LAC Cities Study Tour Sector Notes: Urban Climate Resilience and Nature-Based Solutions

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Disclaimer

This document was prepared as part of the series of sector notes that highlight the characteristics of the urban infrastructure sector, the roles of the private and public sector, and the financing mechanisms for the long-term funding of these urban interventions. The notes are prepared as background material for the Latin American and the Caribbean (LAC) Cities Study Tour offered to African Cities in the UMDF Cities Program. The sector note also highlights the experiences of the LAC region in finding solutions for the urban challenges as well as the lessons learned. The notes were prepared based on the experiences of the Inter-American Development Bank (IADB) with its Emerging and Sustainable Cities Initiative (ESCI) from 2012 thru 2017. The sector notes also benefited from consultations and recent work by development financial institutions and academic institutions in the sector.

This work is a product of an external consultants group led by Ellis J. Juan (former Urban Division Chief at the Inter-American Development Bank) with external contributions. The findings, interpretations, and conclusions expressed in this work do not necessarily reflect the views of the African Development Bank, its Board of Executive Directors, or the governments they represent. The African Development Bank does not guarantee the accuracy, completeness, or currency of the data included in this work and does not assume responsibility for any errors, omissions, or discrepancies in the information, or liability with respect to the use of or failure to use the information, methods, processes, or conclusions set forth.

February 7th, 2024

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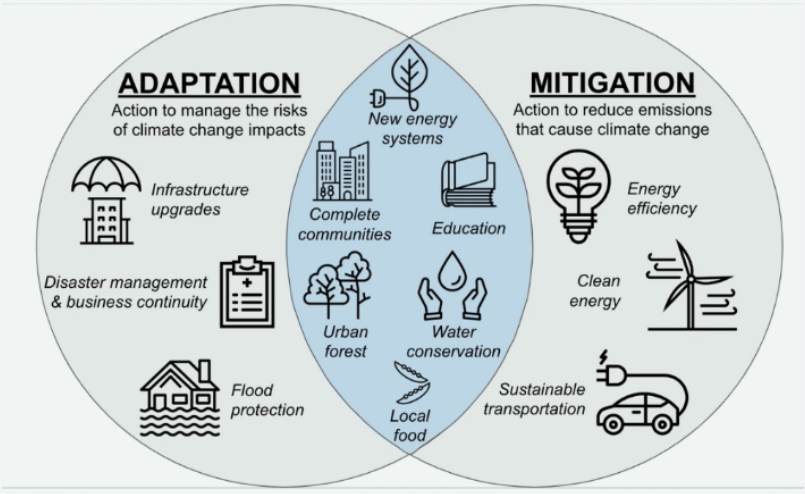
Background

As urbanization accelerates, cities face intensified vulnerability to climate change as average values of variables like temperature, precipitation, sea level, winds, and extreme events are altered. These changes have various consequences at global, regional, and local levels. Managing the impacts of climate change involves mitigation and adaptation. Mitigation efforts aim to address the root causes of climate change on a global scale. It involves reducing or preventing the emission of greenhouse gases and promoting sustainable practices to mitigate the overall impact of climate change. As a global good, mitigation requires collaborative efforts from nations worldwide to collectively curb the progression of climate change, acknowledging that its consequences transcend national borders.

On the other hand, adaptation focuses on local responses to the current and anticipated impacts of climate change and involves adjusting societal and environmental systems to minimize vulnerability and enhance resilience. Recognized as a local good, adaptation necessitates adapted solutions that consider the unique circumstances and challenges faced by individual communities. Local governments, communities, and stakeholders play a crucial role in implementing effective adaptation measures, which can include building resilient infrastructure, developing early warning systems, and implementing sustainable land-use.

While mitigation and adaptation are distinct concepts, they are interconnected components of a comprehensive climate action strategy. Finding a balance between global mitigation efforts and locally driven adaptation initiatives is essential to address the multifaceted challenges and create a resilient and sustainable response.

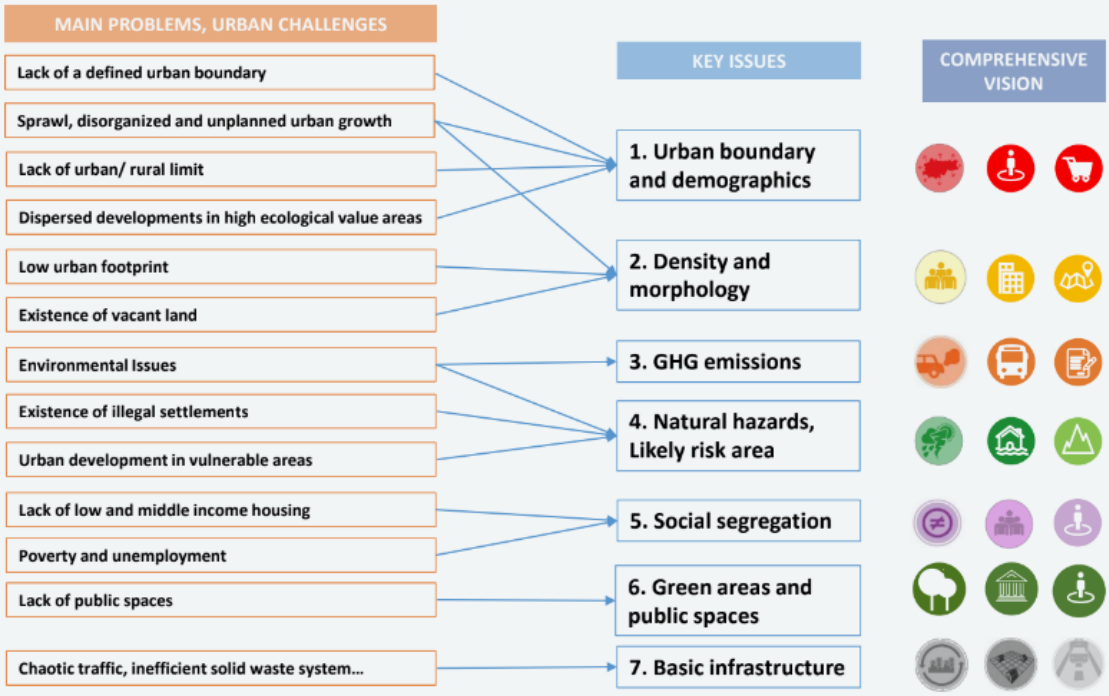
Figure No. 1: Mitigation and Adaptation: A Visual Guide to Climate Action Strategies



Source: University of Michigan. (n.d.). Mitigation and Adaptation.

Urban development serves as the foundation for climate-resilient cities. By considering climate risks early in the planning process, cities can enhance their adaptive capacity. This involves designing infrastructure for extreme weather, incorporating green spaces to mitigate heat island effects, and adopting sustainable water management practices. The integration of urban planning with adaptation and resilience measures aims to enhance community well-being. By creating cities that are adaptive and resilient, we protect lives and livelihoods, promote sustainable development, and foster communities better equipped to bounce back from shocks. In the context of continuous urban expansion, the incorporation of urban planning with adaptation and resilience measures becomes increasingly vital for the well-being of present and future generations.

Figure No. 2: Comprehensive Urban Assessment



Source: IDOM consulting, engineering, architecture. sustainable urban development (2019)

The concept of sustainable cities

A sustainable city is an urban space that provides a relatively good quality of life to its inhabitants via the efficient delivery of urban infrastructure and related public services, while preserving its physical and environmental assets for future generations. A sustainable city integrates its urban planning strategies together with its climate resilience and adaptation policies. It has a local government with fiscal and administrative capacity to support economic growth, while delivering good quality of life and mitigating impact on the environment. Becoming a sustainable city requires a concerted holistic effort, with a long-term vision, combining the action of the different parties involved, under the leadership of local governments and based on citizen participation.

Within this concept, a smart city is a sustainable city that uses ICT technology (+ IoT) to deliver more efficiently urban infrastructure and public services while preserving physical and environmental assets for future generations. It is a city that places the citizen at the center of the planning process.

Figure No. 3: A Sustainable City

Source: Methodological Guide for the Emerging and Sustainable Cities Program - IADB

Urban Evolution: Transforming Mid-Sized Cities in Latin America and the Caribbean

The Emerging and Sustainable Cities Initiative (ICES) was a technical assistance program led by the Inter-American Development Bank, providing support to the governments of mid-sized cities in Latin America and the Caribbean. The primary objective of this initiative was to identify, organize, and prioritize infrastructure projects focused on urban development, environmental sustainability, fiscal and governance practices, all designed to improve the quality of life in Latin American cities and promote sustainability.

The ICES methodology involved the development of an Action Plan for the city, incorporating three baseline studies (i.e., CO2 Inventory, Urban Footprint, and Vulnerability). These studies effectively integrate the variable of climate change into the urban planning process and help to determine, under potential scenarios of urban growth, the prioritization of infrastructure projects addressing greenhouse gas mitigation (e.g., clean urban transport, energy efficiency projects) or adaptation to the impact of natural disasters (resilience), such as comprehensive solid waste management projects or urban river sanitation.

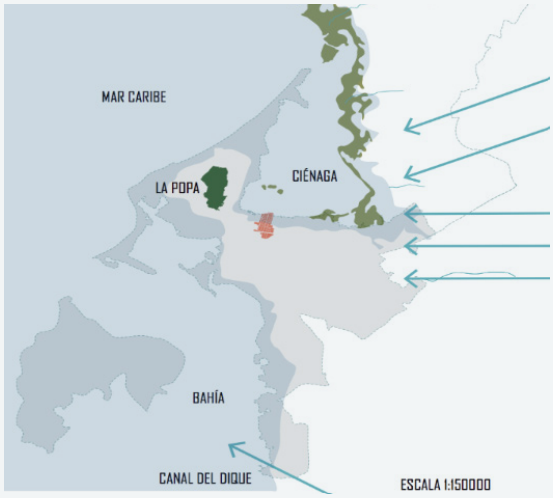
The integration of the climate change variable into the urban planning and project prioritization process increases the efficiency of formulating public-private partnership schemes. The trio of baseline studies allows for the calculation of vulnerable zones and potential environmental liabilities associated with diverse urban growth scenarios. These studies play a crucial role in optimizing urban infrastructure planning by providing targeted recommendations for projects aimed at diminishing both emissions and vulnerability. Also, the comprehensive cost analysis from the third study further illuminates indirect costs linked to projects extending beyond the current urban footprint, encompassing additional investments needed for the establishment of new roads, drainage systems, and power lines outside the existing urban area. Description of the three baseline studies:

- **Greenhouse Gas Mitigation Study:** This study includes a greenhouse gas emissions inventory and a mitigation roadmap, providing an overview of current emissions across various city sectors. By extrapolating future emissions based on historical trends in population and GDP growth, the study identifies sectors—particularly in transportation, energy, and solid waste—where mitigating greenhouse gas emissions will have a significant impact. It concludes by proposing specific measures to contribute to reducing the city's carbon footprint.
- **Disaster Risk and Vulnerability Study:** This study aims to prevent financial damage and the loss of human lives due to natural disasters, exacerbated by climate change. For flood, seismic activity, and strong wind cases, a probabilistic analysis is conducted, quantifying damage in dollars and loss of human life for specific return periods of each event. Other threats undergo analysis using appropriate methodologies. Based on this assessment, which considers climate change projections when relevant, risk and susceptibility maps are developed, identifying risk areas in the city. The study proposes measures to mitigate vulnerability and identifies areas where urban growth should be restricted. The probabilistic analysis provides an estimate of the risk, allowing a comparison of the costs of these measures with the costs of inaction.
- **Urban Footprint Study:** This study conducts a historical and current analysis of the city's urban growth to propose policy recommendations for a sustainable growth model. It analyzes high-resolution images, ideally at a 1:10,000 scale. The study examines how the city will grow if current conditions persist and compares it to an optimal scenario that considers sustainability aspects, using, for example, the risk zones from the second study as growth barriers. Differences between scenarios in terms of land consumption, resource use, and environmental impact are identified. A comparative analysis of the cost of basic infrastructure and the level of greenhouse gas emissions in the scenarios is also conducted.

