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Nature-based Solutions & Green Infrastructure

within BIOCITIS framework, a project of
the German Technical Cooperation (GIZ)
in Mexico.

Emerging opportunities and lessons learned.

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Project

Sustainable Development of Coastal Regions through the Integration of Ecosystem Services and Biodiversity (BIOCITIS, by its Spanish initials)

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Contents

1. Introduction	01
2. Regional and methodological context	05
3. Implemented processes	08
Action Plans	08
GI Planning and Implementation	08
Demonstrative Actions	09
Urban Wetlands	09
Capacity Building for NbS & GI	09
Coastal Resilience	09
4. Emerging opportunities and lessons learned	10
Awareness and appropriation	13
Institutionality and governance	13
Financing	14
Key Messages	15
Subnational Scale	15
National Scale	20
International Scale	23
5. Conclusions	26

1. Introduction.

In July 2020, on behalf of the German Government -through the German Federal Ministry for Economic Cooperation and Development (BMZ, by its German initials)- and in cooperation with the Government of Mexico, the Technical Cooperation project between Mexico and Germany "*Sustainable development of coastal urban regions through the integration of ecosystem services and biodiversity*" (BIOCITIS) was launched. The objective of this project was to improve the protection of biodiversity and ecosystem services in three coastal regions of the country: Northwest, in the municipalities of Los Cabos and La Paz; Gulf of Mexico, in the municipalities of Boca del Río and Veracruz, and; Southeast, in the municipalities of Chetumal and Bacalar.

The relevance and pertinence of contributing to sustainable urban development in coastal regions of Mexico can be understood considering that this country has more than **11,000 km of coastline**, which implies that **17 of the 32 federal entities have coastlines** and that there are **263 coastal municipalities**. This is reflected in the fact that **20% of the Mexican population lives in coastal cities** and that these contexts generate **36% of the national GDP**.

In addition to the above, **the importance of coastal regions lies in their ecosystems**, as they are a source of various benefits for the environment and people. To mention a few of them: they provide basic resources such as water or food, they promote economic activities of great importance for the country such as tourism or fishing, and **they constitute an environmental asset of great relevance in the face of the climate crisis**, as they reduce vulnerabilities,

mitigate socio-environmental risks and increase the adaptive capacity of people and the territory for confronting diverse extreme events.

According to INECOL (Mexico's Institute of Ecology), "Almost half of the world's population lives in coastal plains. In addition, these areas are home to numerous terrestrial and aquatic life forms and play a fundamental role in storing significant amounts of carbon in the soil, among other benefits. However, despite their great ecological and socioeconomic importance, the numerous interactions and connections on which these ecosystems depend, the interests and economic sectors present, as well as the lack of adequate legislation, make them very vulnerable"¹.

Furthermore, we cannot ignore the fact that the **decline in ecosystem function currently represents a cost to humanity of 5 trillion dollars per year**². Beyond the financial losses, for Latin America, a region in which 80% of the population lives in



The BIOCITIS operated in 3 priority coastal regions: Northwest; Gulf of Mexico and; Southeast.
Source: own

¹ <http://posgrado.inecol.edu.mx/cursos/detalle.php?ref=00000001439>

² Kurth, T. et al. (2021). The Biodiversity Crisis Is a Business Crisis. Obtenido de: <https://www.bcg.com/publications/2021/-biodiversity-loss-business-implications-responses>

cities, it is estimated that failure to contribute to the adaptive capacity of this population to the impacts of the global socio-environmental crisis could mean more than 17 million displaced people by 2050 ³.

In this context, the BIOCITIS project implemented a multi-scale approach. From a **top-down** perspective, the BIOCITIS project in direct cooperation with SEDATU and SEMARNAT as federal-level counterparts, selected priority regions for implementation, and whose experiences and lessons learned would serve as inputs to issue recommendations for public policy and instruments for sustainable urban development with the potential to be transferred to other regions at the national level, even if these were not coastal regions.

On the other hand, and as a complement to the regional macro-scale approach, cooperation was carried out at the subnational level with states and municipalities in the defined regions, so that the recommendations issued at the national level reflected an accurate pulse of the challenges, needs and opportunities that occur in the territory and the institutions closest to the population, from a **bottom-up** approach.

The substantial contribution of the BIOCITIS experience and this document lies in the fact that it represents a next step in adapting important international or regional references to local contexts, such as those developed by the International Union for Conservation of Nature (IUCN), the United Nations Environment Programme (UNEP) and even GIZ itself.

The above seeks to **contribute to mainstreaming Nature-based Solutions** (NbS)

and Green Infrastructure (GI) through the articulation of policies and agendas at the subnational level with those at the national and international level, as a way to foster the appropriation of conceptual and operational frameworks, support the detection, preparation and allocation of funds and, above all, increase territorial and population resilience in Mexico.

Even if all previous efforts for mainstreaming NbS and GI are of great value for this mission, the comparative advantage of BIOCITIS was its coastal focus, which involved direct relations and attention to settlements and ecosystems in the lower areas of the basin, a territory still little explored in terms of the integrated urban-environmental agenda.

The German Technical Cooperation (GIZ) in Mexico has extensive experience in working with Mexican cities. The focus of this work is based on a systemic understanding of cities that favors integrative approaches and has allowed for the connection of sectors and stakeholders from different areas and levels in favour of sustainability in the more than 14 cities with which it has cooperated ⁴.

As a result of this experience, it has been identified that Nature-based Solutions (NbS) and Green Infrastructure (GI) are highly useful conceptual and operational frameworks for addressing many of the diverse problems affecting the territory and population in Mexico. Specifically, it is recognized that the comparative advantage of these approaches is that they are based on the intersectoral perspective necessary to solve problems of a **socio-ecosystemic** nature. That is, they consider the structures, processes and dynamics of ecosystems,

³ <https://www.bancomundial.org/es/news/press-release/2021/09/13/climate-change-could-force-216-million-people-to-migrate-within-their-own-countries-by-2050>

⁴ Hermosillo, Mérida, Tlaquepaque, Torreón, Tuxtla, León, Los Cabos, La Paz, Tijuana, Bacalar, Boca del Río, Veracruz, Morelia, Ciudad de México, Campeche, Centla.

but also those of society and its institutions.

Albeit approaches such as NbS or GI are still in a process of adaptation to operate in an articulated and successful manner in Mexican cities, it is undeniable that the benefits of their application have contributed to generalizing their implementation in this and other territories. This is supported at an international level by the successful, quantified, monitored and evaluated results of initiatives of this type.

To give a recent contextual example, the latest Synthesis Report of the Intergovernmental Panel on Climate Change 2023 ⁵ (IPCC) points out that, among other measures, **urban green infrastructure is both an**

planning and resource efficiency, showing how multilateralism catalyzes action at all levels of governance.” ⁶.

Whereas in the national experience, GIZ Mexico has developed a Green Infrastructure implementation approach specifically designed for Mexican cities, which can be consulted in the document *Roadmap for Green Infrastructure in Mexican Cities* ⁷, as well as on the green infrastructure and cities website ⁸. In this same sense, it is worth noting that these efforts have also been sought to be consolidated in a community of practice of GI in Mexico, which can be consulted on the same website ⁹.

The aforementioned approach provides a

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adaptation and mitigation measure that is technically feasible, on the way to becoming a cost-effective measure and enjoys general public support. It is no understatement that the above implies a rigorous analysis that justifies the scientific bases of these approaches.

Regarding the international relevance of these approaches for urban contexts, we can also mention the recent UN-Habitat resolutions on biodiversity, climate change and integrated risk management. These “emphasize the fundamental role of urban

conceptual framework that constituted the basis from which a good part of the technical cooperation processes carried out in BIOCITIS were developed. Firstly, it defines the following 5 principles of application for GI: 1) *systemic approach*; 2) *multiscalarity*; 3) *multifunctionality*; 4) *urban resilience*, and; 5) *collaborative planning and design*.

