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# Environmental Policies in Mexico: A Critical Analysis of Their Implementation and Results

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## ABSTRACT

Mexico, as a megadiverse country, is particularly vulnerable to climate change. In response, it has implemented various environmental policies, including Payment for Water Environmental Services (PES), the ban on single-use plastics, and the carbon tax. The purpose of this article is to systematically analyze recent environmental policies, evaluating their impact and contribution to sustainable development. To this end, a methodology based on a Systematic Literature Review (SLR), complemented by a bibliometric analysis, was employed. The information search was conducted using the Scopus and Web of Science (WoS) databases, as well as institutional repositories, resulting in the selection of 134 qualified publications. The analysis of these documents enabled the identification and grouping of key findings in areas such as renewable energy, the circular economy, and environmental governance. Although the results demonstrate substantial progress in these fields, they also reveal critical shortcomings in waste management, reforestation efforts, and environmental monitoring. Additionally, the study identifies tensions between economic interests and sustainability goals, low levels of citizen participation in public policy implementation, and pronounced regional disparities in policy execution. The study concludes by emphasizing the urgent need to strengthen environmental governance through increased citizen engagement, professionalization of institutions, and the assurance of long-term policy continuity.

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## 1. INTRODUCTION

Environmental protection is a fundamental pillar for ensuring the sustainable economic and social development of countries (D'adamo et al. 2024, García Hernández & Lucatello 2022). In this context, environmental policies serve as key instruments for establishing regulatory frameworks, governance mechanisms, and management strategies aimed at mitigating the effects of climate change and preserving natural resources (Bekun et al. 2021). Mexico, as a megadiverse country and highly vulnerable to environmental impacts, has adopted public policies in recent years aimed at addressing critical issues such as deforestation, air pollution, waste management, and biodiversity loss.

Recent studies on environmental governance in Mexico indicate progress in developing regulatory frameworks aligned with international commitments such as the Paris Agreement and the 2030 Agenda (He et al. 2023, Raihan & Tuspekova 2022). However, structural constraints persist regarding the effective implementation of these policies, institutional fragmentation, and limited administrative continuity (González Ulloa Aguirre & Márquez Muñoz 2021). These challenges are further compounded by tensions between the economic interests of strategic sectors such as energy and agriculture and sustainability goals, resulting in contradictions between policymaking and government practice (Molina et al. 2019)

Although the academic literature has documented these issues, most previous analyses have taken a sectoral or descriptive approach, which limits a comprehensive understanding of the effectiveness of Mexican environmental policies. The novelty of this study lies in its integrative and systematic approach, which combines a systematic literature review (SLR) with bibliometric analysis to identify patterns, gaps, and trends in scientific production on environmental policies in Mexico (Szpilko & Ejdys 2022, Xu & Kim 2022).

In this context, the objective is to systematically analyze the effectiveness of recent environmental policies in Mexico and their contribution to sustainable development, taking into account the legal, institutional, political, and social factors that condition their performance. Although significant progress has been made, such as the establishment of a robust regulatory framework and the signing of relevant international commitments, the central question remains: how effective have these policies been in terms of sustainable environmental outcomes? This question persists despite ongoing challenges, including weak legislative enforcement, insufficient institutional oversight, and a lack of administrative continuity.

### 1.1. Environmental Policies and Their Role in Sustainable Development

According to Xu & Kim (2022), environmental policies comprise a set of principles, norms, strategies, and actions adopted by governments, international organizations, or private entities to protect the environment and promote sustainable development. These policies aim to prevent, reduce, and mitigate the negative impacts of human activities on natural ecosystems by regulating the use of natural resources, controlling pollution, and promoting responsible practices (Cifuentes-Faura 2022). Generally, they are based on compliance with environmental regulations, the application of economic incentives, and the promotion of clean technologies and renewable energy sources (Souza et al. 2022).

In addition, environmental policies adopt a comprehensive approach that encompasses both economic and social dimensions, as they aim not only to conserve the natural environment but also to improve the quality of life for present and future generations(Miller 2025). These policies are essential in addressing global challenges such as climate change, biodiversity loss, and resource scarcity, and are developed in alignment with international agreements such as the Kyoto Protocol or the Paris Agreement (Silva 2021). The effectiveness of these policies depends on political will, citizen participation, and international cooperation (Husted & Sousa-Filho 2019).

### 1.2. Key Principles in Environmental Policies

Environmental policies are founded on fundamental principles that aim to ensure fair, sustainable, and environmentally responsible development (Arguello Suárez et al. 2023). One of these principles is environmental justice, which promotes equity in the distribution of environmental benefits and burdens across different social groups, preventing vulnerable communities from disproportionately experiencing the impacts of pollution or limited access to natural resources (Banzhaf et al. 2019). This justice entails not only equitable distribution, but also democratic participation in environmental decisions and recognition of every person's right to a healthy environment (Álvarez & Coolsaet 2020). It also involves protecting territories from harm caused by extractive, industrial, or urban activities, while integrating social, political, and ecological dimensions (Menton et al. 2020).

Another essential pillar is the ecological transition, understood as the process of transforming current production and consumption models towards more sustainable systems based on renewable energies, less pollution, and conservation of natural resources (Vence & Pereira 2019). This process entails not only environmental but also economic and social challenges, requiring effective public policies, technological innovation, and active citizen participation (Leipold 2021). In this context, the circular economy serves as a key strategy, promoting recycling, reuse, and waste minimization to close production cycles, move away from the traditional linear model (Chizaryfard et al. 2021). This regenerative economy not only reduces environmental impact but also fosters efficiency and resilience in economic systems (Gennari 2023), directly supporting the goals of the green transition (Adami & Schiavon 2021).

