, and these have not changed considerably over the last two decades. The Guanajuato State has shown continuity in its Development Plans over the years, which favored a long-term orientation and continuous regional development. Nevertheless, it is seen that the different sectorial programs (Social, Environmental, and Economic) are not interlinked. On the other hand, the interviewed authorities indicated strong communication between the different areas. Communication and social participation schemes are well established in implementing regulations and laws. Whitepapers and political statements consider the pillars of sustainability, in any case.

Impact evaluation modestly takes place by either the park administration or the involved authorities. In the first years of the park operation, reporting on sustainability indicators was envisioned but no longer pursued, and presently only primary data like occupation employees’ numbers are reported (Gobierno del Estado de Guanajuato, 2012).

By applying the SSEF, the Extent of this dimension is evaluated as GREEN based on the responses of actors who did not see the need for other instruments or strategies. Nevertheless, monitoring could be improved. Coherence is evaluated as YELLOW as the different policy instruments present no overlaps, but the synergies are not visualized with few exceptions (e.g., water use by agriculture versus urban use), thus allowing conflicts or competition. Flexibility is evaluated as YELLOW: The diverse actors related to the industrial park work closely. The strategies used towards sustainability can be adjusted and combined over time in a limited way. The involved actors did not report a need for

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6 See Methodology section: Table 1 and a brief explanation for the colors.
behavioral deviation from current practice. Intensity is evaluated YELLOW because the existing instruments show limited impacts. There are industrial fairs, scientific events, and other discussion fora in the region, and companies inside the park contribute to sustainability issues through negotiations with the government or by their initiatives.

4.5. Responsibilities and resources

The competencies like territorial distribution and use, infrastructure, education, health, environment, and archaeological and historical interests are established according to the respective legal and regulatory frameworks. Competencies are assigned between the three governmental levels. In the case of environmental domains, it depends on the area (air, water, waste, or hazardous waste), the risk classification of industrial activities, and the kind of water bodies. Working groups or committees to address specific projects exist among the different departments at the State level. Nevertheless, it is also observed that there is an imbalance between the various departments at the state governmental level, favoring the state ministry of sustainable economic development, which stresses the region’s economic growth as a priority. (Tagle Zamora et al., 2017).

Resources are allocated through the annual Federal Expenses Budget, municipalities, and state budgets. The tax system in Mexico is complex and favors the Federation (Sobarzo-Fimbres, 2005). Additionally, the municipalities are entities with less tax collection than the states. Regional Development plans are consequently limited to the available resources, mainly from the states, and to the Federal development policies of the present administration.

The GPI is responsible for the correct operation of its infrastructure and controls the behavior of the companies in the park through contractual conditions for their establishment. GPI includes fees for using the common infrastructure, as well.

During the SSEF application, the Extent is evaluated YELLOW in this dimension because the responsibilities are assigned but sometimes with overlapping competencies. Moreover, resources are allocated but sometimes not sufficiently, so the law allows the transfer of competencies from lower to upper levels. This does not lead to optimal implementation of the assigned tasks and reduces efficiency (late responding due to formalities on authorizations). Coherence is evaluated YELLOW because it was found that the collaboration between the different State government departments is reported as very good. On this level, no competence pressure is reported. The municipal level is also said to collaborate on a good level with the State authorities; on the other side, the collaboration of the Federal level is indicated as tedious and limited. Flexibility is evaluated as YELLOW because the assigned responsibilities and resources are sometimes pooled, but accountability and transparency are not always given at the governmental level. Persons with the highest authority sometimes overrule decisions. The economic criteria were the Governor’s priority in the GPI creation and operation context. Environmental or social factors were secondary. The evaluation of Intensity quality was also classified as YELLOW because the amount of allocated resources is insufficient to implement the measures needed for the intended change in the region or the surroundings of GIP in the short range. On the I.P. level, pooling responsibilities and resources are still seen as not accessible or complex to implement (waste management issues). This is due to the limited existing collaboration within the park.