Case Study Cienaga de la Virgen, Cartagena, Colombia

The city of Cartagena de Indias, located in northern Colombia along the Caribbean Sea, faced significant challenges stemming from historical conditions of inequality, resulting in difficulties accessing basic services, high rates of informal employment, precarious settlements, and limited connectivity. The lack of sewerage was identified as one of the primary issues, with the Ciénaga de la Virgen, situated on the northern side of Cartagena, comprising 80% of the city's total drainage area. As the main recipient of sewage waters, accounting for 60% of the city's total discharge, its contamination levels exceeded the water body's self-regeneration capacity.

Figure No. 4: Cienaga de la Virgen, Cartagena de Indias - Colombia



Source: Action Plan Cartagena - Emerging and Sustainable Cities Program - IADB

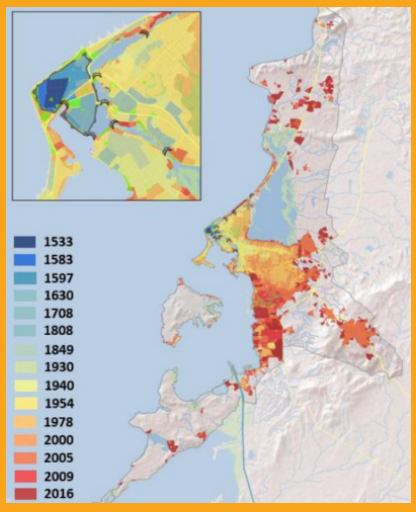
Box 1: ICES methodology baseline studies

Vulnerability Study revealed concerning finding regarding the environmental quality of the Ciéna ga de la Virgen in Cartagena. Among the key re sults, it was found that the swamp serves as the main receiver of sewage waters, accounting for 60% of the city's total discharge, approximately 100,000 m3 of wastewater. These discharges occur without any prior treatment, leading to contamination of the water body and unsanitary conditions in nearby human settlements. Additionally, there is a significant presence of solid waste in the canals and streets of informal settlements, exacerbating environmental degradation. Consequently, this situation has led to the loss of biodiversity, degradation of mangroves and the water body, and increased vulnerability to extreme weather events such as heavy rainfall, tides, and rising sea levels.

Environmental Diagnosis

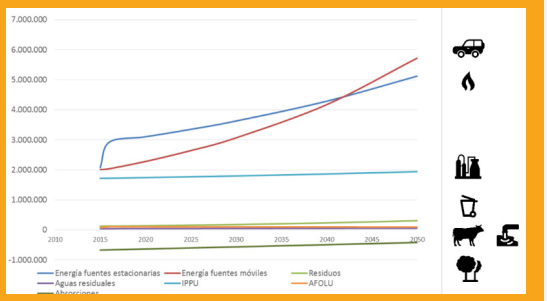
Urban footprint study revealed significar challenges in urban planning and developmen. Over the past 20 years, there has been a staggering 60% increase in the urban footprint, expanding to nearly 4,000 hectares, while the population has doubled to 1.1 million inhabitants. This growth has largely been unplanned and disorderly, leading to the proliferation of informal and illegal settlements, often located in high-risk areas. Moreover, there is a deficiency in essential public services such as water supply, sanitation, and waste management, exacerbating environmental and health risks. Inadequate wastewater disposal practices and improper waste disposal further contribute to environmental degradation. Additionally, the exploitation of natural resources adds to the strain on the urban ecosystem.

Foot Print Study



Cartagena's emissions in 2015 amounted t 6,087,846 tons of CO2 equivalent. Some of these emissions are offset by absorptions, estimated at (-) 202,359 tons of CO2 equivalent for the same year, resulting in a net emissions balance of 5,885,486 tons of CO2 equivalent, representing an increase of over 32% (compared to 2010). Regarding the sectoral contribution to total emissions, the IPPU and Mobile Energy sectors stand out. In 2010, IPPU accounted for 30.46%, while Mobile Energy reported 30.44%. In the base year 2015, these percentages were 28.2% and 33%, respectively. Mobility was considered a priority sector for action due as the largest emitter in terms of emissions balance and its high potential for reducing GHG emissions, as well as for other environmental improvements.

CO2 Emission Estimations



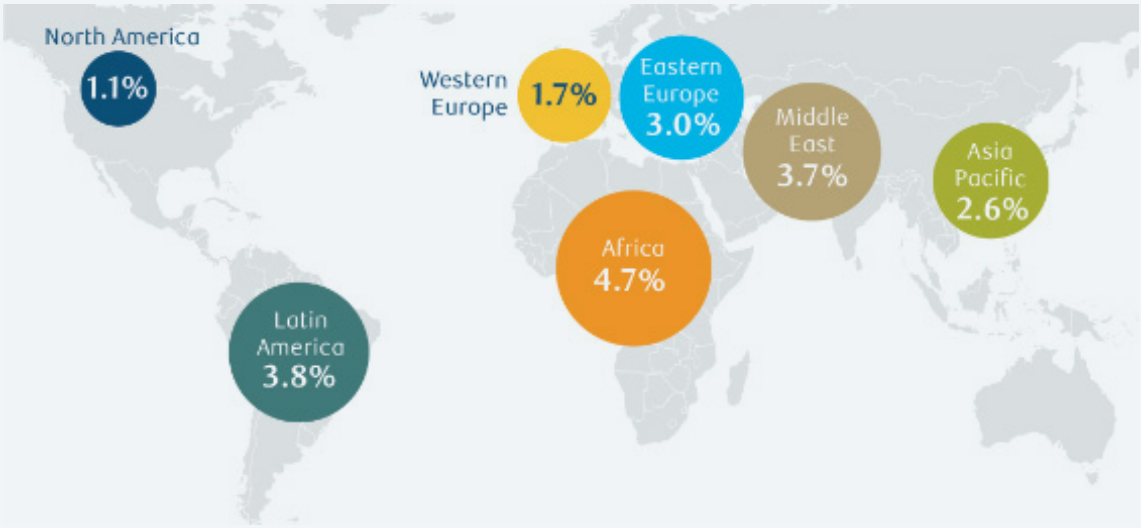
Source: Action Plan Cartagena - Emerging and Sustainable Cities Program - IADB

Addressing Climate Challenges; political economy

The political economy of adaptation and resilience reveals a complex interplay of social, economic, and political factors that significantly impact the effectiveness of initiatives aimed at addressing the impacts of climate change. Often, these impacts disproportionately affect the poorest segments of society, exacerbating existing inequalities. The economic vulnerabilities of marginalized communities are heightened as they face challenges like extreme weather events, rising sea levels, and disruptions to essential services. Access to resources, decision-making power, and the ability to adapt become critical determinants in the face of climate change impacts. Section No. 3 of this note (i.e., Economics of the Sector, Financing Adaptation) provides a rationale and analytical framework for the economics of adaptation and its political economy.

In addition, the effects of climate change are intertwined with those of economic globalization, a process known as "double exposure" that disproportionately affects certain social groups and urban areas. Marginalized neighborhoods and informal settlements face significant deficits in resources and infrastructure, coupled with a high risk of flooding, making them highly vulnerable to the impacts of climate change. Addressing this challenge in cities requires integrated approaches to adaptation and mitigation, focusing on the most vulnerable. The ongoing socio-urban integration processes in informal settlements present opportunities to rethink and territorialize climate action from an integrated habitat perspective.

Figure 5: Estimated economic impact of climate change by 2050 in terms of real GDP loss



Source: Economist Intelligence Unit. Data as at November, 2019.

The World Health Organization (WHO) indicates that 90% of the global population breathes air with elevated pollution levels, leading to approximately 7 million annual deaths attributed solely to air pollution. The prevalence of deaths due to air pollution is most pronounced in emerging markets (EM). Furthermore, projections suggest that mortality related to climate change is anticipated to be more substantial in emerging and developing economies by the year 2100.[1]

According to the World Bank, climate change could drive 216 million people to migrate within their own countries by 2050, with hotspots of internal migration emerging as soon as 2030, spreading and intensifying thereafter. Climate change could cut crop yields, especially in the world's most food-insecure regions. At the same time, agriculture, forestry, and land use change are responsible for about 25% of greenhouse gas emissions.

The route of climate change shows a critical photo for the future. Projections of the OECD indicate that without new policies, in the 2050 the global greenhouse gas (GHG) emissions are set to surge by 50%, with energy-related CO2 emissions experiencing a staggering 70% growth. This surge in emissions contributes to an alarming atmospheric concentration of GHGs potentially near 685 parts per million (ppm) CO2-equivalents. Consequently, the global average temperature is projected to escalate to 3 to 6 degrees Celsius.[2]

1 IHME (Institute for Health Metrics and Evaluation), Global Burden of Disease. Data as at December, 2018

2 https://www.oecd.org/env/indicators-modelling-outlooks/oecdenvironmentaloutlookto2050theconsequencesofinaction-keyfactsandfigures.htm

Case Studies and Experiences in LAC

In the context of Latin America and the Caribbean, cities face massive challenges, requiring innovative approaches in governance, technology, processes, and tools for a resilient and sustainable urban transformation. A comprehensive city metamorphosis involves intertwining diverse land-use types with the creation of effective urban spaces. Urban equity becomes integral, emphasizing the democratization of public spaces to ensure access for all social classes to high-quality public and recreational (green) zones. This vision advocates for pedestrian-centric streets, improved park access, pedestrian-friendly areas, bike lanes, and the rejuvenation of historical and cultural spaces.

This chapter delves into case studies and experiences in the region, shedding light on the intricate interplay between economic growth, environmental resilience, and societal well-being. It explores how flexible land-use plans converge with quality urban spaces and the pivotal role of waterfronts and ports, serving both recreational and flood buffer purposes in urban areas.