### 1.3. Success Stories and Failures of Environmental Policies Implemented in Mexico

Mexico has implemented a range of environmental policies aimed at addressing the challenges of climate change, biodiversity loss, and the degradation of natural resources (Cantú et al. 2021). However, the outcomes have been mixed. While certain initiatives have achieved notable progress in areas such as conservation and the promotion of clean energy, others have been hindered by factors including a lack of policy continuity, weak institutional coordination, and limited citizen engagement (Lytras et al. 2022).

In recent decades, Mexico has promoted various environmental policies aimed at promoting sustainability and mitigating the effects of climate change. One of the most prominent initiatives is the Payment for Ecosystem Services (PES) program, introduced by CONAFOR in 2003. This

program provides financial incentives to forest landowners who engage in ecosystem conservation, contributing to a reduction in deforestation and an increase in vegetation cover (Barquera & Rivera 2020). Similarly, solar energy projects in Baja California and Sonora have advanced the generation of renewable electricity through public-private partnerships, contributing to the reduction of greenhouse gas emissions (Álvarez & Coolsaet 2020). Another noteworthy development is the carbon tax introduced in 2014, which has generated valuable revenue for environmental programs; however, its impact on emissions has been limited due to its relatively low rate (Gálvez 2024). Additionally, the ban on single-use plastics under the 2021 General Law on Circular Economy has yielded positive outcomes in certain cities, although its implementation remains uneven, particularly within the informal sector (Carpio et al. 2021).

However, not all environmental policies have yielded successful outcomes. The case of urban solid waste management, for instance, highlights a significant gap between environmental regulations and their effective implementation. Many cities continue to lack efficient waste collection and recycling systems, resulting in severe pollution issues and low rates of material recovery (García Hernández & Lucatello 2022). Similarly, the General Law on Climate Change of 2012, despite its advanced legal framework, has exhibited structural weaknesses stemming from insufficient coordination among levels of government, which has hindered compliance with mitigation targets (Izquierdo-Tort 2020). The Sembrando Vida (Sowing Life) reforestation program represents another emblematic case; despite its well-intentioned design and substantial public investment, it has faced criticism due to the low survival rate of planted trees (less than 30%) and allegations of corruption (Ojeda-Revah et al. 2020). Recent reports from SEMARNAT (2023) highlight that several federal environmental programs require significant improvements, revealing deficiencies in the design, monitoring, and evaluation processes. In Mexico City, water management continues to pose a major challenge: the Sacmex system has been unable to prevent water losses exceeding 40% due to leaks, nor has it ensured equitable access to this vital resource (Sánchez-Ocampo et al. 2022).

Some initiatives have demonstrated mixed impacts, such as wind projects in Oaxaca. These have been instrumental in positioning Mexico as a regional leader in wind energy, contributing significantly to clean energy generation (Leal et al. 2020). However, its implementation has been marked by a lack of prior consultation with indigenous communities, resulting in social conflicts that have undermined both its legitimacy and sustainability (Arguello Suárez et al. 2023, Fuentes & De León 2024). These cases demonstrate that environmental benefits are not always accompanied by inclusive processes that uphold social rights, underscoring the need to strengthen environmental governance and enhance community participation (Mejía-Montero et al. 2020).

Concurrently, Mexico has sought to diversify its financial instruments through mechanisms such as green bonds, issued since 2015, which have facilitated the financing of sustainable projects in sectors including transportation, water, and energy (SHCP 2021). In 2023, thematic bond issuance reached $38.3 billion, representing a year-on-year growth of 25%. On the Mexican Stock Exchange alone, approximately 60 billion pesos were raised through green bonds, accounting for 45% of the total bonds issued that year (Herrera 2024a). Mexico has also ratified the Escazú Agreement, advancing greater access to environmental information and justice, although its implementation continues to face significant institutional challenges (Barragán et al. 2022). With the update of its Nationally Determined Contribution (NDC) in 2022, the country established more ambitious targets for reducing greenhouse gas emissions, thereby aligning more closely with its international commitments (Loutfi et al. 2024). However, reports from Climate Transparency (2022) and the IEA (2023) caution that the contradiction between these ambitious goals and the continuation of regressive energy policies, centered on fossil fuels and supported by inadequate budgets for environmental institutions, underscores the challenges of policy coherence and long-term sustainability.

Beyond these contradictions, recent assessments indicate that Mexican environmental policies entail economic and environmental trade-offs that warrant more in-depth empirical analysis. For example, Herrera-Ríos (2025) presents spatial econometric evidence on the relationship between CO emissions and economic activity across Mexican states, demonstrating that economic growth without adequate regulatory oversight leads to increased emissions, thereby underscoring the need to strengthen implementation and enforcement mechanisms. Similarly, the Guide to Green Bonds in Mexico identifies barriers to accessing sustainable financing for small and medium-sized enterprises, which limit the adoption of mitigation projects at the local level. This evidence reinforces the idea that the success of environmental policies depends not only on their regulatory design but also on the institutional, financial, and social capacities required to ensure compliance and sustainability (Herrera 2024b).

Table 1 compares Mexican environmental policies, highlighting initiatives that achieved their objectives versus those with limited results. Successful cases exhibit characteristics such as community participation, effective economic incentives, and public-private partnerships, whereas unsuccessful ones reveal structural issues

Table 1: Success and failure stories of environmental policies in Mexico.