Complementing the above, this specific approach identifies four thematic axes in which urban green infrastructure operates in Mexico. Two of them are essentially environmental axes; **water and biodiversity**, and

⁵ IPCC, 2023: Summary for Policymakers. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 1-34, doi: 10.59327/IPCC/AR6-9789291691647.001

⁶ <https://onuhabitat.org.mx/index.php/las-ciudades-deben-liderar-la-lucha-contra-la-triple-crisis-planetaria>

⁷ Implementación de infraestructura verde como estrategia para la mitigación y adaptación al cambio climático en ciudades mexicanas, hoja de ruta, México, 2019

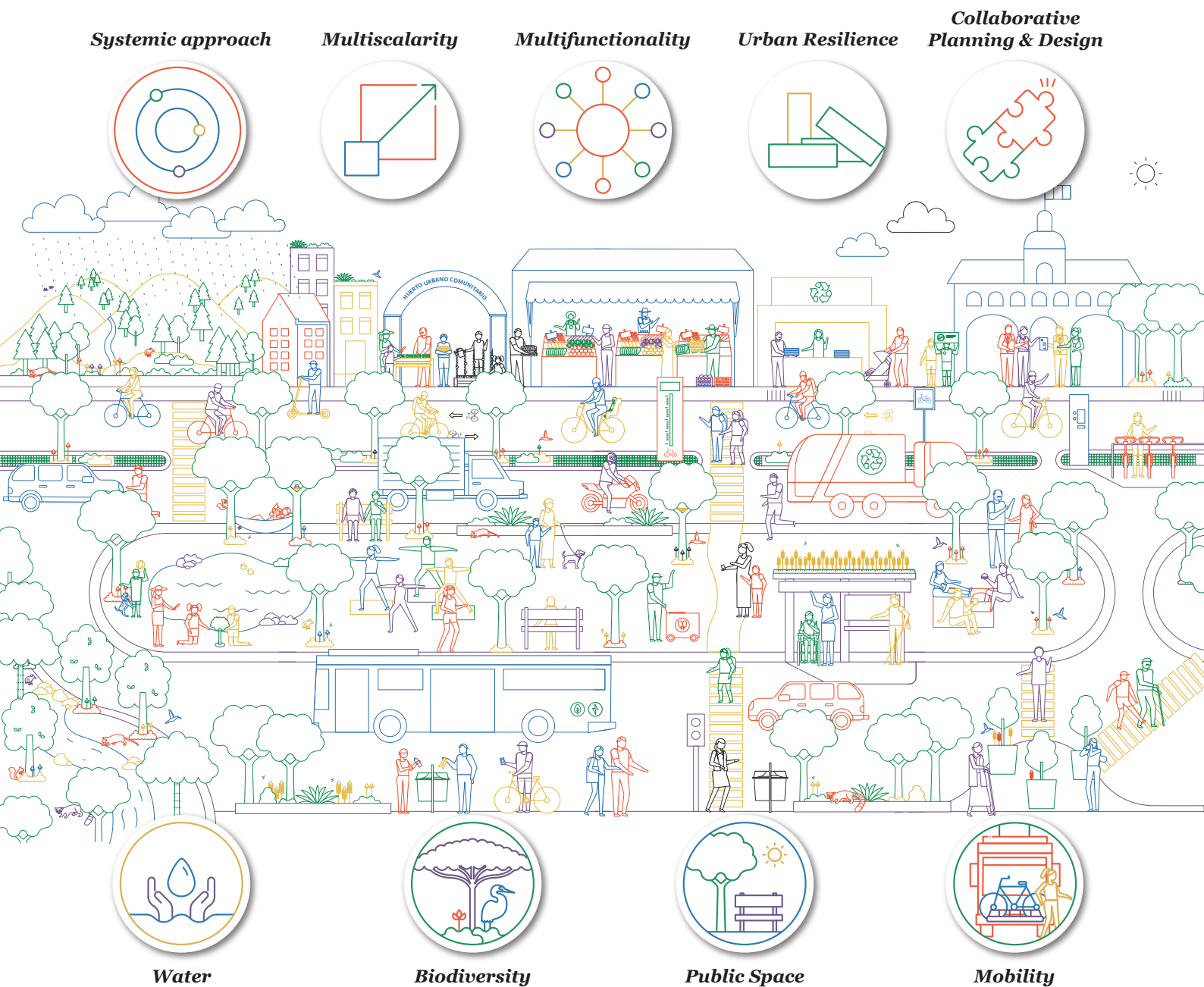
⁸ <https://www.infraestructuraverdeyciudades.com/>

⁹ <https://rediv.infraestructuraverdeyciudades.com/>

two are predominantly urban; *public space and mobility*.

This approach to NbS and GI in Mexico responds to the need to transcend the prevalence of the sectoral approach to socio-environmental challenges, both at the national and subnational levels. This is based on the understanding that ***the solution to the problems of sustainable urban development must be carried out from an inter- and trans-sectoral logic.***

In this regard, it is worth highlighting the momentum that GIZ and other institutions have given to the ***urban-environmental agenda*** in Mexico. Various national bodies have contributed to this end, including SEMARNAT & SEDATU at the federal level, and SEDEMA in Mexico City, projects such as the United Nations CityAdapt, and other initiatives promoted by Mexican organisations such as the Mexican Fund for the Conservation of Nature (FMCN, by its Spanish initials).



Green Infrastructure Principles and Thematic Axis developed by GIZ Mexico. Source: Laguna for GIZ Mexico.

2. Regional and Methodological Context.

As mentioned before, the BIOCITIS project operated in **3 regions of Mexico: Northwest**, in the municipalities of Los Cabos and La Paz; **Gulf of Mexico**, in the municipalities of Boca del Río and Veracruz; and the **Southeast**, in the municipalities of Chetumal and Bacalar. The following territories were also added as replica and transfer sites: the state of Campeche and the state of Tabasco, as well as the municipality of San Mateo del Mar, in the state of Oaxaca.

Work at a scale smaller than regional and directly in territory was put into practice through regional advisors who acted as a link with counterparts at the subnational level, leading to the incorporation of the bottom-up approach through agile and constant communication with relevant actors in states and municipalities.

Processes conducted with different subnational level bodies allowed the identification of substantial differences in terms of the mandates, normative and regulatory frameworks, instruments, mechanisms, opportunities and challenges present in each territory.

At the municipal level in Los Cabos, for example, processes were conducted directly with the Municipal Planning Institute (IMPLAN, by its Spanish initials), a decentralized organization with a focus on planning that enabled certain continuity of the processes, as well as the involvement of various municipal and civil society bodies; in Bacalar, close collaboration with a department that includes several topics: urban development, public works and the environment, but not planning, gave way for a broader thematic approach, but restricted the impact on direct actions in the territory; in Boca del Río and Veracruz, the public works and environmental depart-

ments were involved as a priority, as well as the coastal administration department, which demonstrated the need for greater inter-municipal coordination, as well as the difficulty of articulating agendas that should be deeply harmonized and coordinated without being so.

In general terms, it was also possible to identify a differentiated dissemination, appropriation and implementation of the approaches to NbS and GI in each of the regions. The Northwest region stood out for its notable progress in the involvement of different sectors and stakeholders in diverse initiatives. Although there is also considerable progress in the Southeast region, the role of civil society stands out to a greater extent than the involvement of institutional actors. In the Gulf region, on the other hand, the understanding and impact of these issues is still very nascent. These conditions largely determined the success of conducted processes, but they also clearly revealed the needs in each place.

However, concurrent attributes that frame regional logics shared at the national level were also identified, such as the **urgency to improve water management, the need to conserve and restore ecosystems associated with urban contexts, or the persistence of coastal erosion in a large part of the inhabited coastline**. This also occurs with narratives that make sense in most local contexts, such as **the case of public spaces with different climatic vulnerabilities**, institutional disarticulation at the municipal and state levels, or institutional weakness for crucial functions such as local tax collection.

These differences and similarities are more easily understood if they are analysed from two complementary aspects: territorial and institutional dynamics.