4.6. Connecting all of the GAT governance dimensions with the sustainability performance part of the SSEF

By analyzing the information obtained by implementing SSEF (see Fig. 1), the role and influence of the individual actors and their characteristics related to the regional development of Guanajuato were identified. The authority and power of the State authority’s representatives were decisive in developing the GPI. The matrix Table 2 is based on the compilation of the answers to the interview questions and information obtained through available official documentation and grey literature to validate these responses. The results obtained by implementing the governance part of the SSEF are summarized in this Table 2, which shows that, to some extent, an evaluation is possible by doing this in a participatory approach (integration of diverse opinions by using the same questions).

The quality criteria related to the SSEF are represented in Fig. 1 as the Quality Assessment of industrial parks, amplified by technical indicators in the planning phase and organizational features, representing 5 criteria: technical, organizational, social, environmental and economic. The results of implementing this part of the SSEF in the same case study are reflected in Fig. 3 and were reported in an earlier publication (Kreiner et al., 2015). Each criterion had a list of questions related to the context of the specific industrial park. Although some criteria had more associated questions than others, each answer was given equal weight to construct a 100% score for each criterion. Furthermore, each criterion was given equal weight in the overall evaluation, which reflects the triple bottom line for sustainability. The answers to the questions were classified into 3 levels of maturity, being the lowest level red (only minimum fulfillment of regulations, negative answers and hotspots for attention of improvement), the intermediate level yellow (minimum conditions are fulfilled and some additional criteria toward a best practice or the goal), and the most supportive level green (best international practice or the defined goals are reached). The evaluation was assigned based on information gathered in the interviews, desk research

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<th>Table 2</th>
<th>Results from GPI: The GAT matrix.</th>
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<td>Criteria</td>
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<td>Dimensions</td>
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<td>Strategies and instruments</td>
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<td>Responsibilities and resources</td>
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and finally consensed by the participating researchers.

The results of implementing the quality criteria part of the SSEF indicate, that the technical features during the planning phase were to a considerable extent fulfilling the defined sustainability criteria. However, the criteria related to the operational phase show that social, organizational and environmental criteria still need improvements to achieve the satisfactory level expected from a sustainable industrial park. The economic criteria showed a better evaluation which can be explained through the strong influence of the state authorities who prioritize economic factors in the region and thus impulse the creation of I.P.s (Fig. 3). Additionally, this high dependency of the GPI park performance on the few actors mentioned in section 4 implies a solid tendency to reach only specific regional development goals that can match a few actors’ interests. This situation might add a latent risk of discontinuity of the sustainable regional development plans when they change positions, especially the governing party. That effect/risk can be seen through the colors assigned in the dimensions of levels and scales, problem perspectives and goal ambitions (Table 2) in Flexibility and Intensity, and the quality criteria performance that reflects a clear tendency to prioritize economic aspects. (Fig. 3). Even further, an equilibrium between the pillars of sustainability is not defended sufficiently as the few involved stakeholders might not fully represent the requirements of society.

We interpreted that understanding the culture and the maturity of the democratic system in the context of the GPI, the strategies and instruments implemented have been the correct ones to reach the GPI creation and operation objectives. But, implementing them in an adequate, timely manner could have improved synergies to create a higher impact in the region with sustained growth, e.g., the development of jobs and social infrastructure (housing, transportation). This has to be also seen in the context of resources available by each actor. In this case, the present tax system has to be analyzed, which highly favors the collection of federal taxes, which are later, to some extent, returned to prioritize economic factors in the region and thus impulse the creation of I.P.s (Fig. 3). Additionally, this high dependency of the GPI park performance on the few actors involved might not fully represent the requirements of society.