| Case Type | Policy/Programme | Description | Results | Fountain |
|---|---|---|---|---|
| **Success** | Payment for Ecosystem Services (PES) Program | Initiated in 2003 by CONAFOR to incentivize forest conservation through payments to landowners. | Reduction of deforestation in the participating areas and increase of forest cover. | Muñoz-Piña et al. (2008) |
| | Solar energy in Baja California and Sonora | Promotion of photovoltaic energy through incentives and public-private investment. | Significant expansion of renewable electricity generation and reduction of emissions. | IRENA (2021) |
| | Green bonds (2015-present) | Issuance of financial instruments to finance sustainable projects in transport, energy and water. | Mexico was the first country in Latin America to issue sovereign sustainability bonds, leveraged resources for green infrastructure. | SHCP (2021) |
| | Carbon Tax (2014) | Tax on fossil fuels to discourage their use and finance environmental projects. | Generation of useful income, but limited impact on reducing emissions (price set too low). | OECD (2019) |
| | Wind projects in Oaxaca | Expansion of wind farms for clean energy generation. | Increase in renewable energies, but conflicts with communities due to a lack of prior consultation. | CEMDA (2022) |
| | Sustainable Communities Program (2020-present) | Promotion of conservation, ecotourism and green economy practices in rural areas. | Improved community income, biodiversity conservation and local empowerment. | SEMARNAT (2022) |
| | Escazú Agreement (ratified in 2021) | International treaty to guarantee access to information, public participation and environmental justice. | Improving environmental transparency and the rights of environmental defenders: challenges in local implementation. | Barragán et al. (2022) |
| | Nationally Determined Contribution (NDC) – 2022 Update | More ambitious climate commitments: 35% reduction in GHG by 2030 and 51% reduction in black carbon. | Progressive revision of climate targets, still in the stage of compliance and implementation of sectoral policies. | INECC (2022) |
| | Single-Use Plastics Ban (2021) | The General Law of Circular Economy that prohibits disposable plastics in several states. | Visible reduction in cities, but uneven implementation in the informal sector. | SHCP (2021) |
| | National Electric Mobility Strategy (2023) | Roadmap for the transition to electric transport, with support for public and private fleets. | Despite advances in electric bus fleets in Mexico City and Monterrey, it still faces challenges in charging infrastructure. | SEMARNAT (2023) |
| **Fault** | Urban Solid Waste Management | Despite federal laws, many cities lack adequate collection and recycling systems. | Persistent pollution, open-air landfills and low recycling rate (<10%). | SEMARNAT (2020) |
| | Mexico's General Law on Climate Change (2012) | An advanced legal framework, but with poor implementation and a lack of intergovernmental coordination. | Low emission reductions and non-compliance with climate targets. | OECD (2025) |
| | Amendments to the Electricity Industry Law (2021) | Reform that gives priority to CFE energy over private renewables. | International lawsuits, legal uncertainty, fall in investment in renewable energies. | IEA (2023) |
| | Reduction of the environmental budget (2018-2022) | Cuts to SEMARNAT and key environmental agencies (INECC, CONANP). | Reduction of environmental monitoring, protection of natural areas and technical capacity. | CEMDA (2022) |
| | Regressive energy policy (2019-2023) | Preference for CFE's power generation based on fossil fuels, limiting renewables. | Reduction of foreign investment in renewables, setbacks in the energy transition objectives. | Climate Transparency (2022) |
| | Sowing Life Reforestation | Massive social reforestation program (2019-2024) with financial support for participants. | High investment, but low tree survival rate (<30%) and allegations of corruption. | Ramírez Valverde et al. (2024) |
| | Water Management in Mexico City (Sacmex) | Policies to improve distribution and reduce losses in the capital's water network. | 40% losses due to leaks, and inequality in access to drinking water. | IMTA (2021) |
| | Failure to meet e-waste targets | Lack of effective national policies for the recycling of electronic waste. | Accumulation of technological waste and exposure to hazardous pollutants. | IMTA (2021) |

such as corruption, weak oversight, and poor technical design. The analysis indicates that success depends more on implementation than on regulatory design, clearly distinguishing policies that generate sustainable outcomes from those that perpetuate environmental problems despite significant investment (Cantú et al. 2021).

## 2. Materials and methods

This study was conducted through a Systematic Literature Review (SLR), complemented by bibliometric analysis and bibliographic coupling techniques, with the aim of identifying patterns, approaches, and results in the scientific literature on environmental policies in Mexico. According to Kunisch et al. (2018), this type of review enables the consolidation and structuring of knowledge in a specific area through a transparent and replicable process based on clearly defined selection criteria.

Given the growing volume of publications, the diversity of analytical frameworks, and the increasing complexity of environmental problems, a methodology was selected that combines the rigor of a Systematic Literature Review with the visual and analytical potential of bibliometric mapping (Anh et al. 2025). This approach provided a comprehensive overview of the field, identified knowledge gaps, and highlighted emerging trends and priority areas for future research.

The review identified the most frequent approaches, documented results, and impacts of environmental policies in Mexico, as reported in the specialized literature. Based on these findings, new lines of research emerged around environmental governance, climate justice and sustainability. The systematization provided a critical perspective on the performance of these policies, highlighting both the advances and limitations in their implementation, and offering key insights for the design of more effective and participatory strategies within the context of the country's ecological transition (Szpilko & Ejdys 2022).

### 2.1. Study Design

Fig. 1 presents the inclusion and exclusion criteria, defined based on thematic relevance, publication timeliness (2018-2025), and the methodological rigor of the sources analyzed. In addition to the articles indexed in Web of Science (WoS) and Scopus, gray literature, such as technical reports, institutional evaluations, and government documents issued by agencies including SEMARNAT, UNDP, and OECD, is systematically considered to complement the empirical evidence on the