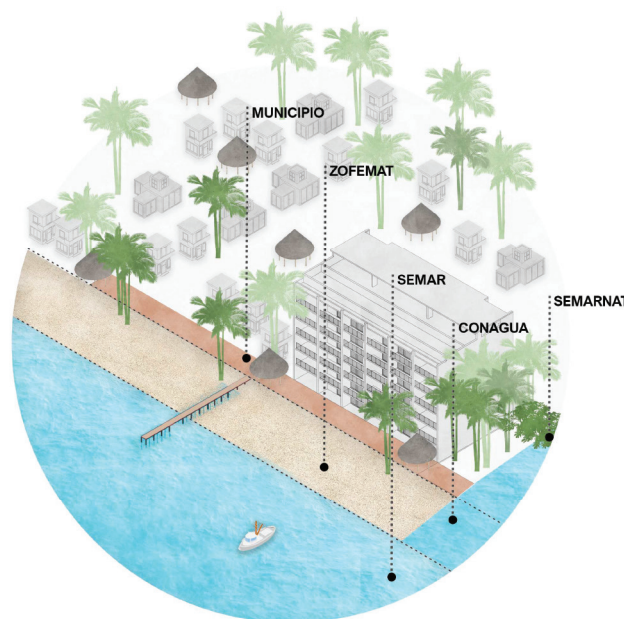
Beginning by describing the territorial dynamics, the BIOCITIS project started with a robust analysis carried out in each of the regions, which headed to a territorial characterization that made it possible to identify the main ecosystems, risks and urban-environmental dynamics ^{10, 11, 12}.

Common attributes for all regions include the presence of ecosystems such as mangroves, dunes, wetlands, grasslands or reefs, whose degree of conservation enables or limits sustainable urban development, while being directly related to the exposure of the territory and people to socio-environmental risks. Likewise, these ecosystems are important environmental assets due to the ecosystem services they provide. However, it was also identified that they are subject to strong pressures due to urban expansion and little or no planning of this process.

In addition to identifying these common attributes, priority actions were also outlined for each region. These include measures such as: updating or creating instruments such as management programs for areas of ecosystem value, municipal urban development programs or risk atlases, or planning and implementing NbS & GI in public spaces.

Regarding institutional dynamics, it is necessary to refer to **a critical state of governance for coastal regions**. The multiplicity of institutions with mandates in the land-sea transition territories and the lack of coordination between them, feeds

back into undesirable situations such as overlapping and non-harmonized normative-legal frameworks, operational functions that are equally redundant as they are divided or non-existent, disarticulation of actions or even gaps and dilution of budgets.



Caracterización de la gestión costera. Fuente: Ithaca Environmental & Urbanística para GIZ México.

Of particular importance is the **absence of a legal definition of integrated coastal management**, which leads to a multiplicity of institutional interpretations of what is considered a coastal zone and contributes to the deterioration and instability of the territory and institutions in these contexts.

According to studies conducted for BIOCITIS: "While coastal management involves processes, stakeholders and elements that have an impact on the sea, land and other

¹⁰ https://ciudadesytransporte.mx/wp-content/uploads/2022/06/los_cabos_plan_de_accion_para_la_integracion_de_la_biodiversidad_y_los_servicios_ecosistemicos_en_el_desarrollo_urbano_costero.pdf

¹¹ https://ciudadesytransporte.mx/wp-content/uploads/2022/06/boca_del_rio_plan_de_accion_para_la_integracion_de_la_biodiversidad_y_los_servicios_ecosistemicos_en_el_desarrollo_urbano_costero.pdf

¹² https://ciudadesytransporte.mx/wp-content/uploads/2022/06/bacalar_y_othon_p_blanco_plan_de_accion_para_la_integracion_de_la_biodiversidad_y_los_servicios_ecosistemicos_en_el_desarrollo_urbano_costero.pdf

bodies of water, there is an absence in the Mexican legal framework of a definition of integrated coastal management that identifies the mandates of the different authorities involved. There are no institutional processes that link in a coordinated manner the authorities with jurisdiction over the sea with those whose jurisdiction is the administration of the territory.”¹³.

Likewise, empirical evidence reiterates **the importance of the subnational scale for the management and governance of coastal regions**, proposing at least two different models: the state-level and the municipal-level, underlining the latter as the one that brings more benefits.

“In the municipal model, it is the municipalities that have the capacity to exercise their powers and coordinate with multi-sectoral actors. This is the case of the municipality of Boca del Río, where two entities stand out: the Department of Integrated and Sustainable Coastal Administration, with high network interaction capabilities and mandates directly linked to coastal management, and a primary stakeholder in the Quality Coordination, which acts as an institutional link in the municipality. The case of the municipality of Los Cabos also responds to a model of municipal participation, with the Municipal Planning Institute leading the Municipal Planning System with a technical vision that incorporates biodiversity and climate change; in addition to promoting participatory mechanisms and having a multi-sectoral Advisory Council.

Finally, cases in which participation in processes related to coastal management is predominantly state-owned respond to the institutional weakness of the municipalities, as is the case of Bacalar, a municipality that was established just 10 years ago

and does not have its own regulatory instruments to enable the action of local actors. In the same region, but in the municipality of Othón P. Blanco, state participation is due to processes such as metropolitanization and the signing of coordination agreements or municipal associations for the provision of public services.”¹⁴

While it is true that the analyses were carried out for the case of coastal regions, the possibility of transferring lessons and replicating experiences for all urban regions, regardless of whether they are coastal or not, cannot be ruled out. This is justified if we remember the need to address sustainable urban development processes from a systemic approach and a comprehensive and intersectoral logic, involving the urban, environmental, water, agri-food, transport and mobility, tourism and maritime sectors, to mention some of the most relevant.

Finally, regarding the methodological approach, it should be mentioned that operations in the complex territorial and institutional environment, forced to adopt a marked position of effective pragmatism for decision-making in the conduction of the processes.

¹³ “Fortalecimiento de la gestión integrada de regiones urbanas costeras para la incorporación de la biodiversidad y los servicios ecosistémicos en la toma de decisiones. Mapa de Actores.” GIZ/Ithaca Environmental/Urbanística. Octubre 2021.

¹⁴ Ibídem

3. Implemented Processes.

This section briefly and synthetically describes the Nature-based Solutions and Green Infrastructure processes implemented within BIOCITIS's framework. The intention is to present in an agile manner what, how, where and with whom the initiatives were carried out, as well as the main results. For more details on each process, please consult the BIOCITIS project report ¹⁵.

Action plans for integrating biodiversity and ecosystem services in coastal urban development.

- *Development of territorial and institutional analyses.*
- *Prepared for each project region.*
- *Worked along with subnational authorities, academia, and civil society in each region.*
- *Specific results:*
 - *Territorial characterization with a focus on biodiversity and ecosystem services.*
 - *Analysis of urban-environmental dynamics at a local scale.*
 - *Selection of areas relevant to urban dynamics.*
 - *Establishment of a collective vision of urban-environmental integration.*
 - *Prioritization of actions and measures to be implemented.*

Green Infrastructure Planning and Implementation ^{16, 17, 18, 19, 20}.

- *Advisory to local governments on the planning and implementation of Green Infrastructure measures.*
- *Processes implemented in Los Cabos, La Paz, Boca del Río, Veracruz, Othón P. Blanco and Bacalar.*
- *Worked along with municipal authorities, depending on the case: IMPLANes or municipal departments of public works, urban development and/or environment.*
- *Specific results:*
 - *Territorial characterization with a specific focus on Green Infrastructure.*
 - *Prioritization matrix for projects and potential projects.*
 - *Project portfolio and development of two measures at a conceptual and pre-feasibility level.*
 - *Definition of vegetation palette.*
 - *NbS and GI catalog with implementation potential in each municipality.*
 - *Inputs for municipal GI plans.*

¹⁵ <https://www.infraestructuraverdeyciudades.com/Files/PDF/PENDING>

¹⁶ <https://www.infraestructuraverdeyciudades.com/Files/PDF/54>

¹⁷ <https://www.infraestructuraverdeyciudades.com/Files/PDF/55>

¹⁸ <https://www.infraestructuraverdeyciudades.com/Files/PDF/56>

¹⁹ <https://www.infraestructuraverdeyciudades.com/Files/PDF/57>

²⁰ <https://www.infraestructuraverdeyciudades.com/Files/PDF/58>

Implementation of demonstrative actions in public spaces.

- Strategic NbS and GI interventions in public spaces.
- Actions implemented in Los Cabos, Boca del Río, Tijuana and San Mateo del Mar.
- In collaboration with municipal governments.
- Specific results:
 - Interventions in 4 public spaces incorporating NbS & GI measures.
 - Methodology for diagnosis and management of urban trees ²¹.

Urban wetlands.

- Specific actions for the protection, conservation and sustainable management of wetlands in the short and medium term.
- Process carried out in Othón P. Blanco and Bacalar.
- In collaboration with municipal governments.
- Specific results:
 - Implementation of pilot actions.
 - Methodological guide for the integration and management of coastal urban wetlands in the formulation of Municipal Urban Development Plans or Programs (PMDUs, by its Spanish initials) ²².