"Revitalizing Medellín: The Parques del Río Project"

Medellín, the second-largest city in Colombia, faced a significant challenge with the absence and deterioration of public green spaces due to rapid urban growth, and difficulties in utilizing territorial planning tools for urban and landscape ecology. In response to this situation, initiatives were conceived to enhance the environment, focusing on reimagining areas near waterways initially perceived as uninhabitable green spaces. These areas, with the potential for transformation into natural public spaces, became central to creating Linear Parks.

Figure No. 6: Medellin River's Past

Source: Economist Intelligence Unit. Data, November 2019.

Strategically designed as connections, protectors of bodies of water, and spaces for citizen recreation, these linear parks played a crucial role in harmonizing urban goals with ecological processes. Positioned as key elements in the city's landscape, these parks emerged as fitting areas to be treated as public green spaces, capable of significantly improving the quality of the urban environment. Beyond their environmental and ecological significance, these parks also became habitats for a diverse mix of native trees, providing shelter for local birds and contributing to environmental conservation, as well as reclaiming spaces for community gatherings.

Initiated in 2012, the "Parques del Río Medellín" project addressed existing challenges associated with the Medellín River. Crossing the city, the river had become disconnected from urban and social flows due to the regional avenue and southern highway, along with national routes running parallel to the river corridor. The project aimed to integrate the city both lengthwise and crosswise, proposing the relocation and revitalization of the riverbank to establish it as an environmental, cultural, educational, sports, and mobility hub. In this sense, "Parques del Río Medellín" created a harmonious alignment between the Medellín River corridor and urban activity, integrating it with the structural systems of Medellín and the Metropolitan Area of Valle de Aburrá.

The initiative strategically utilized opportunity lands, infrastructure, green areas, and nearby public spaces to enable more suitable and consistent uses aligned with the environment, landscape, culture, and existing urban structure. The project played a pivotal role as part of the territorial planning strategy, actualized through strategic interventions in various sectors of the city, and focused on creating a compact city to foster a healthy mix of uses, encouraged inward growth, and comprehensively integrate with the municipal transportation system. Simultaneously, the development aimed to consolidate a new public space and established a new identity and quality dimension for t he citizens.

Figure No. 7: Parque del Río Medellín – Panoramic View

Source: Landscape. (s.f.). Parques del Río Medellín. https://landscape.coac.net/parques-del-rio-medellin

"Parques del Río Medellín", since its construction, became a generator of employment, both direct and indirect, in the city. The project showcased a strong commitment to the environment and city sustainability, implementing measures to reduce noise and pollution. This included the planting of 1,773 trees in the project's influence area, 6,000 in various city sectors as part of compensations, and an additional 100,000 trees in protected areas of the Valle de Aburrá watersheds.[3]

3 Landscape. (s.f.). Parques del Río Medellín. https://landscape.coac.net/parques-del-rio-medellin

The river's recovery and the creation of public spaces for citizens' access and recreation, also consolidated and improved the river's mobility axis, increasing the road from four to seven lanes in the first stage and promoting sustainable mobility with the addition of 32 kilometers of bike lanes and pedestrian paths. Additionally, by prioritizing non-motorized transportation, the Linear Park established connectivity with 17 educational institutions, benefiting 160,000 students. The project also contributed to the improvement of the vehicular road system through the expansion of existing lanes and the construction of both at-grade and underground sections, ensuring a comfortable and secure user experience.

Figure No. 8: Parque Rio Medellin – Public Spaces

Source: Landscape. (s.f.). Parques del Río Medellín, 2015

The optimization of mobility, and the significant contribution in the air quality improvement by capturing CO2 through tree planting, and the noise level reduction, transformed and revitalized Medellin, and become a pioneer in sustainable development and quality of life. The project distinguished itself with innovative landscaping, featuring plant associations creating diverse environments and fostering species diversity.

Figure No. 9: Parque Rio Medellin – Linear Park Corridors

Source: Landscape. (s.f.). Parques del Río Medellín.

This transformative project, backed by an investment exceeding 1 billion dollars from the Municipality of Medellín and facilitated through Empresas Públicas de Medellín (EPM), focused on the revitalization of the river. Urban renewal along the riverbanks aimed to shape a new, more equitable, and inclusive city. Medellín envisioned itself as a 'compact city,' transitioning from outward expansion towards the hillsides to internal growth through extensive urban renewal across the river's plain. This initiative prioritized universal city access, creating a scenario for public life and coexistence with efficient mobility connections, shorter distances from communities to services, and more extensive high-quality green public spaces for interaction and social recreation.

Porto Maravilha Urban Operation: Rio de Janeiro‘s Waterfront Revitalization

Rio de Janeiro is the second-largest city in Brazil, and has been experiencing rapid growth due to urbanization, particularly in the historic waterfront region. Warehouses and old storages lost their importance and were unused and replaced by big containers and new technologies. Also, an elevated highway was built, making the area more segregated. To address those challenges and to make the old port area a new urban innovation, the Porto Maravilha Urban Operation was developed.

The project covered a substantial area of 5 million m² with a population of 32,000 in 2012, and one of the primary goals include increasing the residential population to 100,000 within a decade and improving the quality of public services in the area. Identified urban challenges encompassed low green area coverage, chronic floods, outdated waste collection, sanitation systems, and the preservation of architectural heritage. To address these challenges, Porto Maravilha Operation focuses on increasing green area coverage from 2.5% to 11%, improving soil permeability, and reducing water, air, and noise pollution. A new mobility system prioritizing pedestrians, cyclists, and sustainable public transportation aims to boost traffic flow capacity by 50%.

The project unfolded in two phases. The first phase prioritized essential infrastructure, including sewage and water networks, along with the installation of new water galleries to address future flooding concerns due to expected sea-level rise. This phase also featured the construction and inauguration of the Rio Museum of Art (MAR) in 2013. The second phase focused on implementing a new urban mobility model, incorporating projects such as Binário Avenue, an Underground Express Highway, and 28 km of the Light Rail Transit Lane (LRT). These initiatives aim to increase the residential population from 32,000 to 100,000 within a decade, enhance public services, and augment green area coverage from 2.5% to 11%. The emphasis on sustainable measures not only improves soil quality but also significantly reduces pollution. The introduction of a new mobility system, designed to prioritize pedestrians, cyclists, and eco-friendly transportation, is expected to enhance overall traffic flow.

Figure No. 10: Porto Maravilha Waterfront and Rio de Janeiro’s landscape

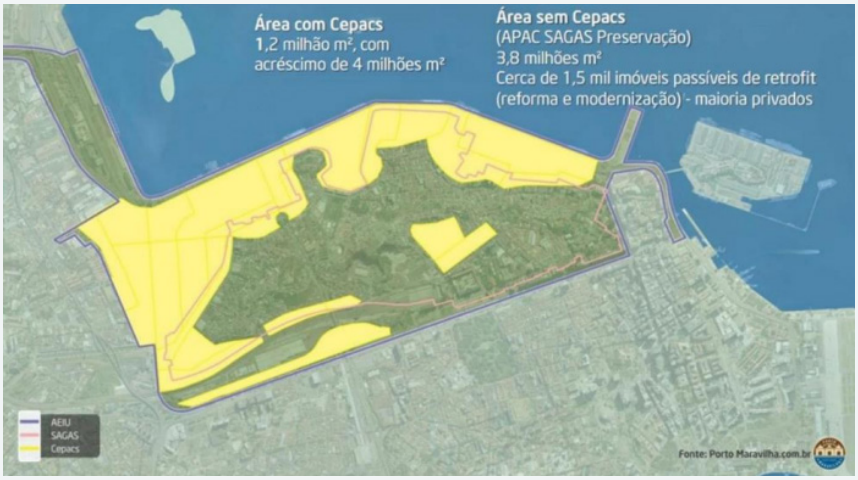
Source: Urban Project Issues: Dealing with Porto Maravilha Project in Rio de Janeiro Denise B. Pinheiro Machado

The positive impacts of the Porto Maravilha Urban Operation go beyond the immediate area, benefiting the entire city, especially the downtown neighborhood. Additionally, the city's infrastructure changes contribute to the creation of an innovative High Technology Park at the Rio de Janeiro Federal University (UFRJ). The transformation merged Rio as a business and research hub, promoting innovation and technological development, and attracting academic and scientific research and qualify professionals. Besides, the cultural projects involve the completed Rio Museum of Arts, and the highly iconic Museum of Tomorrow is considered by some as Rio's response to Bilbao's Guggenheim.

Porto Maravilha's innovative financial model, a public-private partnership, involves selling all CEPACs (Certificates of Potential Additional Construction) and ensured availability of resources before commencing the Urban Operation[4]. This project represents one of Brazil's largest private-public partnerships, with Porto Maravilha's total cost exceeding R$8 billion (approximately US$2 billion).

This concession also includes managing all public services in the region until 2026, covering traffic control, waste collection, public lighting, roads, and public spaces maintenance—a departure from typical PPPs that often focus solely on construction works. Besides, the legal framework for Porto Maravilha is established in national and municipal laws. Innovative strategies, such as the multimodal urban mobility and the unique financial model, can be adapted and replicated, considering the specific characteristics and legislation of each city.

Figure No. 11: CEPAC's zones shown in yellow.



Source: Urban Project Issues: Dealing with Porto Maravilha Project in Rio de Janeiro Denise B. Pinheiro Machado

4 Certificates of Potential Additional Construction (CEPACs) are a method of leveraging private dollars to finance public investment in neighborhood revitalization through a process of rezoning and construction permit auctions. Through rezoning and the sale of CEPACs, the city raises the funds for upfront construction costs, long-term maintenance, and other priorities, such as historic or cultural preservation. These revenues are captured in a fund separate from the general treasury and are dedicated to the particular neighborhood or urban operation. In Rio de Janeiro, the wholesale auction of the CEPACs to a single third-party vendor, Caixa Economica Federal (CEF), covered the costs for all public infrastructure improvement and future service costs in the Porto Maravilha district for 20 years, without requiring any further public outlay. CEF then placed the CEPACs on the open market, where they are traded publicly and purchased by investors or developers. Source: www.portomaravilha.com.br/web/direito/faleConosco.html

Launched in anticipation of the 2016 Olympic Games and included the construction of the Olympic media village (Porto Olímpico), Porto Maravilha represents the largest urban redevelopment in Rio's recent history. This project redefined cities' connection with the waterfront and showed a commitment to sustainable urban development, economic revitalization, and social inclusion.

Figure No. 12: Porto Maravilha Waterfront and Rio de Janeiro's landscape

Source: Academic Star. (2020). Urban Project Issues: Dealing with Porto Maravilha Project in Rio de Janeiro

Porto Maravilha operates as a public agency (CDURP), securing land on behalf of the municipality, giving it complete control over future developments. Since 2009, the agency has been tasked with selling development rights for each plot, raising funds for substantial upfront investments in infrastructure. The objective has been to establish a mixed housing and commercial neighborhood, aligned with a transportation network and attracting major international investors and increasing the residential population.