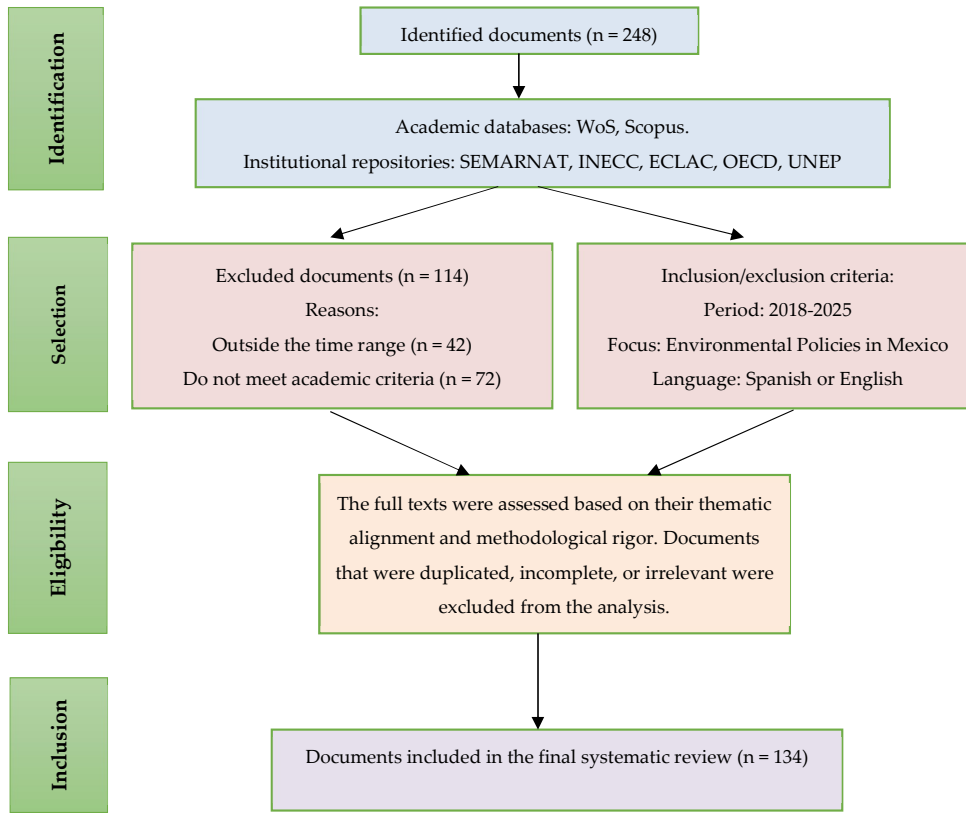


Fig. 1: PRISMA-SLR process flowchart.

implementation of Mexican environmental policies. This selection enabled a more comprehensive understanding of public policy developments and challenges, particularly in areas where academic research remains limited.

The search strategy was developed using Boolean operators and key terms related to public policies, environmental governance, and sustainability in Mexico, following the methodological recommendations of van Oorschot et al. (2018). Specific queries were formulated to include the following terms and their variants (Table 2).

After the initial collection of sources, quality and relevance filters were applied through a manual review of titles, abstracts and keywords, ensuring the scientific validity of the selected documents (Clark et al. 2024). Materials lacking methodological rigor, such as brief articles, technical notes, or opinion pieces, were excluded, with priority given to studies providing empirical evidence or substantive analyses on the implementation and evaluation of environmental policies. This process resulted in the construction of a solid and diversified documentary corpus, comprising both academic and non-academic literature, which enabled a comparative and systematic examination during the critical phase of the analysis.

To minimize potential biases in the selection process, the analysis of the sources was carried out independently by two researchers. Each one applied the previously established inclusion and exclusion criteria. Subsequently, the results were compared, and the discrepancies were discussed until a consensus was reached. This process ensured a more objective review and reduced the risk of omitting information relevant to the study.

#### *2.1.1. Bibliometric Analysis and Knowledge Mapping*

With the final corpus, a bibliographic coupling analysis was implemented to identify networks and clusters between documents that share references. This technique allows examining the intellectual structure of the field by detecting publications that share common references, revealing their conceptual proximity (Rethlefsen et al. 2021). The analysis was carried out with the specialized software VOSviewer, developed by van Eck & Waltman (2010), which allows the construction of similarity maps and the visualization of nodes and clusters of publications according to their bibliographic connections. The distance between articles (Sikh) was calculated using the formula:

$$Sij = Cij — (Wi \times Wj) \quad ...(1)$$

Where Cij represents the number of co-occurrences between the elements i and j, and Wi, Wj are the total number of occurrences of each element.

This approach facilitated the identification of current trends, thematic gaps, and emerging areas related to the evaluation of environmental public policies in Mexico. Although the phases were planned sequentially, the application of the method was iterative and flexible, which allowed adjustments based on preliminary findings. The combination of systematic review and bibliometric analysis provided methodological robustness to the study, favoring robust interpretations aimed at the formulation of more effective and participatory strategies for environmental governance in Mexico (Mozas Moral et al. 2020, Szpilko & Ejdys 2022)

Table 2: Syntax used in query calibration for database exploration.

| No. | Query syntax | Number of results |
|---|---|---|
| 1 | "environmental policies" OR "environmental policy" OR "environmental governance" AND "Mexico" | 171 |
| 2 | "evaluation" OR "implementation" OR "impact" | 53 |
| 3 | "climate change" OR "sustainability" OR "sustainable development" | 24 |

## 3. RESULTS

### 3.1. Descriptive Analysis of Selected Sources

The final corpus comprised a total of 134 documents selected according to the established criteria, enabling a comparative approach and the identification of trends in both scientific and institutional production on environmental policies in Mexico (Rethlefsen et al. 2021, van Oorschot et al. 2018).

Table 3 presents the structure of the systematic review. The temporal distribution of the publications indicates a significant concentration between 2021 and 2023, reflecting a growing interest in environmental policies in Mexico. This increase coincides with the strengthening of the National Climate Agenda and the update of the Nationally Determined Contribution (NDC) during the same period.

In terms of document type, 78% of the corpus consisted of scientific articles, while the remaining 22% includes book chapters, technical reports, institutional documents and books. The most frequently cited journals were *Sustainability and Science of the Total Environment*. From a geographical perspective, most studies focused on national or regional contexts within Mexico. However, comparative analyses of international scope were also identified, particularly involving other Latin American countries. This overview enabled the contextualization of the main thematic and methodological trends of recent research.