Capacity building for NbS & GI.

- Capacity building workshops for the planning, design and implementation of GI.
- Workshops implemented in Campeche and Tabasco.
- In collaboration with state governments.
- Specific results:
 - Strengthened capacities in state officials, public servants, members of CONANP and local academies.

Coastal resilience.

- Advice for the development of a coastal resilience program.
- Process carried out in Boca del Río.
- Cooperation with the Boca del Río Municipality, the Oceanographic Institute of the Gulf and Caribbean Sea of the Navy (IOG/SEMAR, by its Spanish initials), the Veracruz Reef System National Park (PNSAV, by its Spanish initials) of the National Commission of Protected Areas (CONANP, by its Spanish initials), the National Port System in Veracruz (ASIPONAVER, by its Spanish initials) and the Masters del Golfo Foundation (hotel group).
- Specific results:
 - Integrated modeling and analysis of bathymetry, sedimentation dynamics, tides, winds and waves.
 - Preparation of an integrated grey-green infrastructure measure (sand feeding in strategic sites on the coast to reverse coastal erosion) at the pre-feasibility level.
 - Institutional strengthening strategy to ensure sustainability of the measures.

²¹ <https://docs.google.com/forms/d/e/1FAIpQLSfTOS7m2ftuIGED24GIN-QnjgA7Yt05aiOjMpnCoEUFUJNiQJQ/viewform?vc=0&c=0&w=1&flr=0&fbzx=-3658471739810922440>

²² <https://www.infraestructuraverdeyciudades.com/Files/PDF/59>

4. Emerging Opportunities and Lessons Learned.

Over the four years of operation of the BIOCITIS project -in which there was cooperation with organized civil society, governments, academies and representatives of the private sector in seven municipalities, four states and two federal ministries-, numerous valuable experiences were systematically collected to guide public decision-making in the field of sustainable urban development from an intersectoral perspective at the national level.

This section brings together the main learnings and outlines the key messages that are especially relevant in the current context of government transition at different levels in Mexico. In this regard, it is necessary to take into consideration ***the progress that the current administration (2018-2024) has made***, referring specifically to the ***Mexican Official Norms*** (NOMs, by its Spanish initials) created by the Ministry of Agrarian, Territorial and Urban Development, as well as ***other notable advances made at the subnational level such as the laws and regulations in the process of consolidation for the case of Mexico City***.

By way of example, but not limited to, the following cases may be mentioned:

- Mexican Official Norm 001-SEDATU-2021, Public spaces in human settlements ²³.
- Mexican Official Norm 002-SEDATU-2022, Equipment in the instruments that make up the General Territorial Planning System. Classification, terminology and application²⁴.
- Mexican Official Norm 003-SEDATU-2023, Which establishes the guidelines for strengthening the territorial system to resist, adapt

and recover from threats of natural origin and climate change through territorial planning ²⁵.

- PROY-NOM-006-SEDATU-2024, Classification, characterization and delimitation of areas not susceptible to human settlements in primary zoning due to presenting critical risks originating from hydrometeorological, geological and climate change threats or due to having environmental or cultural value in the instruments that make up the General Territorial Planning System ²⁶.
- Environmental Law for Mexico City draft and its complementary regulations.

The relevance of these examples of regulations at the national and subnational level lies in the fact that they incorporate concepts and approaches that are closely linked to NbS and GI, such as: ***conservation, restoration and provision of ecosystem services***; strengthening of the territorial system based on ***comprehensive risk management***; and ***green infrastructure*** itself as an optimal strategy to conserve the health of ecosystems, reduce vulnerabilities and, in general, provide benefits to the territory and the population.

In addition to the above, another important characteristic of these examples and other experiences within the framework of BIOCITIS is that they are notable references for addressing the urgent challenges associated with urban development in Mexico, and they have the potential to also contribute to the solution of other historical needs of cities such as socio-spatial inequalities or the water crisis -situations that are exacerbated by the climate crisis- as well as issues of security or access to housing, which opens the possibility of thinking about integral

²³ https://www.dof.gob.mx/nota_detalle.php?codigo=5643417&fecha=22/02/2022#gsc.tab=0

²⁴ https://dof.gob.mx/nota_detalle.php?codigo=5662152&fecha=23/08/2022#gsc.tab=0

²⁵ https://dof.gob.mx/nota_detalle.php?codigo=5719284&fecha=06/03/2024#gsc.tab=0

²⁶ https://www.dof.gob.mx/nota_detalle.php?codigo=5718767&fecha=01/03/2024#gsc.tab=0

solutions.

In other words, the BIOCITIS experience made it easier to trigger initiatives that alleviate global crises at the urban level, in the short and medium term, and from an urban-environmental perspective. While, at the same time, the resilience of the territory and people was favoured in the long term. In short: ***integral and concrete solutions were promoted with positive impacts in the short and long term from a global-local perspective.***

Integral and concrete solutions were promoted with positive impacts in the short and long term from a global-local perspective.

The pertinence and urgency of promoting the planning, design, financing, implementation, monitoring and evaluation of Nature-based Solutions and Green Infrastructure is incontrovertible and, as already stated, is a fact that has been demonstrated internationally. However, it is very important that the application of these approaches in Mexico is adapted to the specific context of Mexican cities.

For this reason, ***the approach developed by GIZ Mexico for NbS and GI*** through its BIOCITIS project has used clear criteria and principles adapted to the specific situation of Mexican cities. These principles and criteria are set out below as recommendations, and it is also noted that they could eventually lead to more robust and comprehensive implementation frameworks, policies and urban-environmental management instruments.

The importance of ***intersectoral logic*** was one of the main criteria put into practice in most of the technical cooperation processes advised by BIOCITIS. An effort was made to ensure that counterparts at the subnational level -state ministries or municipal directorates- had the mandate to influence at least the urban and environ-

mental sectors, as well as the marine-coastal sector. Similarly, an attempt was made to generate links of close collaboration with actors from the academic and private sectors.

On the other hand, the ***risk approach*** was also considered as a criterion to guide the implementation of processes to address urgent needs in cities in the face of the double crisis caused by climate change and the loss of biodiversity. In this way, it was possible for the experiences to provide

inputs for the different regulatory or planning instruments aimed at strengthening the territorial system based on this approach.

In addition, multiple ***awareness-raising and capacity-building*** processes were promoted for various stakeholders. These actions played a crucial role in adapting conceptual and operational frameworks to the specific needs of each local context and, thereby, leveling the foundation that will allow NbS and GI to become a common and first-order practice for the sustainable development of Mexican cities in the long term.

Regarding the strictly operational aspects and as a way of putting adaptive management into practice, ***flexibility was encouraged between top-down and bottom-up approaches***. This was a natural response to the need to operate in the multi-scalar environment that is unavoidable for the success of NbS and GI implementation.

In some contexts, NbS and GI frameworks are best supported by a top-down approach applicable to broader spatial, temporal and institutional scales, and in others, the bottom-up approach is more

successful because it adheres to a more specific spectrum of the same spatial, temporal, and institutional scales. In any case, ***adaptive management requires more flexible institutional frameworks, or individuals with the capacity, motivation, willingness or even courage and audacity to make them so.***

In this sense, even if BIOCITIS's scope was limited to urban environments (always considering urban-rural links and peri-urban areas), sensitivity to different situations and conditions at a regional scale played a crucial role. In the same sense, common attributes relevant to broader-scale perspectives were also considered, in particular ecological regions, hydrological-administrative regions, the basin approach and, in general, a socio-ecosystemic management approach.

At the same time, a local-scale approach was promoted focused on addressing the specific opportunities of this scale, empha-

promote sociocultural expressions, embrace diversity and foster social cohesion." Additionally, NbS and GI in urban contexts and public spaces also constitute an important component of the ***Just Transition***, as they are a source of jobs associated with food security and water management in cities ²⁸.

Finally, special consideration was given to ***the importance of identifying and prioritizing ecosystems and actions*** with the potential to increase the adaptive capacity of the population and reduce risks in the territory. This was done with the intention of defining pathways that contribute to ***the understanding of natural capital as infrastructures of high socioeconomic value.***

Although ***this assessment is undoubtedly essential for the mainstreaming of Nature-based Solutions and Green Infrastructure*** as adaptation and mitigation measures in cities, ***the importance of the precau-***

...the importance of the precautionary principle is strongly emphasized, so that the economic valuation of ecosystem services won't imply their monetization...

sizing attention to subnational Protected Natural Areas (ANP, by its Spanish initials) adjacent to or close to urban settlements, the opportunities represented by constant investment in public spaces, as well as state or municipal instruments of territorial and ecological management associated with these opportunities.