Figure No. 13: Porto Maravilha in the Olympic Games 2016

Source: Academic Star. (2020). Urban Project Issues: Dealing with Porto Maravilha Project in Rio de Janeiro

Puerto Madero Redevelopment: Transforming Buenos Aires Sustainably

Buenos Aires, the capital of Argentina, has not been immune to the impacts of climate change. With a stable population of around 3 million residents and a transient population of approximately 3.5 million, the city is located on the southern coast of the estuary of the Río de La Plata, which serves as a source of drinking water for the city and receives sewage and industrial effluents. Buenos Aires experiences a humid temperate climate with hot summers and cool winters, and an average annual temperature close to 17ºC. The average annual relative humidity is around 72%, with an annual average precipitation of approximately 1,100 mm.

One of the projects conceived as part of a broader development strategy for the city center was the restructuring of Buenos Aires' main port, Puerto Madero. Covering 170 hectares near the government house (Casa Rosada) in the city center, it was one of the first urban redevelopment projects of this scale and complexity in Latin America. Abandoned as a port in the early 20th century, Puerto Madero had experienced decades of neglect by the late 1980s. The shift of activities away from the traditional city center had reduced the use of public transportation and led to the slow deterioration of historical heritage buildings, many of which had become substandard residential structures.

Figure No. 14: Puerto Madero before its renovation

Source: Infobae. (2019, noviembre 15). La transformación de Puerto Madero: De una costa desolada a uno de los barrios más exclusivos de Buenos Aires.

In 1989, the federal government transferred the land to a special body, the Corporación Antiguo Puerto Madero (CAPM), to study and develop its reuse. CAPM was tasked with developing a plan for the sector, defining a self-financing financial model, overseeing improvements associated with the project, marketing the land, and supervising the development process according to the established master plan. The redevelopment of Puerto Madero was part of a broader city strategy to protect heritage, promote downtown development, stimulate the local economy, and contribute to the reduction of undesirable settlement patterns. The development took place in four stages:

In the first stage (1989–1992), CAPM sold the old properties at the western end of the port, initiating the redevelopment process and covering initial project costs. In 1991, the city government and the Society of Architects signed an agreement to facilitate the National Ideas Competition for Puerto Madero. The redevelopment required a new subdivision geometry to allow construction without demolishing valuable historical structures. Many historical port buildings, such as warehouses, were restored for new functions, combining valuable historical heritage with new development.

In the second stage (1993–1995), the master plan contract was awarded to the winners of the Ideas Competition. The original proposal aimed at developing 1.5 million square meters of built-up area concentrated in a central location to revitalize the city center. The plan, spanning a 20-year horizon, included commercial activities, cultural and recreational facilities, cafes, restaurants, services, professional studios, and medium-sized commercial activities located in the 16

renovated former port warehouses. To compensate for a lack of green spaces around the city center, green spaces such as a metropolitan central park, an ecological reserve, and the rehabilitation of the Costanera Sur were proposed, aiding in the recovery of local fauna.

In the third stage (1996–2000), most of the public works were carried out, and project expenses increased significantly along with land sales. By this stage, investor profiles had evolved from an initial group of pioneers comprising small and medium enterprises facing high levels of risk (1989–1993) to large firms investing in proven products.

Figure No. 15: Puerto Madero 1990 and 2018

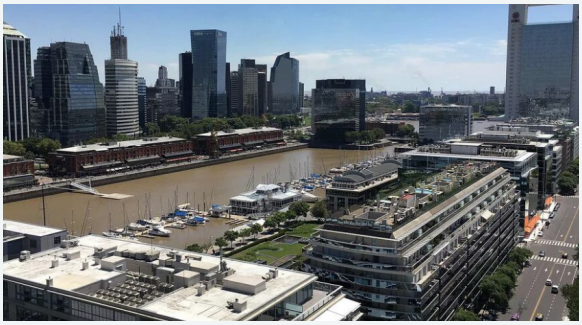
Source: Martínez, Bertha & Ramo-Díaz, Rodrigo & Honorato, Luis & Bentes, María. (2022).

By 2001, few public lands were left for sale, and the public company had enough liquid assets to complete the necessary public works for the project. However, the project initially suffered from economic, financial, and political turbulence associated with the 2001 fiscal crisis. Throughout this period, CAPM faced high levels of uncertainty, leading to a halt in land sales. After 2003, as the country achieved improved political and economic stability, CAPM resumed land sales to continue public works and space renovation.

As available land in Puerto Madero became scarce, developers turned to areas surrounding the city center as alternative investment sites. Many developers chose to invest in the center rather than the suburbs, successfully redirecting market trends to align with urban policy priorities, a change that would not have occurred without government intervention.

With approximately 1.5 million square meters of built-up area, the project financed its renovation through land sales and concessions, attracting considerable private sector investment. Puerto Madero also fostered economic growth in the area, ultimately resulting in increased tax revenue. As a state initiative, it triggered over $2.5 billion in private investments, with a current value exceeding $6 billion. Estimates indicate that income from income tax was estimated at $158 million.

Figure No. 16: Puerto Madero 1990 and 2018
(From an abandoned site to a high-scale residential site)



Source: Infobae. (2019, noviembre 15). La transformación de Puerto Madero: De una costa desolada a uno de los barrios más exclusivos de Buenos Aires.

The project also stimulated job market growth. Private constructions in Puerto Madero reached about $450 million in labor costs, equivalent to 900,000 work months or 3,750 jobs per year over 20 years. Project investments in public works generated 313 jobs per year for 20 years, along with 26,777 administrative jobs by 2006 and 45,281 service jobs by 2010. The project added four large water bodies (totaling 39 hectares) and 28 hectares of green spaces to the city's park system. It facilitated the opening of the ecological reserve and renovated access to the southern area, known as Costanera Sur. This creation of green spaces was crucial for improving water quality, reducing runoff, and fostering healthy habitats. Additionally, the promotion of sustainable mobility, through pedestrian and cyclist-friendly infrastructure, contributed to reducing dependence on motorized vehicles, lowering CO2 emissions, improving air quality, and creating recreational spaces.

Figure No. 17: Puerto Madero
(From an abandon site to a high-scale residential site)

Source: Infobae. (2019, noviembre 15). La transformación de Puerto Madero: De una costa desolada a uno de los barrios más exclusivos de Buenos Aires

Revitalizing the Urban Heart: A Comprehensive Plan for the Choluteca River Integration in Tegucigalpa and Comayagüela

Tegucigalpa and Comayagüela, located at the head of the Choluteca River Basin in Honduras, Central America, exemplify the challenges faced by many emerging cities in Latin America and the Caribbean. These cities have undergone massive urbanization, leading to the disintegration of their territories and issues in various aspects of urban development, such as water, housing, transportation, and the environment. Currently, cities like Tegucigalpa and Comayagüela struggle to address each problem separately due to limited resources and unfavorable conditions.

The Choluteca River, spanning 250 kilometers and traversing three departments, presents diverse environmental challenges in the Prioritized Area. It has become a critical point of pollution in Tegucigalpa and Comayagüela, facing the discharge of liquid and solid waste, raising concerns about potential risks to public health. Additionally, the natural vegetation along the river experiences both destruction and neglect, with areas overgrowing uncontrollably, becoming inaccessible, and others disappearing entirely, facilitating the accumulation of garbage and debris. The constant deterioration of structures near the river exacerbates the situation, as many of these buildings are abandoned and in ruins, offering no spaces for a gradual transition from the city to the river.

Figure No. 18: Situation Affected by Flood Risk vs Situation with Mitigation Measures

Source: Action Plan Tegucigalpa (2015) by the Inter-American Development Bank.

The Choluteca River has the potential to become the greatest environmental and social asset of Tegucigalpa and Comayagüela. Besides being the backbone of the sanitation system in the capital, its central location makes it ideal for functioning as a structuring axis for a strategy to densify and revitalize the Historical Centers of Tegucigalpa and Comayagüela (CHTC). This comprehensive project not only involves providing citizens with a healthy and risk-free environment but also offers the opportunity to create a green corridor providing new housing options, and public spaces.

Figure No. 19: Rio Choluteca before the intervention

Source: Action Plan, Tegucigalpa (2015) by the Inter-American Development Bank.

Within the methodology of the Emerging and Sustainable Cities Initiative, an action plan was developed for Tegucigalpa. The "Choluteca Urban Environmental Project" is a multisectoral intervention proposal that introduces the Action Plan, aiming to clean and revitalize the urban front of the Choluteca River. This project is envisioned as a public-private initiative to enhance the environmental quality and safety of the river, generating private investment in the revitalization of the Honduran capital.
The studies involved various key analyses. Firstly, hydrological analyses were conducted to examine precipitation and flow values across different return periods. Additionally, hydraulic analyses were undertaken to assess flood threats, resulting in the creation of flood threat maps that delineate velocity and depth values for various return periods. Furthermore, the studies explored landslide risks, evaluating the vulnerability of urban settlements to natural disasters and their susceptibility to landslides.

Figure No. 20: Situation Affected by Flood Risk vs Situation with Mitigation Measures

Source: Action Plan, Tegucigalpa (2015) by the Inter-American Development Bank.

The strategic lines include the reactivation of the urban riverfront, new housing and commerce options, restoration of historical heritage, improvement in citizen safety, and efficient mobility in the central area. The "Choluteca Urban Environmental Axis," as a multisectoral intervention led by the Municipality of the Central District, local economy, and civil society actors, aims to recover and "sanitize" the river (and its beds), and regenerate the core of the urban basin of the Honduran capital, transforming the city into a greener and more resilient place capable of dealing with precipitation impacts. It also seeks to generate social integration with new habitable and recreational spaces promoting cohesion and citizen security, enhanced connectivity with infrastructure prioritizing pedestrians and public transport users, and increased competitiveness by creating more formal jobs and fostering new businesses.

In the context of the consultancy to conduct the baseline studies for this Action Plan (IDOM-IH Cantabria, 2015), a proposal for multisectoral urban transformation was developed along three axes:

- **Green Axis:** This axis concentrates actions to control floods, perform river sanitation and dredging, and establish a linear park with floodable recreational areas. This ensures a safe riverbank adaptable to the variability of the flow throughout the year.
- **Culture Axis:** With the aim of improving mobility patterns and prioritizing pedestrians, this axis proposes the restoration and recovery of historical parks and buildings. It suggests a 6 km pedestrian route connecting 10 points of interest in the Historical Centers of Tegucigalpa and Comayagüela (CHTC)
- **Urban Renewal Axis:** Leveraging the infrastructure improvements of the Green Axis and complementing the efforts for habitability in the Culture Axis, a new urban model is proposed for the constructive rehabilitation and renewal of buildings on both sides of the river.

Figure No. 21: Rio Choluteca before the intervention

Source: Action Plan Tegucigalpa (2015) by the Inter-American Development Bank.

Figure No. 22: Rio Choluteca after the intervention (render)

Source: Action Plan Tegucigalpa (2015) by the Inter-American Development Bank.