The bibliometric analysis conducted using VOSviewer software, based on scientific publications related to

Table 3: Distribution of revised documents by type, year and source (2018-2025).

| Post Type | 2018–2020 | 2021–2023 | 2024–2025 | Principal Fuentes/Databases | Total [n] |
|---|---|---|---|---|---|
| Scientific Articles | 38 | 47 | 21 | Scopus, WoS | 104 |
| Book Chapters | 2 | 4 | 2 | Scopus, SpringerLink | 8 |
| Technical/Institutional Reports | 5 | 8 | 4 | SEMARNAT, INECC, OECD, UNEP, ECLAC | 17 |
| Books | 1 | 1 | 1 | Institutional and Academic Editors | 3 |
| Total | 46 | 60 | 28 | — | 134 |

Source: Authors' elaboration based on the Systematic Review of Literature (2018-2025).

environmental governance in Mexico (Table 2), revealed key associations among the most prominent terms in this field. As shown in Fig. 2, environmental policies are closely linked to concepts such as environmental management, sustainable development, green development, and climate change. This interconnectedness underscores the central role that these policies play in promoting sustainable strategies and mitigating the effects of climate change.

In the context of Mexico, these findings are particularly relevant for evaluating the implementation and outcomes of environmental policies. Martínez & Mesa (2021) point out that, although environmental policies promote sustainable development, their financial impact on companies can be socially negative. This aligns with the identified challenges, where the adoption of environmental regulations may encounter economic and operational barriers. These divergences underscore the complexity of implementing effective environmental policies in Mexico, where factors such as industrial structure, economic incentives, and institutional capacity can influence outcomes (Walter 2020). While these policies are essential for advancing green development, they can generate tensions between sustainability and profitability, particularly in the short term (Velasco & Mumme 2025).

### 3.2. Cluster Analysis in Terms of Environmental Policies

The bibliometric analysis conducted using VOSviewer (Fig. 3) identified three primary thematic groups, green, red, and blue, that organize the scientific production on environmental policies in Mexico between 2018 and 2025. The network, comprising 134 documents and 312 terms with at least five co-occurrences, exhibits an average link strength of 28.4 and a network density of 0.43, indicating a moderate level of interconnection among the analyzed topics.

#### *3.2.1. Red Cluster: Circular Economy Tension*

The red cluster, representing 8.3% of the network, concentrates terms such as circular economy, business competitiveness, and sustainable production. This group illustrates the tension

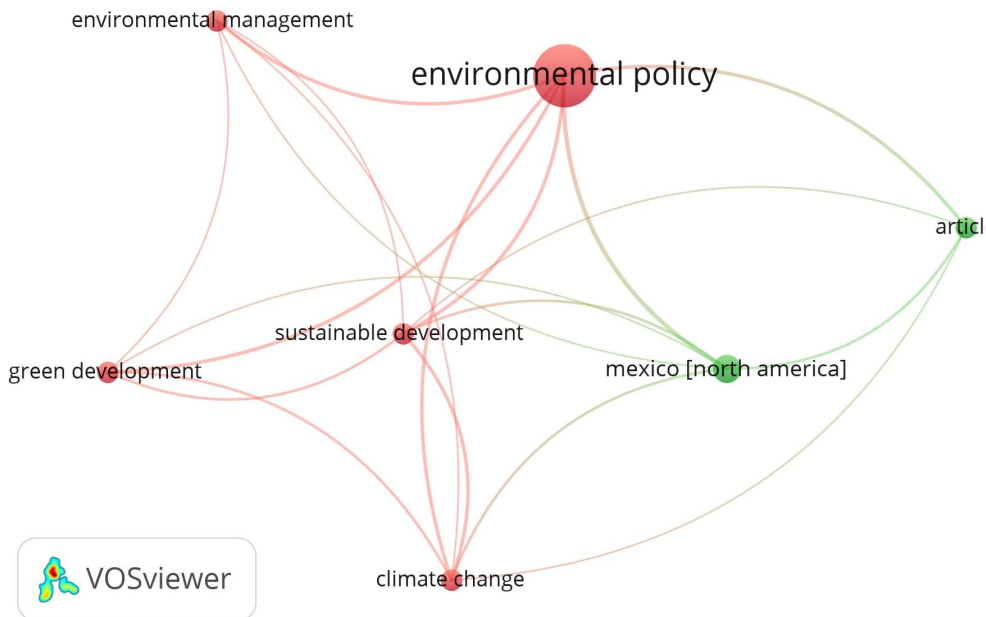


Fig. 2: Thematic association map between categories visualized in VOSviewer.