In fact, ***attention to public spaces*** was a criterion on itself, as approaches such as the ***Right to the City*** have shown that this common good is a way to "improve social interactions and political participation,

nary principle is strongly emphasized, so that the economic valuation of ecosystem services won't imply their monetization and, thus, undesirable scenarios are encouraged in which natural resources continue to be understood as just another consumer goods, at the cost of the health and subsistence of the entire planet.

Now, if all these criteria and principles were indeed crucial in the development of the BIOCITIS project, ***much of the learning comes from the limitations*** that persist in making them operational. These

²⁷ <https://onuhabitat.org.mx/index.php/componentes-del-derecho-a-la-ciudad#:~:text=El%20Derecho%20a%20la%20Ciudad%20implica%20responsabilidades%20en%20todos%20los,un%20h%C3%A1bitat%20de%20derechos%20humanos.>

²⁸ ILO, UNEP and IUCN. 2022. Decent Work in Nature-based Solutions 2022. Geneva. Licence: CC BY-NC-SA 3.0 IGO

limitations can be grouped into at least **3 categories**: 1) **awareness and appropriation**; 2) **institutionality and governance**, and; 3) **financing**.

Awareness and Appropriation.

Regarding this aspect of Nature-based Solutions and Green Infrastructure as mitigation and adaptation measures in cities, it is important to refer to the broad spectrum of actors that have a role in their planning, design, financing, implementation, maintenance, monitoring and evaluation.

So far, efforts to raise awareness and strengthen capacities have been directed primarily at municipal and state officials, with the understanding that they are the ones who have the greatest influence in the crucial stages for the territorialization of initiatives (planning, design and implementation).

However, the constant rotation of staff in subnational institutions, as well as their heavy operational and administrative burdens, make it clear that there is still much work to be done in this regard, especially to further promote the integration of other actors such as: civil society in general, to foster the appropriation and sustainability of initiatives and strengthen environments for citizen participation; academia, to eliminate any gap between the generation of information and decision-making, contributing to integrated socio-ecosystemic management; as well as different members of the private sector, such as hoteliers and tour operators, developers, builders, architects, engineers and construction workers, to ensure that the financing and execution of works consider the opportunities of the principle of multifunctionality.

Despite the fact that none of these needs is new, it is considered that the full understanding and appropriation of the principles and thematic axes defined for GI from the perspective of GIZ Mexico are an important differentiator to enhance the opportunities to innovate in these processes. Especially if, from a behavioral economics perspective, it is considered that the strong inertia to operate in business-as-usual environments is related to incentives and interests that can be modified based on simple changes in people's understanding and motivations ²⁹.

An important note in this regard is that the success of this type of measures depends on respecting other principles such as those defined for the global standard of NbS by the IUCN, which indicate that: all measures must represent a net gain in biodiversity and ecosystem integrity and that they must effectively address the necessary societal changes ³⁰. Likewise, the application of these measures should not condition, limit or stop the structural changes necessary at a systemic level to mainstream NbS and GI ^{31, 32}.

Institutionality and Governance.

Despite existing efforts to assess, conserve, improve, or sustainably manage ecosystems and landscapes intervened by NbS or GI, they still lack the degree of connectivity necessary to ensure their optimal functioning and the provision of all the benefits they can provide. In the Mexican context, this is due to the uncoupling between the institutional structures of urban-environmental governance and the territorial reality. In other words: ***ecosystems, their functions and dynamics do not respond to political-administrative limits.***

²⁹ https://www.unep.org/explore-topics/education-environment/what-we-do/little-book-green-nudges?_ga=2.94614046.365520006.1718573889-564530522.1716932428

³⁰ <https://portals.iucn.org/library/sites/library/files/documents/2020-020-En.pdf>

³¹ <https://www.polytechnique-insights.com/en/columns/society/why-there-is-no-scientific-consensus-on-the-nudge/>

³² <https://philarchive.org/archive/DESWIG>

The scope of relevant stakeholders for mainstreaming NbS and GI at the subnational level is usually the same in terms of structure and general mandates. However, the implications of their limitations have physical, temporal, functional and operational dimensions, since: the periods of national or subnational administration encourage short-term decision-making; despite the fact that ecological regions and hydrologi-

and municipal finance units. This would facilitate the design and implementation of mechanisms through which technical advisors intervene to integrate technical evaluations of NbS and GI, as well as to consider the environmental and social benefits that can derive from these approaches, in addition to the economic ones.

In short, state and municipal institutions

...ecosystems, their functions and dynamics do not respond to political-administrative limits...

cal-administrative regions are defined, the jurisdictions and specific territorial mandates at the subnational level -especially in municipalities- are rarely concurrent with them; additionally, the operational functions between and within the same state secretariats and municipal departments are still strongly sectorized.

In particular, for urban contexts, the logic of implementing NbS and GI is determined by their location in the basin ³³. Throughout the national territory there are mountain cities, riverside cities, delta cities or coastal cities and it has been shown that, although there are solutions that could be considered for general application (such as retention, conduction, infiltration and capture of rainwater, or pollinator gardens, ecological corridors and urban gardens in public spaces), the solutions that can be implemented must be differentiated according to the ecosystems and landscapes they serve, and they will be more successful when they take this into consideration, as well as the multi-scale spectrum of which they are part.

In addition, other government bodies that are not directly related to the urban-environmental field but are involved in resource management should be included, such as the secretariats of economic development

involved in urban-environmental governance face significant difficulties in carrying out a comprehensive approach at the basin scale and from an intersectoral logic. This is recognized as one of the main failures caused by the lack of incorporating a socio-ecosystemic approach when designing and implementing solutions.

Financing.

Closely related to the two previous categories, the limitations in terms of financing derive from both the lack of awareness and appropriation of the operational concepts associated with NbS and GI by different entities at the national or subnational level, as well as from the institutional fragmentation and sectorization in states and municipalities. Even more and above previous causes, limitations in terms of financing derive from institutional weakness at municipal level to implement local tax collection schemes that would enable funding for NbS and GI measures capable of delivering social and economic benefits within their jurisdictions.

In particular, a strong dependence of municipalities on federal contributions is detected (branch 33 of the Federal Expenditure Budget), which means that a large part of

³³ World Bank, 2021. A Catalogue of Nature-based Solutions for Urban Resilience. Washington, D.C. World Bank Group

the budget is tagged and limits the measures that can be financed with these resources³⁴. Albeit municipalities plan investment programs annually and many of them contemplate projects likely to incorporate approaches such as NbS and GI, political pressures and circumstances, the lack of specialized suppliers, the lack of evidence of the benefits of their implementation, as well as the inertia of operating as done before, reduce the impact that these approaches can have at the budgetary level.

Concerning contributions from the state level, there are quite attractive funding sources, such as numerous trusts for urban and environmental issues, but which, due to their design or operating rules, cannot fund yet NbS or GI measures.

Key Messages.

Emerging opportunities and lessons learned for the mainstreaming of Nature-based Solutions and Green Infrastructure in the sustainable urban development of Mexican cities are related to very diverse aspects. To mention a few, thematic, conjunctural, regional, political, capacity, institutional, governance, financing, territorial, methodological and even conceptual aspects can be considered.

Due to this diversity, we sought to categorize the following key messages only under the scale that is considered most appropriate for their application. This, however, does not imply that the benefit of their application is limited to the aforementioned scale, but that, based on BIOCITIS' experience, it is from there that the greater and better impacts can be harnessed.

Subnational Scale.

Opportunities related to working from a bottom-up approach.

Empirical evidence obtained from cooperation with municipalities and states indicates that this is the ideal entry point for directly transforming the territory through territorial characterizations and analysis done from an NbS and GI perspective. In turn, these efforts enable the regionalization or zoning of prototypical solutions. This paves the way for the design of project portfolios, as well as the adaptation of financing, regulatory, legal, and planning frameworks to transform such projects into reality.