By SSEF implementation to the GPI case, we also observed that there is still a need for monitoring progress in the region towards reaching the SDGs. The obtained data often are related to actions implemented as results of the public administration, but the impact derived from these actions is not monitored yet. The data needed for this research are either scattered, only scarcely publicly available, or not detailed enough. Information might be available at the company level, but this is not published or shared because of confidentiality issues. Additionally, to our best knowledge, the definition of the SDGs still needs improvement, and their mutual dependencies or interrelations are not either visualized or documented. Updating the strategic planning with scenario models, simulating the outcomes and impacts, and the participation of the critical stakeholders could support the visualization of these interrelations and dependencies. The SSEF results might contribute to constructing those models because SSEF gives an instant overview of the contextual governance dimensions of the quality criteria. For instance, the environmental aspects received mixed evaluations depending on the environmental dimension analyzed. Stakeholders related to those environmental aspects were very limited consulted during the planning and the operational phase of the industrial park (actors and networks dimension), which is also seen through the dimension levels and scales with a clear predominant role of some of them (intensity criteria in RED).

5. Discussion

The explanatory part of the SSEF model strongly relies on the CIT and GAT. All of the governance dimensions of this theory were further presented and explained through the case study of GPI. Here we will mainly discuss some aspects as lessons learned through implementing the SSEF framework in the GPI case, which can guide us through its improvement and further refinement.

Implementing the explanatory part of the SSEF allowed us to understand the context for sustainable development related to the I.P.s’ region. It became clear how explanatory information will always be influenced by the individual characteristics (cognitive, resources, and power) of the stakeholders who provide inside the industrial park’s regional context. This can be interpreted in several ways; one of them is that an investigation of the region’s political history and development must be done before implementing the SSEF framework to identify key persons and understand how decisions are taken in the specific regional context. But at the same time, select the informants that can represent/bring the opinions of other less empowered groups who also need to be involved in the decision-making process to enhance sustainable regional development.

The assignment of the different evaluations related to the specific context depends on the goals defined for sustainable regional
development and how the existing governance criteria and dimensions are assessed (in GAT terms, whether the contextual conditions are supportive, neutral, or restrictive). From the SSEF implementation exercise, we confirmed that the three defined levels of evaluation (GREEN, YELLOW, or RED) are adequate to identify general improvement areas. On the other hand, for a more specific assessment that can enable the identification of improvement opportunities in line with the characteristics and instruments of the governance context, we suggest:

a) to implement, as a preparatory phase, systematic stakeholder identification and characterization process;

b) to develop and apply questionnaires that should be broadly answered in interviews by critical stakeholders and people more involved in the execution who have little say in the Planning phase or decision-making process. These interviews should include talking to several managers and employees and people from the community to enrich the information to detect managerial improvement opportunities. The number of key stakeholders involved in the implementation of the SSEF will strongly depend on the regime structures in the regional context. If there is a more centralized governance scheme or a more decentralized one, this will also influence the concentration of responsibilities related to the different dimensions of sustainability. Another aspect to be considered during the identification process of potential interviewees is that a stakeholder’s influence sometimes has no association with the official assigned functions, responsibilities, or authorities. During the implementation process of the SSEF, we could learn that obtaining the needed information can present difficulties depending on the cultural and political context of the evaluated I.P. In our case, we envisioned that there would not be answers when sending out questionnaires by mail. Therefore, semi-structured interviews should be applied to overcome some potential sensitivity to share information about the Mexican political context. This latter represented an additional challenge, namely identifying knowledgeable respondents on the specific topics to allow an evaluation of the governance part. Also, it is essential to mention that what is decisive is not the number of responders but the quality and extension of the answers they give.

c) to further implement the SSEF as a whole in different contexts, e.g., water governance, where the early stages of GAT were already implemented. (de Boer et al., 2016; Casiano-Flores, 2017).