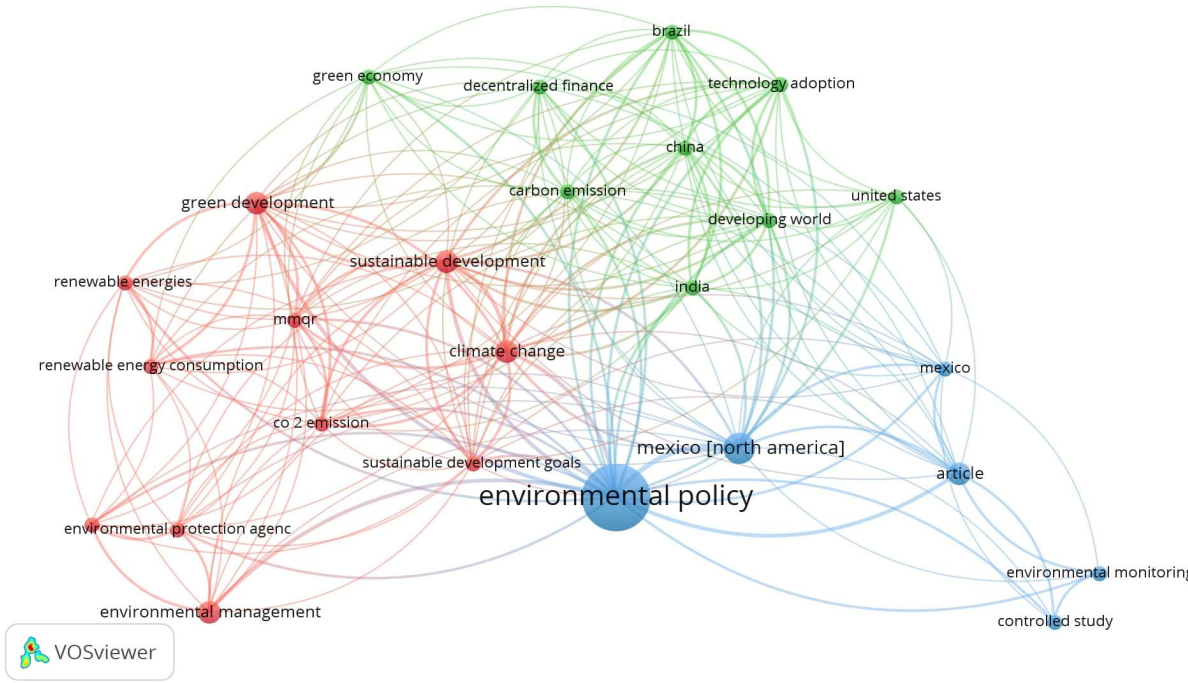


Fig. 3: Relationship between productive sectors and environmental policies.

between sustainability and profitability, a common dilemma in economies dependent on manufacturing for export. Carpio et al. (2021) found that strict enforcement of environmental regulations increases compliance costs by 12% to 18% during the initial years of adaptation, temporarily affecting competitiveness. However, recent research indicates that integrating circular economy strategies can enhance resource efficiency and increase value added in the medium term (Padilla-Rivera et al. 2024, Rodríguez-Espíndola et al. 2022). In terms of public policy, this cluster highlights the need for green tax incentives and sustainable innovation mechanisms that balance economic and environmental objectives, as promoted by the General Law on Circular Economy (2021) and the Sovereign Green Bonds issued by the SHCP (2021).

### *3.2.2. Green Cluster: Challenges of the Energy Transition*

The green cluster encompasses concepts related to renewable energies, $CO_2$ emissions, and energy efficiency. It accounts 13.7% of the co-occurrences in the total corpus, underscoring the priority of this issue on the Mexican agenda following the update of the NDC(INECC 2022). This group clusters the structural challenges of the energy transition, particularly in the technological adoption of industrial SMEs, where high upfront costs and limited access to financing constrain innovation (Pischke et al. 2019). Comparatively, recent studies in Latin America indicate that technological affordability and regulatory stability are the primary factors influencing the success of the green transition (Afshan et al. 2022, D'adamo et al. 2024). In Mexico, while solar and wind projects in Sonora and Oaxaca have demonstrated progress, their uneven implementation and the associated social conflicts highlight persistent gaps in energy governance (Fuentes & De León 2024).

### *3.2.3. Blue Cluster: Institutional Fragility*

Finally, the blue cluster, representing 10.5% of occurrences, groups together terms related to environmental management, regional planning, and policy evaluation. The low strength of the link between these concepts (average value of 14.6) indicates a weakness in the integration of environmental management with evaluation and accountability mechanisms, reflecting the institutional fragility documented in multiple assessments (He et al. 2023). In Mexico, only 22% of municipalities have adequate systems in place to monitor the impact of their environmental policies (Leal et al. 2020). This institutional gap has also been observed in other Latin American countries, such as Colombia and Peru, where decentralization without technical capacity building has limited the effectiveness of environmental governance (Raihan & Tuspekova 2022). Consequently, this cluster underscores the urgency of strengthening local capacities, professionalizing public environmental services, and promoting intergovernmental coordination.

### 3.3. Relationship Between Environmental Policies and Sustainable Development

#### *3.3.1. Regulatory and Legal Frameworks*

According to Sánchez-Ocampo et al. (2022), the evolution of Mexico's environmental legal framework has been strongly influenced by international agreements such as the Paris Agreement and the 2030 Agenda. Since 2018, the literature has reflected a growing effort to align national legislation with global standards, including reforms to the General Law of Ecological Balance and Environmental Protection (LGEEPA) (Ogwu et al. 2025, ORyan & Ibarra 2018, Pacheco-Vega 2020). However, the studies also indicate that regulatory harmonization remains partial and uneven, with limited coordination between different levels of government and the states (He et al. 2023, SEMARNAT 2022).

Despite the existence of a robust legal framework, limitations in its effective implementation have been identified. Research indicates that environmental regulations, although advanced in design, lack adequate enforcement mechanisms and rely excessively on local political will for their implementation. This has resulted in legal loopholes and fragmentation, particularly in rural and highly biodiverse areas (INECC 2023). Between 2019 and 2023, accusations regarding the discretionary use of concepts such as "public interest" to justify megaprojects intensified, thereby undermining the principle of environmental precaution (ECLAC 2019). Despite certain regulatory advances, such as the incorporation of the principle of environmental justice in some states, inconsistencies persist between legal discourse and institutional practice (Mayen Huerta & Cafagna 2021, Ojeda-Revah et al. 2020).

#### *3.3.2. Government Strategies and Programs*

According to Pischke et al. (2019), the Special Climate Change Program (PECC) and the National Energy Strategy have been frequently analyzed in recent literature as the principal instruments of environmental planning in Mexico. Between 2018 and 2022, the publications report progress in the formulation of these programs, including quantifiable targets for emission reductions and the promotion of clean energy (SEMARNAT 2020). However, the approach remains predominantly sectoral and top-down, with limited social participation (Mardero et al. 2018, Margallo et al. 2019).