Likewise, working with states and municipalities provides the possibility of linking and coordinating entities such as public works and urban development or environment departments, water service operators, civil protection, economic development and, of course, planning. This offers a particularly attractive opportunity to, from this scale, articulate traditional infrastructure solutions with Green Infrastructure measures that allow for efficient use of resources while effectively meeting shared objectives.

Furthermore, it goes without saying that it is at the municipal level where there will be greater proximity to the population and the territory, which represents an ideal scenario to enhance the impact of demonstrative actions.

³⁴ https://www.gob.mx/cms/uploads/attachment/file/855431/2023_Instrumentos_para_el_financiamiento_de_la_ciudad_ok.pdf

Citizen participation opportunities.

Related to the previous point, it is relevant to say that the direct involvement of citizens in decision-making for the planning, design, financing, implementation, monitoring and evaluation of NbS and GI measures, can only be triggered at the subnational scale -in particular the municipal scale- since it is the closest to population.

Some examples of existing structures that encourage this practice are: a) participatory budgets; b) users as members of river basin councils; c) liaison houses in specific neighbourhoods; d) citizen participation departments that form part of various city councils; e) officially valid participatory governance schemes for Indigenous peoples; or other experiences in this regard that are already part of institutional structures.

On the other hand, various citizen science initiatives contribute to the involvement of citizens in the monitoring of different criteria relevant to NbS and GI in cities, such as water quality ³⁵, species sightings ³⁶, community beach monitoring ³⁷, monitoring of climate adaptation measures in urban environments ³⁸, mapping of urban trees ³⁹ and countless similar initiatives that, in addition to directly strengthening social participation, contribute to the appropriation and sustainability of the measures through the involvement of people.

Opportunities to generate consensus among different sectors arise in the diverse platforms in which multiple groups of society interact, such as in the working groups for the creation or update of regulations and norms in which members of the private sector, academia, governments and civil society participate. These stakeholders frequently tend to have very different expectations of what aspects should be considered to regulate or legislate the frameworks associated with the planning, design, financing, implementation, monitoring and evaluation of NbS and GI projects.

While these processes may originate from regional, national or even international contexts, it is the subnational level that provides the opportunity to bring all actors together at the same table to compare points of view and reach joint agreements.

It is pertinent to mention that the generation of such consensus could strengthen relevant schemes for the assessment, protection and restoration of ecosystems in different territories at a subnational level, as is the case of Areas Voluntarily Designated for Conservation (ADVC, by its Spanish initials).

Opportunities around specific problems, such as coastal erosion, the conservation of protected areas adjacent to or close to cities, or interventions in public spaces that present climatic vulnerabilities -such as floods, heat islands, landslides or socio-spatial segregation-. Attention to these issues has the potential to align the wills of different stakeholders and sectors (public, private, academia and civil society) at different levels, around situations of urgency or

³⁵ <https://www.worldwateratlas.org/narratives/water-cities/the-clean-water-experiment/#citizenscience-in-amsterdam>

³⁶ <https://mexico.inaturalist.org/>

³⁷ <https://www.coastsnap.com/>

³⁸ <https://climatescan.org/>

³⁹ https://www.giz.de/de/downloads/ICT-A-%20IoTrees-Guadalajara_Brochure-A5_English.pdf

general interest, as well as to enable exchanges between various subnational level bodies to share experiences and lessons.

The above represents an opportunity for institutional strengthening, not only at the subnational level, but also at the national level, since it is at the municipal and state levels where progress made at the national level can be monitored, validated and given feedback, as is the case of the NOMs mentioned previously.

Opportunities regarding attention to public spaces, since interventions in them have the potential to join together international and national agendas with those at the subnational level, specifically those related to issues such as public health, climate risks, the Right to the City, population well-being, gender and socioeconomic equity, or other problems that can be addressed in public spaces for the benefit of the general population.

They are also a way to eliminate the gap between academia and government in terms of information generation and decision-making at the local level, while allowing civil society to be involved in citizen participation experiences relevant to their immediate contexts.

Opportunities to harmonize, update, create or articulate different normative, regulatory, planning and management instruments.

This is the case of the updating of Ecological Planning Programs (POE, by its Spanish initials), Territorial Planning Programs (POT, by its Spanish initials), State Climate Change Programs (PECC, by its Spanish initials), Municipal Climate Action Plans (PACMUN, by its Spanish initials), Municipal Urban Development Programs (PMDU, by its Spanish initials), as well as the creation of green infrastructure plans or programs and nature-based solutions, and coastal resilience plans or programs at the state or municipal level.

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Financing opportunities at the subnational level.

In this regard, the experience of BIOCITIS has identified at least three pathways that stand out for their viability for the implementation of NbS and GI projects. Firstly, and at the state level, there is the case of various urban-environmental public trusts that, by updating their operating regulations, can become agile routes for financing existing projects. Whether the trust funds come from taxes or charges for pollution (such as the case of vehicle inspection charges or environmental compensation measures) or from taxes on activities that directly benefit from ecosystem services (such as local taxes on tourism) these schemes are a way in which urban development itself may become the source of financing for this type of projects.

At both the state and municipal levels, there are mandatory or voluntary contribution schemes such as the Payment for Environmental Services (PSA, by its Spanish initials) or voluntary contributions associated with the payment of services that, due to their characteristics, would allow for the financing of programmatic actions in the medium and long term.

Similarly, but in the case of the municipal level, it is worth mentioning the case of annual investment programs in which the opportunity is twofold, since they can contemplate the inclusion of projects linked to other planning and management instruments such as those mentioned in the previous point and, in general, catalogs of construction concepts can be updated so that projects executed by municipal administrations are capable of incorporating green or integrated green-gray solutions.

There are also cases with the potential to coordinate actions between the three levels of government, such as the *Administrative Collaboration Agreements on Federal Tax Matters signed by the Federal Government, through the Ministry of Finance and Public Credit, the corresponding State Government and the City Council of the corresponding Municipality*. These types of legal agreements can be modified through additional agreements that allow them to operate within existing governance frameworks such as the operational structure of the Federal Maritime Land Zone (ZOFEMAT, by its Spanish initials) and its relationship with the municipalities or, potentially and in the case of non-coastal cities, the River Basin Councils and the different Committees that comprise them.

It is also at the subnational level where projects can be financed by the various compensation and mitigation schemes that result from environmental impact assessments.

And, of course, it is at the subnational level where private sector participation has the greatest potential for financing NBS and GI programs, plans or projects, since the economic interests of every company's business models are inextricably linked to ecosystems and the services they provide.

Juncture opportunities, especially those related to the differentiation of awareness, appropriation and institutionalization of NbS and GI in the different regions.

In the northwest of Mexico, for example, the scenario is favourable for channelling funding that allows the implementation of integrated green-grey solutions in increasingly more public spaces. In addition, there is good inertia, capacities and wills for the anchoring of NbS and GI at the institutional level in instruments and mechanisms of territorial incidence. States such as Baja California, Baja California Sur, Coahuila, Sonora and their respective municipalities stand out.

In the Southeast Region, it is possible to continue with capacity-building measures that allow the actors involved to clearly distinguish what are and what are not NbS and GI measures. Likewise, the potential of expanding collaboration between highly sensitized and trained civil society groups and government agencies with the authority to plan and implement territorial impact projects is recognized.

In the Gulf of Mexico Region, opportunities relate to the exchange of experiences from other sites such as awareness-raising and capacity-building strategies at a conceptual level. However, there are some actors in the municipalities and civil society organisations with more developed capacities, who are an important asset to lead early awareness-raising efforts and to ensure the sustainability of NbS and GI mainstreaming in the medium and long term.

Opportunities associated with the availability of resources and the presence of key ecosystems in states such as Campeche and Tabasco (states with a quarter of the country's mangroves and 35% of the freshwater available in Mexico, respectively) should not be overlooked. These territories represent a favorable environment for taking accelerated steps and consolidating progress for regions such as the Gulf or the Southeast of the country.

Moreover, it is important to keep in mind the progress that has been made in other cities that were not part of the BIOCITIS project, but that were recent beneficiaries of other international development cooperation initiatives, or that have notable previous experiences in the implementation of NbS and GI, as is the case of Xalapa, Oaxaca, Hermosillo, Tuxtla, Mérida, Torreón, Guadalajara, as well as many of the cities with which GIZ has cooperated at a national level.