The SSEF is meant to give us some hints to identify improvement opportunities in the managerial process to reach sustainable regional goals. As presented in the findings section, we confirmed that the SSEF contributed to such an aim. The framework does not assess the tools identification of improvement opportunities in line with the characteristics and instruments of the governance context, we suggest:

6. Conclusions

The framework SSEF is a double-folded tool because it aims to shed light on instant (environmental, social, and economic) impacts through its quality evaluation criteria. At the same time, it evaluates the contextual conditions simultaneously. Later, we want to highlight how several strategic institutional plans (and their execution) might be intertwined within a region. Therefore, some assessed criteria require a historical analysis instead of a punctual (instant) evaluation. The interdependency of the different factors and criteria is seen through the evaluation results (section 4). As discussed throughout this article, SSEF can be applied as a tool to monitor progress towards sustainable regional development due to its GAT component in particular. We also conclude that the most critical phase of any I.P. strategic framework is evaluating the planning phase and its processes to integrate action plans in collaboration with governmental institutions. The I.P. strategic plan toward S.D. requires several key elements: (i) the involvement of all governance levels; (ii) the establishment of adequate measurable indicators and processes related to managing changes in the operation; (iii) adjustment procedures of the plans to coordinate the involved governmental representatives and the industrial parks administration. It is also important to mention that the success of SSEF implementation depends on the meaningfulness of the collected data to support the monitoring of the process and its evaluation. Though throughout this research, it was proved that obtaining data was by itself a challenge.

Moreover, through the SSEF implementation, we could verify how the contextual conditions of an industrial park change over time, which could be influenced mainly by the continuity or discontinuity in policies and action plans of the respective governmental administration. Nevertheless, continuity is needed to implement policies in the timeframe required for sustainable development (S.D.) processes. S.D. demands long-term solutions in any region.

Additionally, the different actions and programs related to sustainable development and strategies might differ in time or change during their implementation. Often it is faster to develop respective infrastructures than the time needed for the embeddedness or deriving processes in the environment of these infrastructures, including decision-making processes. Not considering these differences in the processes concerning regional sustainable development might lead to an imbalance that could cause another type of pressure and high costs in the future for reaching a balance again. Examples are the water stress in the region due to different velocities of a growing industry and housing or promptly providing qualified human resources and innovation systems.

In this line of thought, it is recommended to focus on reaching the best conditions for every of the governance dimensions of the SSEF, starting with the identification of all relevant stakeholders to be included in the governance regime and informing them about results obtained to satisfy the respective needs of information of the stakeholders. Applying the SSEF questionnaire to a broader set of stakeholders could also help get a more comprehensive and fairer view of the targets and expectations fulfilled.

Additionally, during the interviews, the involved actors went through learning processes, suggesting changing some processes in the future and the timely involvement of other actors to accelerate the process of regional sustainable development. This indicates that the SSEF can be a helpful tool in identifying gaps in the governance aspects and opportunities for improvement.

To conclude, the SSEF allowed evaluating of the present state and monitoring of the progress in achieving the set of sustainability targets of the GIP in its region of influence. It also enabled the researchers to put these results within the GIP context and contrast them against the different governance aspects of the contextual conditions. Researchwise, this allowed reflective thoughts for future improvements and developments of the SSEF implementation processes by detecting insufficient governance quality that might facilitate the achievement of long-term targets for regional sustainable development. A multiple-case analysis is recommended for future research to allow the improvement of the framework to fine-tune it. Further research is envisioned related to expanding the SSEF to include frameworks that could relate the cultural differences between the I.P.’s locations to the comparison of the sustainability evaluation of the industrial parks.

Limitations of this study

Regional aspects of the national circumstances, cultural influences, governance regimes, and levels of development by country were excluded from this study. The authors acknowledge that those aspects are different, so the interaction scores to be applied are expected to vary
alongside. Further research might revise this by connecting SSEQ with other frameworks, e.g., proposed Transformative Innovations policies (Boni et al., 2019). This later plays an important role when focusing on measures to support those complex processes towards sustainable development.

**CRediT statement**

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**Declaration of competing interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

**Data availability**

No data was used for the research described in the article.

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