Revitalizing Montería: Climate Change Mitigation and Adaptation through Sinú Riverbank Rehabilitation

Montería, the capital of the Córdoba department in Colombia, stands proudly in the northwest region of the country, settled along the Sinú River and called the “Pearl of the Sinú”. This vibrant municipality has a total population of 516,217, with 402,069 residents residing in the bustling urban center and 114,148 in the scenic rural areas. (DANE 2023).

Figure No. 23: Rio Sinú Panoramic View

Source: Worldwide Fund for Nature (WWF). "Montería: Sustainable Growth."

A must-visit attraction in Montería is the iconic Avenida Veinte de Julio parallel to the Sinú River. This busy avenue is home to the largest linear park in Latin America, known as Ronda del Sinú, a vibrant space for culture and recreation, offering a view of the river stretching over 200 kilometers up to Montería. On the other hand, the Sinú riverbank is home to 7,942 plant species and 22 fauna species, and the river is considered a key nature reserve for biodiversity conservation, as well as a fundamental ecological asset for generating a refreshing microclimate within the city.[5]

In the past, the riverbank was vital for the city's growth, but with time and urban changes, it lost significance. This led to social issues and the decline of public spaces along the river, becoming associated with problems like degradation and vulnerability. As a response, Montería initiated an innovative public permit model in 2002 for one hundred parks, encompassing a dedicated segment of the Sinú riverbank. This includes conceive, construct, and maintain public spaces, marking the inception of a profound transformation. The recovery plan not only concentrated on the riverbank itself but also aimed to forge connections between the urban landscape and the river. It emphasized the imperative to respect biodiversity while fostering the overall well-being of the city's residents.

The intervention of the Sinú Riverbank reflected a commitment to ecological criteria, specifically preserving biodiversity and aligning with established citizen movement actions. The project prioritized the creation of permeable spaces, ecological adaptability, maintenance, and sustainability, and community engagement through extensive consultations and dialogues.

As the Sinú riverbank restoration progressed, the focus shifted towards integrating the river with the rest of Montería. The city introduced green corridors, perpendicular pathways adapting to existing vegetation, enhancing ecological connectivity. These corridors utilize rainwater channels and incorporate Nature-based Solutions and biodiversity monitoring. The positive response from residents to the project's activities played a key role in incorporating green corridors into the city's land management plan, becoming an essential element of mitigation and adaptation

5 Montería Baja - ICES, Inter-American Development Bank
URL: https://issuu.com/ciudadesemergentesysostenibles/docs/monteria_baja/25

strategies.

Figure No. 24: Sinú Riverbank before vs after

Source Instituto Humboldt. "Rivers of Change: Water Governance for Sustainable Cities

Montería's groundbreaking strategy revolved around utilizing advanced land management and financing tools, establishing a symbiotic relationship between the public and private sectors. The anticipated capital gains from adjacent land, bolstered by restoration efforts, were envisioned to sustain the continuous development of the riverbank project. This innovative approach contributed to the strategic inclusion of green corridors in the city's land management plan, forming an integral part of mitigation and adaptation strategies.

Figure No. 25: Sinú Riverbank Public Spaces

Source: El Heraldo - Cordoba. "Cordoba: El Parque de la Ronda del Sinú en Monteríæ (expansion of the "walkable" urban space)

The restoration not only restructured citizens' connection with nature but also improved public trust through the delivery of high-quality initiatives and restorations. This transformative project also contributed to economic development, increased utilization of public spaces, and thermal regulation for climate change adaptation.

To maintain the vitality of the revitalized Sinú riverbank and enhance citizens' connection to this transformed space, Montería implemented various initiatives. These included managing the puppet theater, organizing school trips, hosting the Summer Festival, the Montería Jazz Festival, and an array of day and nighttime activities. These endeavors were crucial in fostering a sense of belonging among the residents and attracting tourism to the city.

The recovery journey of the Sinú riverbank began as a mayor's office project to recover an initial area of the riverbank. Over time, it has evolved into a city-wide initiative demanded by the community. Several key lessons have emerged from Montería's experience[6]:

6 https://proyectos.humboldt.org.co/biodivercitiesby2030/pdf/exp-rivers-of-change.pdf

- **Nature-Based Solutions:** Montería embraced nature-based solutions, utilizing the ecological benefits inherent in the area to enhance public space conditions. This highlights the potential for respectful and compatible human uses with nature.
- **Land Management and Financing Instruments:** Existing land management and financing instruments played a pivotal role in the success of the Sinú riverbank recovery project. These instruments, especially crucial in intermediate cities, enable infrastructure development and alleviate financial constraints.
- **Public Space Investment:** Montería recognized the significance of investing in public space, recognizing its importance for people, especially for the more vulnerable and low-income residents.
- **Climate Adaptation:** The Sinú river corridor serves as a barrier and adaptation area for climate change. Improved thermal regulation is achieved with each additional stretch added to the corridor.
- **Citizen Participation:** Essential for achieving success is the active involvement of citizens in the design process. This engagement, facilitated through open communication and collaboration among diverse stakeholders, nurtures a shared sense of ownership..
- **Ecosystem-Based Design:** Public space projects, particularly those involving green infrastructure, should be designed based on the ecosystem services they can provide to all life forms in the city, including humans, plants, and animals.

Box No. 2: Case Study: Adaptive Reuse - Revitalizing Fundidora Park

Innovative urban development revitalizes city landscapes by adaptively reusing old factory grounds, transforming them into parks and recreational areas. This strategy not only offers an outdoor escape and pays homage to the industrial heritage but also brings multiple benefits, positively impacting the environment and communities while minimizing the carbon footprint.

Converting old factories into new spaces injects vitality, attracting businesses, fostering job creation, and stimulating economic growth. This economic revitalization complements the preservation of architectural heritage, maintaining historical value while adapting to modern needs. Adaptive reuse fosters mixed-use developments, integrating residential, commercial, and recreational spaces. Additionally, it addresses critical housing needs by facilitating affordable housing development in these repurposed spaces.

An example of innovative urban development is the Fundidora Park, situated in Monterrey, Mexico. This transformative project involves repurposing existing manufacturing facilities into vibrant spaces, creating a unique mixture of an industrial heritage museum and a public park. Fundidora Park stands as evidence of the potential of adaptive reuse, revitalizing the urban environment while simultaneously preserving and showcasing its rich industrial history.

Originally a steel foundry dating back to 1900, the park repurposed the old foundry structures, including the iconic blast incinerator Horno Alto No. 3, into an educational facility. The adaptive reuse of Fundidora Park not only honors the industrial history of the region but also serves as a recreational and educational space for the city and its visitors. Fundidora Park, included in the 2014 World Monuments Watch, received support from American Express for conservation work, including the steel elements of the detonation incinerator and awareness-raising campaigns. These efforts not only ensured the preservation of industrial history but also contribute to the sustainable development of the region.

In conclusion, the adaptive reuse of factories presents substantial benefits for both the environment and communities. By repurposing existing buildings, this strategy reduces environmental impact, stimulates economic growth, preserves architectural heritage, and creates diverse community spaces. Fundidora Park stands as a testament to the success of adaptive reuse, showcasing how transforming industrial legacies can contribute to sustainable urban development and

Source: World Monuments Fund, Fundidora Park Project 2014 - https://www.wmf.org/project/fundidora-park

Economics of the Sector – Financing Urban Resilience

Managing climate change impact is represented by two different set of economic activities: (a) Mitigation, these are specific and focused actions to prevent and mitigate the emission of greenhouse gasses (GHG) into the atmosphere, to make impact on global temperature increase less severe (i.e., "avoid the unmanageable"), and (b) Adaptation are specific and focused actions to anticipate the adverse effects of climate change and take the appropriate actions to prevent and mitigate the damage they can cause (i.e., "manage the unavoidable").

Mitigation is represented by actions such as increasing the share of renewable energy, developing a clean urban mobility system (i.e., electric buses), or increasing the "storage" of such GHG (i.e., reforesting and increasing the size of the forests). Adaptation is represented by actions such as infrastructure developments changes (i.e., building hard infrastructure defenses to protect against sea level rise, or building a new road or bridge with resilient material that can connect vulnerable communities and informal settlements with access to hospitals, and safe evacuation routes)[7].

"The difference between climate change mitigation strategies and climate change adaptation strategies is that mitigation is aimed at tackling the causes and minimizing the possible impacts of climate change, whereas adaptation looks at how to reduce the negative effects it has and how to take advantage of any opportunities that arise. Where mitigation strategies fail to reach emissions containment targets, **climate resilience will be key to lessen the impacts of climate change and pave the way for our survival, along with the rest of the Earth's inhabitants."**[8]

A major factor in understanding the economics of climate change, is that mitigation actions support the creation of a "global good". Reduction of GHG emissions in Hamburg, Germany due to an increase in renewable energy generation benefits societies across the globe. Adaptation and resilience to the adverse impacts of climate change is a very local issue. It only affects specific localized communities. The costs of adverse climate change impacts (i.e., flooding, extreme heat, etc.), and the subsequent losses (i.e., housing, road infrastructure, crops, human lives, etc.) is only felt by the local community where the adversity took place. As reflected in the next sections, Mitigation as a "Global Good", and "Adaptation" as a "Local Good" have direct and important implications in the "pricing" and "financing" of both activities. Both climate change strategies (i.e., mitigation and adaptation) complement each other, and although they present different challenges, the end goal is the same. The concept of resilience (i.e., as the capacity to cope, adapt and transform), complementary to adaptation, sets-up the need for fundamental and system-level changes when incremental adaptation to climate change is insufficient.

7 European Environmental Agency, what is the difference between adaptation and mitigation? October 22, 2023

8 https://www.iberdrola.com/sustainability/climate-change-mitigation-and-adaptation

Box No. 3: Improving Mass Transit as an Adaptation measure.

Road transport accounts for 72% of global transportation-related emissions, a percentage which will continue to grow unless more low-carbon transportation options become available and accessible. Transportation infrastructure is also extremely vulnerable to climate change impacts like storms and extreme heat. Disruptions to the network due to extreme weather will disproportionately affect low-income people and other vulnerable urban populations who have fewer mobility options. Resilient, low-carbon mass transit addresses both challenges.
Expanding urban public transportation by 40% by 2050 could decrease the projected number of cars on the road and avoid 6.6 gigatons of carbon emissions. Retrofitting and designing mass transit to withstand climate risks such as natural disasters, sea level rise or extreme heat ensures these transport options are safe and reliable in the long-term. These improvements can influence usage and better accommodate future growth.

Cities like Rome and Buenos Aires have integrated additional adaptation measures like heat-proofing buses and greening stops and routes to improve the commute experience. Increased public transportation also has the added benefits of relieving traffic congestion, reducing accidents and fatalities, and improving air quality.