The above is of utmost relevance since, as mentioned, the ecosystems and landscapes affected by NbS or GI still lack the degree of connectivity necessary to ensure their optimal functioning and the granting of all the benefits they can provide. So articulating actions that transcend territorial, political and administrative limits in a coordinated manner is a non-negotiable requirement for Nature-based Solutions and Green Infrastructure to effectively contribute to the comprehensive strengthening of the socio-ecosystem in Mexico.

Low-hanging fruits and no-regret measures.

The pragmatism mentioned as part of the BIOCITIS methodological approach led to the implementation of strategies that deserve special mention since they're ideal for application at the subnational scale with the potential for expanded impact at the regional or national level.

"Low-hanging fruits" is the term used to refer to the recognition and exploitation of the most affordable opportunities in institutional, technical, financial, political and social terms. Advantages of such opportunities lie in the fact that they do not require complex or detailed analysis and diagnosis, and that there is empirical certainty they will not generate negative impacts of any kind, which implies that they are no-regret measures.

Commonly, these kinds of opportunities are widely known by large parts of local stakeholders, thereby ensuring long-term appropriation and sustainability, as well as means of implementation that are efficient in the use of resources and effective in achieving the stated objectives.

National Scale.

Opportunities related to working from a top-down approach.

Experiences of direct interaction with federal-level counterparts resulted in learnings related to broad spatial and temporal scales

Specifically, the opportunity to define long-term actions with potential scope throughout the national territory is highlighted, such as the design and implementation of National Programs or Plans. This implies the incorporation and institutionalization of NbS and GI concepts at the federal level, which undoubtedly would favor the mainstreaming of these approaches in a generalized manner.

This also implies greater opportunities to channel higher investment amounts from potential Programs and Plans, as well as access to international financing banks.

Financing opportunities at the national level. It is clear that the main opportunity in this regard comes from the PEF (Federal Expenditure Budget, by its Spanish initials) and the harmonization of specific branches for the incorporation of NbS and GI principles and criteria in their objectives. This potential is specifically highlighted in the following branches: **8** Agriculture, Livestock, Rural Development, Fisheries and Food; **9** Communications and Transport; **10** Economy; **12** Health; **15** Agrarian, Territorial and Urban Development; **16** Environment and Natural Resources; **20** Social Development; **21** Tourism; **28** Participations to Federative Entities and Municipalities, and; **33** Federal Contributions to Federative Entities and Municipalities.

The possibility of participating in Environmental Funds ⁴⁰ at a national level is also highlighted to increase financial participation for the strengthening of environmental conservation and sustainable development, and to contribute to the mainstreaming of NbS and GI at a national level.

Another high potential opportunity is the mainstreaming of Guarantee Funds. Currently, most of these operate for the agricultural sector, and, although they are already susceptible to financing actions associated with NbS and GI, an important opportunity is recognized to extend the benefits of these schemes to other sectors such as urban, environmental or water, in order to facilitate the implementation of the vast number of existing projects that already incorporate NbS and GI, but that still have difficulties in acquiring funding sources.

Related to the above, it is necessary to assess and explore in detail the opportunity to design and implement cross-sector investment funds with a basin-management perspective, in a way that the planning, design, implementation, monitoring and evaluation of NbS and GI projects can be carried out by integrating sectors, stakeholders and levels of government whose participation is crucial to guarantee the success of sectoral development, minimizing or eliminating any risks for the conservation of the ecosystems on which each sector depends.

⁴⁰ <https://redlac.org/acerca/>

Juncture opportunities such as those offered by the government transition at multiple levels and territories throughout the country. Particularly noteworthy is the creation or update of General Laws, such as the *General Law on Seas and Coasts*, the *General Law on Biodiversity*, or the *General Law on National Waters*. These laws will favor the achievement of their objectives if they incorporate NbS and GI approaches from the perspective described throughout this document, emphatically highlighting the need to propose intersectoral actions and the opportunity to strengthen participation at the subnational level to strengthen the territorial system.

Opportunities are also detected in actions complementary to those applicable to the legal frameworks, such as the implementation of Plans and Programs associated with crucial issues for NbS and GI, as is the case of the *National Water Plan*.

In the 2022 update of Mexico's Nationally Determined Contribution, Nature-Based Solutions are identified as a priority mitigation measure linked to Land Use, Land Use Change and Forestry sector (USCUSS, by its Spanish initials) and mentions that Mexico will increase its actions and the channelling of resources as a priority for the conservation of its ecosystems and for the development of programs based on a solidary and sustainable economy.

In addition, there is also an important opportunity to compensate for and mitigate the impacts caused by national strategic works and projects in the different sectors.

Likewise, NbS and GI stand out as relevant measures to alleviate the pressures caused by the recent and increasing manifestations of different climatic risks such as hurricanes, storms, floods, rising temperatures or fires. These kinds of measures also stand out for alleviating other socio-environmental risks constructed by poor socio-ecosystemic management, such as the increase in zoonotic risks due to pressures on ecosystems, the increase in risks caused by geological movements due to poor urban development planning or the exploitation of resources exceeding the carrying capacity of ecosystems.

Opportunities around specific territories or topics.

Even if it has already been mentioned, it is worth emphasizing the attention to emerging opportunities at a national scale derived from attention to specific issues such as territorial planning or water management, as well as those offered by the particular situation of specific territories, such as Campeche, a state that has a quarter of Mexico's mangroves, or Tabasco, a state that is home to 35% of the country's fresh water.

Opportunities for continuity of the solutions and initiatives promoted by the current administration (2018-2024), specifically the ones related to the operation of the Mexican Official Norms 001-SEDATU-2021, 002-SEDATU-2022, 003-SEDATU-2023 and PROY-NOM-006-SEDATU-2024.

Specifically highlighted is NOM-003-SEDATU-2023, *which establishes the guidelines for*

strengthening the territorial system to resist, adapt to and recover from threats of natural origin and climate change through territorial planning, which recognizes green infrastructure as an element that must be integrated into municipal Urban Development plans or programs as an element that allows the recharging of aquifers and reduces the probability of risk from flooding and as a strategy to prevent environmental impacts.

Opportunities for cooperation with the private sector to encourage their participation in the funding and implementation of NbS and GI. Highlighting the role of chambers such as the Mexican Chamber of the Construction Industry (CMIC, by its Spanish initials) or the National Chamber of Cement (CANACEM, by its Spanish initials), as well as associations or collegiate bodies of professionals related to said chambers, such as the College of Urban Planners of Mexico (ECUM, by its Spanish initials), the Federation of Colleges of Architects of the Mexican Republic, or the Society of Landscape Architects of Mexico (SAPMx, by its Spanish initials).

Opportunities for institutional renewal and restructuring to accommodate mandates and budgets more effectively to achieve national-level objectives such as climate adaptation, socio-economic equity and employment, security, etc.

On a preliminary basis, but subject to more in-depth analysis to understand whether the necessary actions are strengthening, merger or restructuring, the following government entities are listed: The Ministry of Environment and Natural Resources (SEMARNAT, by its Spanish initials), the Federal Attorney's Office for Environmental Protection (PROFEPA, by its Spanish initials), the National Institute of Ecology and Climate Change (INECC, by its Spanish initials), the National Commission for Knowledge and Use of Biodiversity (CONABIO, by its Spanish initials), the Mexican Institute of Water Technology (IMTA, by its Spanish initials), the Ministry of Agrarian, Territorial and Urban Development (SEDATU, by its Spanish initials), the Ministry of Infrastructure, Communications and Transportation (SICT, by its Spanish initials) and the Mexican Institute of Transportation (IMT, by its Spanish initials).

International Scale.

International financing opportunities.

It is worth going into more detail here, as there is currently a strong international push to focus on finding the best ways to mobilise the various sources of international funding to support the mainstreaming of NbS and GI.

From the international level, there is a consensus on the urgent need for “reorient and realign the way public finance is planned and disbursed and catalyze private finance at scale for nature. Recent figures are compelling: with **half of the world’s gross domestic product (GDP) dependent on nature** and 75 percent of global crops relying on animal pollination, **the importance of filling the biodiversity finance gap cannot be overstated**. There is global recognition that biodiversity loss is just as urgent as the climate crisis and that they are intimately linked. Ecosystem degradation is both a cause and a consequence of climate change and ecosystem protection and restoration is a powerful solution to avert catastrophic climate change” ⁴¹.