Budget cuts and administrative changes have been identified as factors that undermine the continuity and effectiveness of government strategies (Izquierdo-Tort 2020, Rodríguez-Espíndola et al. 2022). In particular, the cancellation of funding sources, such as the Climate Change Trust Fund, has resulted in setbacks in the implementation of mitigation and adaptation projects (ECLAC 2019). Despite these obstacles, some technical and academic studies highlight positive experiences in inter-institutional coordination, such as reforestation and watershed conservation programs in Yucatán and Chiapas (Zárate-Toledo et al. 2021). However, these cases remain the exception rather than the rule, reflecting the need to strengthen environmental governance (Barkin 2019, Lewis & Tietenberg 2019).

In addition, there has been a recurrent trend towards the implementation of short-term policies that respond to international pressures or specific crises, such as natural disasters or territorial conflicts, without consolidating structural strategies or long-term evaluation mechanisms (Solorio Sandoval et al. 2020). This reactive inertia has limited the institutionalization of sustainability as a cross-cutting axis in public decision-making (Molina et al. 2019).

#### *3.3.3. Perceptions of Social Actors*

The period 2018-2025 has been characterized by a growing visibility of indigenous communities, non-governmental organizations (NGOs), and citizen groups in the field of environmental policies(Abalansa et al. 2021). The literature shows that, although participation in public consultations and evaluation processes has increased, these spaces often lack binding mechanisms and respect for collective rights (Bee 2018, Guibrunet et al. 2021, Ortega Díaz & Gutiérrez 2018).

In many cases, social participation has been mediated by socio-environmental conflicts(Torres-Lima et al. 2018). Cases of criminalization, threats, and violence against environmental defenders have been reported, documented both in institutional reports and in academic theses between 2020 and 2023 (Arroyo & Carrete 2019). This contrasts with the official discourse on openness and transparency.

The trend toward the judicialization of environmental conflicts related to deficient evaluations has increased, particularly in the case of infrastructure megaprojects, such as the Maya Train (Bonilla Padilla 2023). This has generated growing social and academic pressure to reform the current model and adopt more participatory and preventive evaluation schemes (Elmagrhi et al. 2019, López-García & Navarro-Cerrillo 2021).

However, experiences of co-management of natural resources are also highlighted, particularly in community-based tourism and agroecology, where social actors have managed to influence local decisions (Herrera et al. 2018, Nadal et al. 2018). These examples, although limited, demonstrate that effective participation is possible when the appropriate institutional conditions are in place.

#### *3.3.4. Institutional Barriers and Achievements*

The presence of institutional barriers, especially in terms of fragmented responsibilities, the lack of trained personnel, and the poor coordination between levels of government, is recurrently evident (Blanco-Portela et al. 2018, Cárdenas-Cabello 2016, Padilla-Rivera et al. 2024). Various publications agree that the Mexican institutional structure lacks the technical and financial capacity to address the challenges of the environmental crisis (Cantú et al. 2021). However, the SLR also reveals certain significant achievements in local contexts. For example, in Oaxaca and Yucatan, cases of intersectoral coordination have been documented that have achieved positive results in resource conservation, sustainable water management, and environmental education (Huesca-Pérez et al. 2018, Zárate-Toledo et al. 2021). These cases were frequently addressed between 2021 and 2024 by thesis studies and articles specialized in territorial development (Gilabert-Alarcón et al. 2018, Mejía-Montero et al. 2020).

Finally, proposals for institutional reform aimed at establishing multilevel governance mechanisms, as well as professionalizing the environmental public service, have been identified (Reyes-Santiago et al. 2019). Although these proposals have not yet been translated into national policies, they represent a promising avenue for strengthening the institutional framework.

## 4. DISCUSSION

### 4.1. Correspondence Between Thematic Clusters and Policy Outcomes

The green cluster, associated with the energy transition, illustrates how the lack of financing and regulatory stability hinders the adoption of technology in key sectors. This institutional deficit limits compliance with the NDC and perpetuates dependence on fossil fuels (Fuentes & De Leó 2024, INECC 2023). The red cluster, focused on the circular economy, highlights the tension between environmental policies and economic objectives. The absence of tax incentives and limited public-private coordination has restricted the expansion of sustainable production models, unlike the successful experiences in Brazil, where the Solid Waste Law (2010) established clear responsibilities for producers and municipalities (Padilla-Rivera et al. 2024). Finally, the blue cluster is directly associated with institutional fragmentation and weak evaluation mechanisms. This deficiency prevents accurate measurement of the impact of policies and perpetuates a form of environmental governance that is more formal than effective (He et al. 2023).

### 4.2. Implications of Environmental Policies

Among the main findings of the Systematic Literature Review (Fig. 4), a persistent structural gap is identified between the regulatory design and the practical implementation of environmental policies in Mexico. This gap results in chronic institutional fragmentation, weak intergovernmental coordination, and poor administrative continuity, which limit the effectiveness of strategies and compromise their long-term sustainability (González Ulloa Aguirre & Márquez Muñoz 2021, Sánchez-Ocampo et al. 2022). Although the country has an advanced legal framework, including the General Law on Climate Change and adherence to the Paris Agreement, policies tend to operate in a reactive and disjointed manner, oriented more toward responding to short-term pressures than consolidating processes of structural transformation.