Source: World Resource Institute, Five Strategies that Achieve Climate Change Mitigation and Adaptation Simultaneously, Isabella Suarez, February 10th, 2020

"Pricing" Mitigation[9] ("avoid the unmanageable")

Considered as a "global good', economic activities leading to the reduction of GHG emissions can be "economically" priced by assigning a relative value to each unit of mitigation (i.e., usually a Ton of GHG emissions reduction).

Pricing carbon is essentially calculating the cost of releasing another ton of carbon dioxide (CO_2) into the air. The use of fossil fuels may create jobs and commerce right now, but they enjoy an implicit subsidy: users don't have to pay for environmental damages. In economic terms this is known as a "market failure" in which the price of a good or service doesn't fully reflect all the costs. When a power company is deciding between investing in a new wind farm or a coal-fired power plant, the decision should consider the cost of pollution on top of the costs of both technologies. This market failure, is being corrected since the Kyoto Protocol of 1994 when policymakers have developed two distinct mechanisms to price "mitigation", that have in turn establish what is known today as the "Carbon Finance Markets":

Carbon tax: This sets a direct tax on coal, oil products, natural gas, and other fossil fuels in proportion to their carbon content. The tax is passed from suppliers to consumers in the form of higher prices for electricity, gasoline, heating oil, and other products and services that rely on fossil fuels.

Cap-and-trade system: This sets allowances on the total amount of carbon emissions released each year, creating a market-based system in which the allowances can be traded from less-carbon-intensive to more-carbon-intensive sectors.

9 IMF, the world faces a two-front battle to halt global warming and address the effects of climate change, September 2021, and Authors' contribution.

The best form of carbon pricing depends on a country's individual circumstances, but a carbon tax has been identified as the most effective way to change behavior. Carbon taxes are appealing because they can be added to existing taxes on gasoline and other fuels and can help countries meet pledges to reduce emissions under the 2015 Paris Agreement. They can also provide an additional revenue stream for governments, allowing them to cut burdensome taxes or fund development. Beyond direct carbon pricing, regulatory measures can minimize carbon emissions. Governments can set what's called a renewable portfolio standard, which mandates production of a certain amount of energy from renewable sources like wind and solar, among others. Carbon pricing, however, has an advantage over regulatory approaches because it forces a more rapid and broader behavioral shift in both the type and amount of energy used. To save money, electricity providers, manufacturers, and consumers will seek cleaner, lower-cost energy sources; adopt more efficient technologies; and reduce their demand for energy.

The goal is to reduce emissions enough to limit global warming to 1.5°C– 2°C above pre industrial levels—the point of likely irreversible changes in sea level rise, extreme weather, availability of water, and other significant shifts. An international carbon price floor is increasingly viewed as the way to get the world's largest CO_2 emitters to reduce emissions enough to keep global warming below the 2°C target. Concerted action can allay concerns that one country's energy-intensive or trade-exposed sectors will be less competitive or that companies will flee to countries where there is lower or no carbon prices[10]. Pursuing a just transition is vital. The revenue raised through carbon taxes will be necessary to compensate low-income households that struggle to afford higher energy costs and to support people who currently rely on coal, petroleum, and other fossil fuels for their livelihoods.

Besides the "pricing" of the mitigation component, and as explained in previous sector notes, the delivery of sustainable public infrastructure service to the end-user (i.e., electricity, urban transport, solid waste management, water and sewage, etc.) will bear, in addition to the benefits of the carbon pricing, the tariff and fees scheme to end-users that such service provides[11]. As previously explained in developing countries for the types of basic sustainable infrastructure services, end-user tariffs tend to be below the full-cost recovery levels (except some services such as telecommunications and electricity and water and sewage provided to industrial and commercial end-users).

"Pricing" Adaptation and Resilience ("manage the unavoidable")

Adaptation as a "local good" that only presents negative externalities to the people and assets affected by the climate change impact residing in the area (i.e., flooding, sea water rise, droughts, etc.), has many complexities, when attempting to define a pricing mechanism.
Pricing a "local" good via a "global" mechanisms

One of such complexities is that any tax-based pricing mechanism for adaptation needs to be, by the nature of the concept, global (i.e., it would be unfair to tax the same "local" residents, that are suffering the "losses and damages" of the climate change impact – land, houses, crops,

10 The IMF has found that it will take a $75 a ton price on CO_2 worldwide by 2030 to limit warming to 2°C. The world has far to go. Four-fifths of global emissions are not priced, and the global average emissions price is only $3 a ton. There's a reason for slow action: such measures have costs both in real terms and in political decision-making. At $75 a ton, over 10 years electricity prices would rise, on average, by 45 percent and gasoline prices by 15 percent.

11 These "Sector Notes" referred to the documents developed in support of the LAC Cities Study Tour (i.e., Urban Mobility, Solid Waste Management, Slum Upgrading and the Role of National Development Banks).

roads, and bridges). Compensation funding for "losses and damages" (i.e., taxing the sources of climate change impact) will need to be of a global nature, and will need to be a transfer of resources from wealthy nations to developing countries.[12] These issues have been at the forefront of the last COPs (COP-26, COP-27, and COP-28). However, governments are still working out the institutional framework as well as the funding mechanisms and financial products to make this global compensation possible and doable[13].
Lack of commercial based adaptation tariff (zero cost recovery)

The other important complexity is that the costs of adaptation and resilience (i.e., better, and resilient economic and social infrastructure, innovative research in resilient crops, sea walls protecting sea level rise, efficient use of water and new water sources such as desalination, replanting forests, etc.) cannot be directly transfer to the end-user via tariff increases[14]. In terms of bankability, investments in adaptation and resilience do not have a stream of cash flows directly linked with the provision of the sustainable infrastructure service. This means that investments in adaptation and resilience needs to be supported by a stream of cash flows directly linked to public money support (i.e., local and/or global), as well as grant financing. Investments in adaptation and resilience are not financially attractive when analyzed under short-term conditions. When the future "losses and damages" linked to climate change impacts are considered (i.e., US$ 290 billion to US$ 580 billion per year by 2030), the financial value of these investments take another dimension and become financially attractive as a disaster risk protection (i.e., costs of inaction)[15].

Taxing luxury items to fund investments in adaptation and resilience (i.e., similar concept as taxing gasoline to fund road network maintenance), has been tried in selected countries (i.e., Canada, Morocco, Maldives, etc.) with relatively good results but it is not yet a widespread practice.

12 The issue of loss and damage in global climate negotiations have been contentious for decades. In 2019 at least five United Nations treaty bodies affirmed that states must cooperate to establish global responses addressing loss and damage suffered by vulnerable countries. It wasn't until November 2022 at COP27, after a tense two weeks of advocacy and negotiation, that countries reached a historic agreement establishing funding arrangements as well as a fund for loss and damage experienced by vulnerable countries hit by climate disasters, financed by developed countries (who are the largest historical emitters). The decision does not detail which countries would be required to provide funds nor the structures, beneficiaries, or other crucial details of the fund still to be designed and negotiated – but the agreement marks an initial step forward for climate justice and reparations. A "transitional committee" will make recommendations in 2023 on how to operationalize the funding arrangements and fund for consideration and adoption at COP28 in Dubai at the end of 2023. Outside of the UNFCCC, there continue to be important initiatives and dialogues contributing to the loss and damage agenda. Source: Institute of Human Rights and Business (IHRB), September 2023.

13 World Resource Institute (WRI), Adaptation Finance, 11 Key Questions, Larsen, Brandon and Carter, October 25, 2022

14 Additional investments in economic infrastructure to improve resiliency can range for 9% to 27% of the overall initial investment costs per sector. World Bank, Global Review of Public Infrastructure Funds, June 2020.

15 Loss and damage can be characterized as economic and non-economic: (a) Economic losses include the loss of resources, goods, and services traded in markets that lead to income streams or constitute assets. It also includes the loss of physical assets such as infrastructure and property. Not considering non-economic losses, estimates of economic damages due to climate change range from US$290 billion to 580 billion a year by 2030, and (b) Non-economic losses can be understood as everything that is not a pure economic loss. This includes the loss of human lives, health, mobility, communities, cultures, societal and cultural identity, heritage, indigenous knowledge, biodiversity, and territory. Non-economic losses can have catastrophic impacts on a community or a nation's history and culture. Source: Institute of Human Rights and Business (IHRB), September 2023.

Box No. 4: Pricing Adaptation and the Affordability Challenges, Egypt PPP Desalination Program

The Government of Egypt (GOE) has prioritized achieving water sustainability through various projects, including developing a desalination program aiming to add from 6.4 to 10 mcm per day of desalination capacity by 2050 to its existing, yet limited, close to 1 mcm per day capacity. In parallel, the GOE has succeeded in bringing down the financial operational deficit of the municipal water sector, mainly caused by low (subsidized) water tariffs. Furthermore, as a part of the GOE´s Energy, Water and Food Nexus program, [GOE / Ministry of Housing, Utilities, and Urban Communities / HCWW] has identified 5 locations on the coasts of 4 governorates on the Mediterranean and Red Sea to construct 5 solar desalination plants with a total capacity of 525,000 m3/day [115.5 MGD], planned to be extended to 1,750,000 m3/day [385 MGD] in 2050. As described in the recent World Bank Country Climate and Development Report (CCDR) of 2022, at the current pace of water consumption in Egypt, and without further actions to reduce technical and commercial losses, Egypt will reach extreme water scarcity threshold by 2033. Besides the impact of availability of water for human consumption, scarcity will severely impact the agricultural and agri-business sectors which accounts today for 21% of Egypt's exports and provides employment to a third of Egypt's workforce.

Together with the sector strategy for reduction of the non-revenue water (NRW), Egypt's Desalinization Program is probably today one of the most significant adaptation and resilience projects in the country's climate change strategy (i.e., securing long-term water sources). In terms of the concessional finance markets, mitigation projects today are taking the lions' share of the funding when compared to adaptation projects. Given current macroeconomic conditions and levels of income per capita, the affordability challenges in the provision of water and sanitation services are likely to be present in the forthcoming years. To make possible the effectiveness of the cost recovery tariff that would facilitate private capital flows into the Desalinization Program, will require an important amount of public sector support, in a moment when Egypt has significant fiscal space challenges. These two challenges are connected and represent the single most important risk when structuring the financing via private capital.