The above becomes even more relevant if we consider that “*Current finance flows to NbS of **US \$200 billion** are massively outweighed by finance flows with direct negative impacts on nature of **almost US \$7 trillion***” ⁴².

Ecosystem restoration can be fully cost-effective and **the economic benefits of sustainable land management could amount to \$75.6 trillion annually**. This is without taking into account that “Social and gender equity could be improved through policy and institutional adjustments that promote equity in the implementation of NbS. Indigenous Peoples, women and other vulnerable groups can be empowered by expanding access to financial resources, enabling them to scale transformative change through regenerative practices and their connection to nature” ⁴³.

Since the sources of these fundings are both public and private, hybrid financing schemes (public-private) are increasingly being promoted, as they represent important opportunities in terms of the level of joint risk that can be assumed, the ease of experimenting with mixes of economic and financial instruments, the capacity for replication and scaling, as well as the possibility of promoting reforms to fiscal and financial systems designed to mainstream NbS and GI and, above all, **the possibility of financing NbS and GI projects in a transversal manner at spatial, temporal and administrative scales, as well as between different sectors**.

All of this means that, by 2050 and at a global level, there is an opportunity to mobilize public and private financing in favor of NbS and GI for a total of at least 538 billion dollars ⁴⁴. Therefore, this constitutes an ideal opportunity for Mexico to take advantage of the immense and urgent opportunities offered by the allocation of a good part of these resources in favor of the resilience of the territory and the people of the country.

⁴¹ <https://www.greenclimate.fund/document/making-blended-finance-work-nature-based-solutions>

⁴² <https://www.unep.org/resources/state-finance-nature-2023>

⁴³ Ídem

⁴⁴ Íbidem

A specific example of funding opportunities for NbS and GI at the international level comes from the Horizon 2020 programme ⁴⁵, a European Union fund worth 80 billion euros and aimed at research and innovation. Despite being a European Union fund, a large part of the resources was directed to international cooperation, specifically cooperation with the Latin American region, as was the case of CONEXUS ⁴⁶, a project aimed at urban sustainability through NbS that received funding for 5 million euros.

As a successor to Horizon 2020, the Horizon Europe programme ⁴⁷ was created, another research and innovation programme that will operate until 2027 with a funding of **95.5 billion euros**. It also has an international cooperation component and includes the following mission areas among its objectives: 1) adaptation to climate change, including social transformation; 2) healthy oceans, seas, coastal and continental waters; and 3) climate-neutral and smart cities ⁴⁸.

The *Biodivercities Network of Latin America and the Caribbean*, from the Development Bank of Latin America and the Caribbean (CAF, by its Spanish initials) stands out for this region, whose mission is identifying, structuring and financing of sustainable urban interventions of quality and high impact, based on people and biodiversity ⁴⁹.

More recently, the G20 Sustainable Finance Working Group (SFWG) has identified financing for Nature-based Solutions as a priority on its agenda. Specifically, the scaling up of financing for NbS through previously mentioned instruments such as hybrid finance or **debt for nature swaps** ⁵⁰.

Juncture opportunities.

Closely related to the previous point, the growing mobilization of resources in favor of the mainstreaming of NbS and GI implies a strong inertia at the international level for the emergence of programs, projects and initiatives aimed at the development and strengthening of various enabling conditions with that same goal.

Opportunities for synergies with other actors.

The correlation between the growing sources of financing and the current opportunities they offer opens the door to strengthening the scope of international cooperation in favour of mainstreaming NbS and GI, especially to avoid redundant efforts and to **provide integrative solutions for cities through intersectoral involvement**, being efficient with the use of

⁴⁵ https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-2020_en

⁴⁶ <https://www.conexusnbs.com/>

⁴⁷ https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en

⁴⁸ https://research-and-innovation.ec.europa.eu/document/download/9224c3b4-f529-4b48-b21b-879c442002a2_en?filename=ec_rtd_he-investing-to-shape-our-future.pdf

⁴⁹ <https://www.caf.com/es/especiales/biodiverciudades/>

⁵⁰ <https://g20sfwg.org/wp-content/uploads/2024/02/2024-G20-SFWG-NAP.pdf>

resources and effective in achieving objectives through cooperation.

Some of the institutions that are promoting such objectives with potential for cooperation for the mainstreaming of NbS and GI are: the **World Bank**, through the Global Program on Nature-based Solutions for Climate Resilience; the **United Nations System**, through agencies such as the United Nations Environment Program (UNEP), the Food and Agriculture Organization of the United Nations (FAO), UN-Habitat, and projects such as City Adapt; the Inter-American Development Bank (**IDB**); the World Resources Institute (**WRI**) through its Natural Infrastructure Initiative; the Green Climate Fund (**GCF**) and the Global Environment Facility (**GEF**); or **GIZ** itself through the multiple projects it promotes with objectives associated with NbS and GI in Mexico and other countries.

In addition to the above, BIOCITIS' experience has detected excellent opportunities through methodologies and processes that allow the matching of local needs with international financing requirements.

Opportunities to comply with international agreements.

It is worth mentioning the opportunity that the mainstreaming of NbS and GI represents to comply with various international agreements and commitments to which Mexico is a signatory.

At least the following agreements can be mentioned in this regard: the Paris Agreement, the Sustainable Development Goals (SDGs), the United Nations Framework Convention on Climate Change (UNFCCC) and its Nationally Determined Contributions (NDCs), the Convention on Biological Diversity (CBD), its Aichi Targets and its National Action Plans to Halt Biodiversity Loss (NBSAPs), the New Urban Agenda (NAU), the Kunming-Montreal Global Biodiversity Framework (GBF) and the Sendai Framework for Disaster Risk Reduction.

Geopolitical opportunities.

In an exploratory manner, it is worth mentioning the opportunities offered by the current geopolitical context, emphasizing cases such as financing for losses and damages to vulnerable countries seriously affected by floods, droughts and other climate disasters, agreed upon as a result of the most recent Conference of the Parties to the UNFCCC ⁵¹.

⁵¹ <https://www.weforum.org/agenda/2023/12/cop28-loss-and-damage-fund-climate-change/>

5. Conclusions.

It is undeniable that the state of many ecosystems is critical. Their degradation and loss of functions increases the risks and vulnerability to which the territory and people are exposed to, and implies an annual loss of 5 billion dollars.

Likewise, it is undeniable that the expansion of cities and the failure to plan this process contributes strongly to the degradation and loss of ecosystem functions that benefit humanity.

In response to this scenario, Nature-based Solutions and Green Infrastructure have proven to be effective measures to avoid catastrophic scenarios caused by the double crisis of climate change and biodiversity loss. The implementation of initiatives and projects with these approaches must be articulated at multiple territorial scales to provide all the benefits they provide, which implies the participation of urban contexts, places where their application brings broad environmental, social, economic and cultural benefits.

BIOCITIS was a project of the German Technical Cooperation (GIZ) in Mexico, whose objective was to integrate biodiversity and ecosystem services in the urban development of 3 regions of Mexico: Northwest, Gulf of Mexico and Southeast. During the 4 years of operation, lessons and emerging opportunities of great relevance were identified to mainstream Nature-based Solutions and Green Infrastructure as a first-order way to increase the resilience of the territory and people at a national level.

Mexico is a megadiverse country that must strategically take advantage of this condition, since ecosystems are environmental assets of great socioeconomic value. However, their valuation should not mean the monetization of their benefits, since this would feed back into many of the severe problems that afflict the population.

The problems arising from the current global crises are interrelated and of a socio-ecosystemic nature, since they involve the structures, processes and dynamics of ecosystems, but also the structures, processes and dynamics of society and its institutions. Therefore, it is imperative to address them from an intersectoral perspective.

The current situation in Mexico is ideal for adapting public policy frameworks in a way that favors intersectorality at the institutional level and fosters socio-ecosystemic resilience in a comprehensive manner. Institutional strengthening at the subnational level is especially necessary to take advantage of environmental, social, economic and financial opportunities, so that it is possible to address population problems effectively.

The implementation of NbS and GI in Mexico is related to multiple priority agendas, since it has been shown that these approaches contribute to alleviating social inequality, mitigating socio-environmental risks, reducing people's vulnerability, providing health benefits, combating unemployment, as well as contributing to the reduction of gender inequality.

There is a strong international momentum that will provide access to broad sources of funding for the implementation of Nature-based Solutions and Green Infrastructure. This is an opportunity that Mexico must leverage