The evidence analyzed indicates that most Mexican environmental policies retain a discursive and symbolic character, with limited achievements in terms of measurable results (Arvidsson & Dumay 2022). Tensions between economic growth and environmental sustainability remain

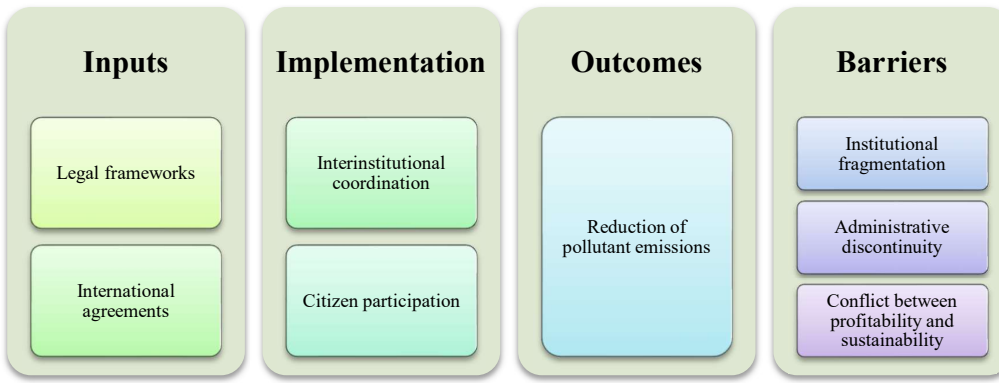


Fig. 4: Main findings of the systematic literature review.

latent, particularly in strategic sectors such as energy, mining, and agribusiness, where policy decisions prioritize short-term profitability over ecological commitments (Elmagrhi et al. 2019). In addition, the lack of independent evaluation mechanisms and limited binding citizen participation reduces the legitimacy and sustainability of public interventions (Izquierdo-Tort 2020, López-Feldman et al. 2021, Ortega Díaz & Gutiérrez 2018).

From a territorial perspective, significant asymmetries in institutional capacity are evident: while entities such as Mexico City, Yucatán, and Nuevo León demonstrate better environmental monitoring and management indicators, the southern and southeastern states exhibit substantial lags due to administrative deficiencies, low technical professionalization, and budgetary constraints (Leal et al. 2020, SEMARNAT 2023). Only 22% of municipalities have formal assessment systems, highlighting an uneven environmental governance pattern that depends on local capacity.

Comparative analysis with Latin America suggests that countries such as Chile and Brazil have reduced these gaps by institutionalizing autonomous environmental agencies and incorporating binding participation mechanisms, thereby strengthening the accountability and stability of public policies (Afshan et al. 2022, Raihan & Tuspekova 2022). In contrast, Mexico maintains a centralized and overlapping model, with environmental competencies dispersed among ministries and agencies, resulting in duplication of functions and low intersectoral coherence.

Likewise, the lack of continuity between government administrations leads to ruptures in institutional learning processes and discontinuities in environmental programs (Cantú et al. 2021, Carpio et al. 2021). In the energy sector, recent reforms have responded more to economic agendas than to sustainability criteria, exacerbating socio-environmental conflicts and increasing citizen distrust of authorities.

### 4.3. Towards Participatory and Decentralised Governance

The negative correlation between institutional fragmentation and environmental performance, observed in the thematic clusters of energy, circular economy, and institutional management, underscores the need for integrated and evidence-based policies. Overcoming this paradox of regulatory maturity with low effectiveness requires institutional reforms aimed at ensuring technical continuity, financial stability, and effective social participation (Jacobo & Jalile 2023, Rubio 2018). In short, moving towards participatory, decentralized, and technified environmental governance is an indispensable condition for transforming existing regulatory frameworks into sustainable and verifiable outcomes.

Mexico's challenge lies not only in creating new policies but also in strengthening institutional capacity to implement them in a participatory and transparent manner. The literature and data reviewed suggest three priority areas for reform:

1) Professionalization of the environmental public service, ensuring technical continuity beyond political cycles (Reyes-Santiago et al. 2019) .
2) Decentralization with oversight, transferring environmental competencies to local governments while ensuring accompanying supervision and financing mechanisms (Herrera-Ríos 2025).
3) Linking citizen participation, transforming public consultations into co-decision processes, following successful models such as the Regional Environmental Councils in Chile(Bonilla Padilla 2023) or the Local Agenda 21 adopted in Brazil (Mardero et al. 2018).

These measures would enable a transition toward deliberative environmental governance, in which social legitimacy is integrated with technical performance.

## 5. CONCLUSIONS

Despite significant advances in Mexico's regulatory and institutional design of environmental policies, such as the General Law on Climate Change and adherence to international commitments, a structural gap remains between the formulation and effective implementation of these policies. This gap can be attributed to institutional constraints, weak oversight, and fragmented intergovernmental coordination, all of which undermine the effectiveness and sustainability of environmental strategies. The systematic review indicates that the performance of Mexican environmental policies is uneven. Programs such as Payment for Environmental Services (PES) and the promotion of solar energy have had positive impacts on conservation and mitigation; however, other initiatives, such as Sembrando Vida (Sowing Life), waste management, or Mexico City's water strategy, have suffered from design flaws, corruption, or lack of monitoring mechanisms, limiting their outcomes in the short and medium term.

Moreover, Mexican environmental governance continues to lack binding participatory processes and effective environmental justice. In several cases, local and indigenous communities have been excluded from decision-making on megaprojects, leading to social conflicts and increased environmental litigation. This suggests that sustainability depends not only on the legal framework but also on

the State's capacity to ensure inclusive, transparent governance with institutional continuity. The research confirms that institutional strengthening, professionalization of environmental public services, and coordinated decentralization are necessary for policy effectiveness and legitimacy. Local experiences, such as those in Yucatán and Oaxaca, demonstrate that the combination of political will, social participation, and technical monitoring can lead to more effective and sustainable environmental policies.

It is recommended to conduct empirical studies at the state and municipal levels to evaluate the implementation and impacts of environmental policies. Such studies should focus on identifying factors that explain the success or failure of local programs and on developing environmental governance indicators adapted to territorial realities. Additionally, establishing institutional continuity plans to ensure the persistence of strategic environmental projects beyond administrative changes is a priority. The combination of rigorous technical evaluation, transparent management, and effective citizen participation presents the most viable approach to consolidating a robust, equitable, and sustainable Mexican environmental policy in the long term.

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