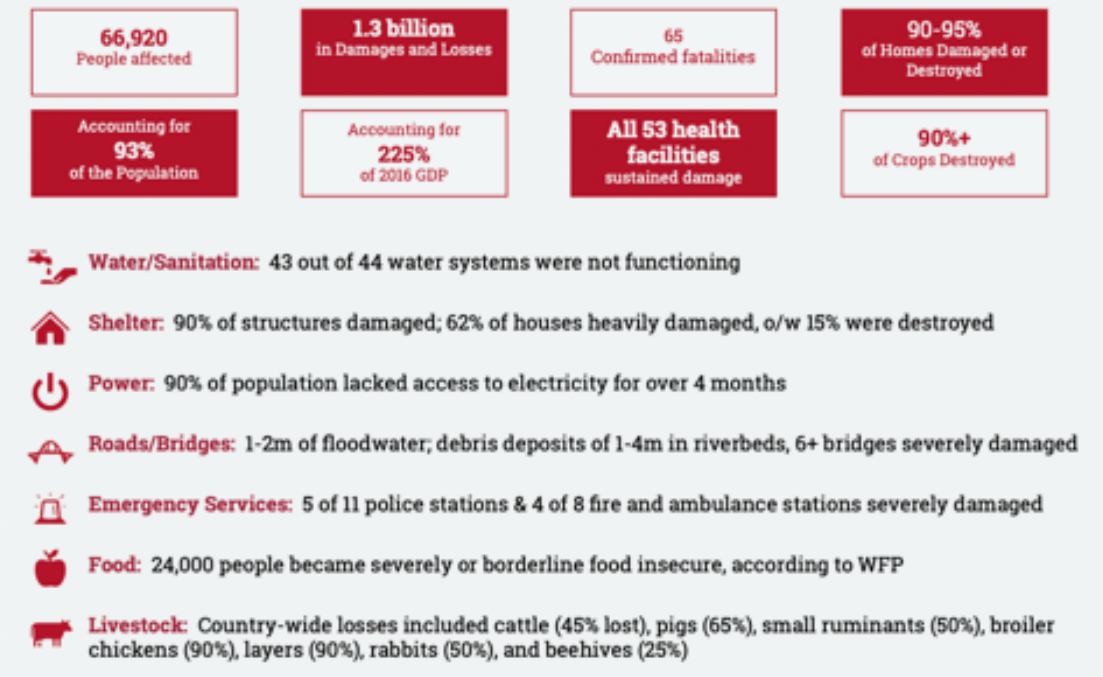
Source: World Bank, Concept Note on the PPP Desalination Program, 2023

Payments for Environmental Services (PES)[16]

PES have been tried in some developing economies as a pricing mechanism to compensate for investments in betterment of the environment (that could qualify as investments in adaptation and resilience). PES can work in both ways by levying a surcharge on the end-user tariff (i.e., a surcharge for water treatment charges in the water consumption bill to residential and commercial users); or payments for environmental services (PES) transfer to landholders or farmers for actions that preserve the services to public and environmental health provided by ecosystems on their property, including services that contribute to both climate change adaptation and mitigation. Given affordability risks in developing economies, PES application has been limited and mostly concentrated in the water and agricultural irrigation sectors.

16 WGIIAR5, Chapter No. 17, The Economics of Adaptation, 2022

Figure No. 25: Losses and Damages Illustration, Dominica, Hurricane Maria, 2020



Source: Government of the Commonwealth (2020)

Financing Urban Adaptation and Resilience

As previously explained, at the outset (i.e., without considering the future costs of inaction), investments in adaptation and resilience are not financially attractive. There is not a pricing mechanism in place for the impacts of climate change, that could generate cash flows. (i.e., end-user tariffs add-on or ear-marked taxes). This situation explains why today in average adaptation finance (which has increased notably in the latest years), represents only less than **10% of the total climate change finance** according to Climate Policy Initiative (CPI)[17]. Mitigation still represents the lion's share of climate finance (more than 90%)[18].

In terms of the adaptation finance needs, it has been estimated by UNEP Adaptation Finance GAP Report (United Nations Environmental Program), November 2023, that the total demands of adaptation finance by developing countries stands at around approximately US$ 400 billion annually, and that the total actual financing has not been growing as expected staying at around US$ 21 billion in 2023. It is expected that the total demand for adaptation finance will grow to US$ 500 billion per year towards 2050.

17 World Resource Institute, Larsen, Brandon & Carter, October 25, 2022

18 Global climate finance flows in 2013 were about US$ 359 billion. Of these flows around only 6% (US$ 22 billion) was for adaptation finance. The Lions' share of the climate finance came from DFIs, Donors and Climate related funds. Global Facility for Disaster Reduction and Recovery (GFDRR), Annual Report, World Bank, 2014.

"Based on a detailed update, the adaptation finance gap now stands at US$194–366 billion per year, with adaptation finance needs in developing countries likely to be 10–18 times as great as finance flows – over 50 per cent higher than the previous range estimate. At the same time, new adaptation projects are being added more slowly and the number of new national adaptation planning instruments is plateauing. The new finance gap results from growing needs coupled with adaptation finance flows to developing countries **declining 15 per cent in 2021 to around US$21 billion**. Considering that the finance needed to implement domestic adaptation plans in developing countries is currently estimated at **US$387 billion per year until 2030 –** most of which will require international support to deliver – this is a hugely worrying deceleration. Neither the goal of doubling 2019 international finance flows to developing countries by 2025 nor a possible new collective quantified goal for 2030 will significantly close the finance gap on their own. Therefore, finding new ways to deliver finance for adaptation action is essential" [19].

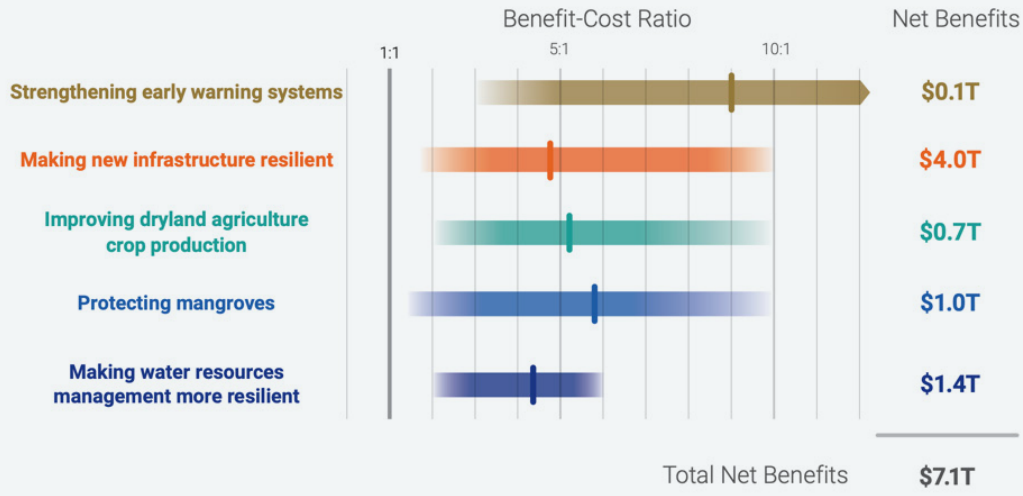
To make matters more complex the lion's share of the relatively small amounts of adaptation finance have been deployed to middle-income countries (70%, OECD, 2022). There is no real scientific data about the allocation distribution of concessional funds for climate change in recent years (i.e., mitigation plus adaptation finance). Middle Income Countries (MICs) with stronger institutional capacities (i.e., execution and disbursements) tend to benefit largely from the allocation of concessional funding. Previous statement raises a conflict of interest between criteria and realities of concessional funds allocation. Concessional funding should benefit more the poorer economies (LDCs); however, these are the economies with weaker institutional capacities to execute and disbursed (e.g., Haiti after the earthquake in 2010)[20]. It is likely that the total allocation of concessional finance for developing countries will increase in the near future. However, requirements for middle-income countries are likely to become more astringent, due to the need to have a stronger development impact (lesser weightfor the poorer countries).

The current financing gap, as explained by the recent UNEP Report (2023), is impossible to close under market financing terms due to the lack of adequate pricing mechanism for the cost of adaptation and resilience. One of the few financing options left for small and less developed economies – *other than concessional finance provided by DFIs and Donors, which is largely skewed towards MICs* – will be to developed financing mechanism that can help "monetize" the future costs of "inaction". As can be seen in figure No. 1 below, the benefit cost ratio of five different key adaptation strategies ranges on average between 4 to 9: 1 benefit-cost ratios. Each monetary unit of investment costs in these systems provide a benefit (expressed in that same monetary unit) of around 7 times in median terms. If we could monetize these benefits (i.e., costs of inaction), there will be a consistent repayment source for adaptation and resilience investments. Effective adaptation and resilience finance brings broad social benefits but usually does not result in clear financial returns for a private investor.

19 Underfinanced. Underprepared. Inadequate investment and planning on climate adaptation leaves world exposed, UNEP, GAP Report, November 2023.

20 Haiti is still struggling to recover a decade after the 2010 earthquake that destroyed the country. Haiti is known for its very limited institutional framework, which has been incapable of executing what has been one of the largest donor funds contribution programs in economic history. Donors from around the world swiftly pledged billions of US dollars in aid and made promises to rebuild. A decade on, Haitians who survived say they feel forgotten, as much of the good will has been lost to waste, greed, and corruption," from "A Lost Decade," NPR, Carrie Khan, January 12, 2020.

Figure No. 26: Benefit Cost Ratios of Illustrative Investments in Adaptation



Note: This graph is meant to illustrate the broad economic case for investment in a range of adaptation approaches. The net benefits illustrate the approximate global net benefits to be gained by 2030 from an illustrative investment of $1.8 trillion in five areas (the total does not equal the sum of the rows due to rounding). Actual returns depend on many factors, such as economic growth and demand, policy context, institutional capacities, and condition of assets. Also, these investments neither address all that may be needed within sectors (for example, adaptation in the agricultural sector will consist of much more than dryland crop production) nor include all sectors (as health, education, and industry sectors are not included). Due to data and methodological limitations, this graph does not imply full comparability of investments across sectors or countries.
Source: World Resources Institute.

Source: Global Center for Adaptation / WRI, A Global Call for Leadership on Climate Resilience, September 2019

Another relevant factor when defining types and origins for adaptation finance is the definition of the adaptation "term" or "definition" and its difference from infrastructure development finance. Building a road may improve resilience for a particular community by making it easier to access hospitals, markets, and other sources of assistance in the event of a natural disaster. However, for that road infrastructure to account as adaptation finance the road needs to be built under certain technical standards to resist climate impacts, and with the needs of the vulnerable segments of society upfront. The road will need to be in areas where it is not directly exposed to storm surges and/or erosion and be elevated in the event flooding takes place. Unless these technical conditions are met it would be difficult to qualify as adaptation finance and access to long-term concessional finance will be stricter[21].

Need for New Financial Product Development (adaptation and resilience)

One way in which the future costs of inaction are being monetized is the development of a wide array of disaster risk insurance products (i.e., catastrophe bonds, agricultural crop protection bonds, flood risk insurance, etc.)[22]. Disaster risk insurance represents a form in which compensation for future "losses and damages" due to inaction can be monetized by insurance claims payments.

21 World Resource Institute, Adaptation Finance, October 25th, 2022

22 Catastrophe bonds allow entities exposed to natural disaster risk, to transfer a portion of that risk to bond investors. Catastrophe bonds work in a similar manner to insurance, paying out when a disaster event meets certain pre-defined criteria (e.g., a specified earthquake magnitude). In a typical catastrophe bond structure, the entity exposed to the risk (known as the "sponsor") enters an insurance contract with a SPV that issues the bonds to investors.

Box 5. An Introduction to Climate Science and its impact on disaster risk insurance valuation methodologies

The climate system is chaotic and hard to predict in the short term but can be predictable in the long term. Chaos is what makes it hard to predict weather accurately beyond a few days. However, weather is constrained by stable exogenous forces called boundary conditions including geography and the global heat balance regulated by, among others, greenhouse gasses. As a result, stable weather patterns emerge over time, assuming that boundary conditions are not affected by, for example, increased anthropogenic greenhouse gas emissions.

The long-term distribution of weather is called "climate." Temperature, precipitation, droughts, and tropical cyclones all have their own long-term probability distributions in a certain place at a certain time. Climate change is about the transformation of all these probability distributions.

Scientists use a 20- to 30-year time window to define the climate of a region. Deviations from the norm must be persistent to imply that climate has changed. It is certain that temperature is increasing virtually everywhere. Very high temperatures, defined based on the historical climate, are becoming more frequent. Very cold days are becoming less frequent. Warming is faster at high latitudes and on land.

Source: IMF, Economic Principles for Integrating Adaptation to Climate Change into Fiscal Policy, Bellon-Massetti, March 2022

Financial innovation in the disaster risk insurance business lines via insurance derivatives and re-insurance mechanisms are driving the availability of new products to compensate for the future costs of inaction in the adaptation and resilience arena. For example, Catastrophe bonds allow clients to access a much larger pool of capital (i.e., the trillions of dollars held by bond investors), and in general, longer coverage periods than conventional insurance. Catastrophe bonds are fully funded transactions (i.e., investors put up all their money upfront by purchasing the bonds) and therefore there is no risk to the sponsor of default by the investors. In contrast, insurance products involve no upfront payments by the insurer. Rather, the insurer only makes payments when a triggering event occurs. Therefore, the client is exposed to the potential default of the insurance provider (i.e., It is paid to the sponsor as a pay-out under its insurance contract with the SPV. If no specified event occurs, the collateral assets are liquidated on the maturity date of the bonds and the money is paid to the investors[23]. The key factor impacting the development of a financial solution, and its pricing (i.e., risk premium), in the disaster risk insurance business are: (i) term explained as the required length of the coverage, (ii) timeline (i.e., time requirement to design and execute the transaction), (iii) market and legal requirements (i.e., subject to geographical location of insurers and reinsurers, (iv) market interest (i.e., capital market demand among investors), (v) economies of scale (i.e., transaction costs and sizing), and (vi) counterparty credit risk in the transaction.

The SPV invests the proceeds of the bond issuance in highly rated securities that are held in a collateral trust, and it transfers the return on this collateral, together with the insurance premiums received from the sponsor to the investors as periodic coupons on the bonds. If a specified natural disaster occurs during the term of the bond, some or all the assets held as collateral are liquidated and that money (World Bank, Disaster Risk Insurance Platform, 2018)

23 World Bank, Disaster Risk Insurance Platform, (2018)

Box No. 6: Selected Cases of Disaster Risk Insurance in Developing Countries

The Caribbean Catastrophe Risk Insurance Facility (CCRIF), a Carib- bean-owned "parametric" insurance pool, offers fast payout to its 16 Caribbean member countries upon occurrence of pre-defined hurricane strengths and earthquake magnitudes. The CCRIF offers participating countries an efficient and transparent vehicle to access international reinsurance and capital markets and is a self-sustaining entity, relying on its own reserves and reinsurance for its financing. Building on the Caribbean experience, a similar effort is underway in the Pacific, and under development in Indian Ocean Islands and in Africa.

The Government of Ethiopia is integrating contingency planning and financing into the Productive Safety Net Program, its food security safety net. This enabled Ethiopia to scale up food assistance from 6.5 million to 9.6 million drought-affected people during the 2011 Horn of Africa drought.

The Government of Kenya is exploring large-scale agricultural insurance, implemented as a public-private partnership, to provide protection for vulnerable populations. This complements Kenya's Hunger Safety Net Program, a social protection program for the poorest.

Mexico's long-standing natural disaster fund FONDEN was established in the late 1990s as a mechanism to support the rapid rehabilitation of federal and state infrastructure affected by adverse natural events. FONDEN was supplemented by the FOPREDEN Program for prevention in the early 2000s, recognizing the need to promote stronger preventive disaster risk management.

Source: World Bank, Financing Resilience and Climate Change Adaptation for the poorest, 2014

Monetization of under-utilized real estate assets owned by the public sector.

Monetization is a financial concept associated with all required actions to convert an under-utilized asset (i.e., an asset that does not generate adequate cash flows for the owner), into a productive asset that generates cash flows for the owner. In the case of real estate assets, and other public sector assets, we will include in such definition the following activities: (i) outright sale of the asset, (ii) long-term lease, and/or concession of the asset, (iii) joint venture or partnership with private investors to develop the asset, and (iv) pledge of the asset to rise long-term financing.

Very frequently, countries face a tight fiscal situation where availability of fiscal space to promote public investment is severely constrained. What these countries have -- *from past periods of better economic performance* -- is a public sector asset base whose financial performance (i.e., cash flow generation) could be improved via some type of monetization arrangement. This concept is also known as asset recycling, as the proceeds from the monetization arrangements can be used to fund new infrastructure developments (i.e., rehabilitation or expansion of existing assets and development of new assets). The exercise "unlocks" capital value tied up on existing sub-utilized public sector assets. This same exercise is also very frequent at municipality level, where a particular city will have a very constrained annual budget based on its current revenues to face a major investment program. However, in most of the cases these municipalities do own lots of unutilized land and buildings (i.e., real estate assets), that could be recycle (i.e., monetize) to fund a capital investment program[24].

24 The Public Wealth of Nations: How Management of Public Sector Assets Can Boost or Bust Economic Growth, Dag Detter & Stefan Folster, 2015.

Several countries have been experiencing with public sector asset monetization and recycling programs such as Australia (i.e., South Wales and Victoria), Mexico (i.e., banking sector assets after the 2004 financial crisis), Sweden (i.e., creation of the public sector asset holding company, Statum leading to recycling of the government portfolio of public sector assets in the 1998-2002 reform period, and Venezuela (i.e., monetization of the Venezuelan Development Corporation, asset holding of medium size state owned enterprises in the 1998-2002 reform period), among others. Several cities in Europe and USA have large monetization and recycling programs for the sub-utilized real estate assets (i.e., Boston, Miami, Philadelphia, Washington, Barcelona, Bilbao, etc.).

Monetization of under-utilized public sector assets is not in any way related to the financing of needed investments in adaptation and resilience. However, monetization of under-utilized public sector assets, particularly in the real estate category, can achieve two simultaneous objectives in support of improving urban adaptation and resilience: (a) recycling the proceeds of the monetization of under-utilized real estate assets can provided needed funding for adaptation and resilience finance, and (b) sustainable development of under-utilized real estate assets can improve the adaptation and resilience of urban abandon areas[25]. This concept of monetizing underutilized public real estate assets and recycling the proceeds for adaptation finance is closely related to the land value capture concept[26].

Box No. 7: Jordan, Exploring Asset Recycling Potential

With limited fiscal space available for a public capital investment program, Jordan, a leader in the region in financial and economic reforms, needs to develop a new approach to support sustainable infrastructure development, a key component of a needed economic growth strategy. As part of these reforms to develop a new approach, Jordan needs to look at its asset base, and consider asset recycling via monetization techniques to generate new cash flows that could be injected into an infrastructure investment program.

A successful asset recycling program via the monetization of under-utilized assets (i.e., sale, long-term lease, joint development with investors, etc.), will need to be executed via the private sector (i.e., both local, and international) to optimize mobilization of capital (i.e., private sector, donors, DFIs), into needed infrastructure investments. Jordan has been in the forefront in the region when developing public private partnerships schemes. The country should leverage on these capacities.

Defining the landscape ("mapping") of asset recycling in Jordan should not be difficult. Jordan already has several public sector institutions managing a sizable portion of the Government's assets. The following five groups of assets represent the bulk of the potential asset recycling base in the country: (i) General Management Shareholding Company (GSMC), the holding company at the Ministry of Finance with the shares of the bulk of state-owned enterprises, (ii) social security investment fund, (iii) ASEZA and the Aqaba Development Corporation (holding company for investments in the Aqaba region), (iv) Greater Municipality of Amman, with a recent effort to organize its asset recycling function via an asset management company owned by the Municipality (i.e Amman Vision Investment and Development, AVID), and (v) under-utilized real estate assets owned by the Government, such as the commercial lands surrounding the Queen Alia International Airport, or the Wadi Araba Development Corporation (WADC).

Categorizing these assets according to their monetization potential, selecting a group of such assets to be recycled, and executing the transactions via the private sector through an expedient and professional institutional framework should generate in the medium term a stream of new cash flows for the sustainable infrastructure development required to recover economic growth.

Source: World Bank, Mobilizing Private Capital in Jordan, 2021

25 Under-utilized public real estate asset is an urban space that is not developed, does not provide any service to the community, and does not generate any cash flow for society (i.e., property taxes, lease payments, et.).

26 Land value capture is a policy approach that enables communities to recover and reinvest land value increases that result from public investment and government actions. Land value capture is rooted in the notion that public action should generate public benefit. As challenges mount from rapid urbanization, deteriorating infrastructure, climate change impacts and more, this funding source has never been more important to the future of urban areas (i.e., municipalities). When used in conjunction with good governance and adequate urban planning, land value capture is an integral tool for the fiscal planning and environmental impact in cities. OECD and Lincoln Institute of Land Policy, 2017

Recycling proceeds of asset monetization to support climate change investments (i.e., adaptation and resilience)

As previously mentioned, recycling proceeds from the monetization of under-utilized public real estate assets is another way in which some cities are finding new sources for adaptation finance. In addition, sustainable development of these under-utilized urban territories within a city improves its resilience to climate change impact and mitigates the "losses and damages" due to such events. For example, sustainable development (i.e., sanitation, water control, linear parks, dredging, etc.). of bodies of water (i.e., riverbeds, lakes, coastline, etc.) constitutes a "natural defense" against the impact of flooding due to rain, and hurricanes.

As described in Box No. 5 below, the orderly sustainable development of the riverbed of the Choluteca River in Tegucigalpa, capital of Honduras, via the Choluteca Environmental Corridor Project fulfills both objectives of adaptation finance: (a) monetization of under-utilized urban space (riverbed) via land value capture mechanisms (commercial, entertainment and retail real estate development), plus (b) natural protection to flooding events due to climate change impact (the Tegucigalpa urban footprint) is very sensitive to climate hazards.

Box 8: Urban Sustainable Development | Choluteca Environmental Corridor

The Urban Integral Project of Choluteca ("Eje Urbano- Ambiental Choluteca") highlights prioritized interventions included in Tegucigalpa's (Honduras) ESCI Action Plan. This project consists of an integrated multi-sector urban infrastructure project to develop a new centrality for the citizens of Tegucigalpa in what is currently a polluted urban river.

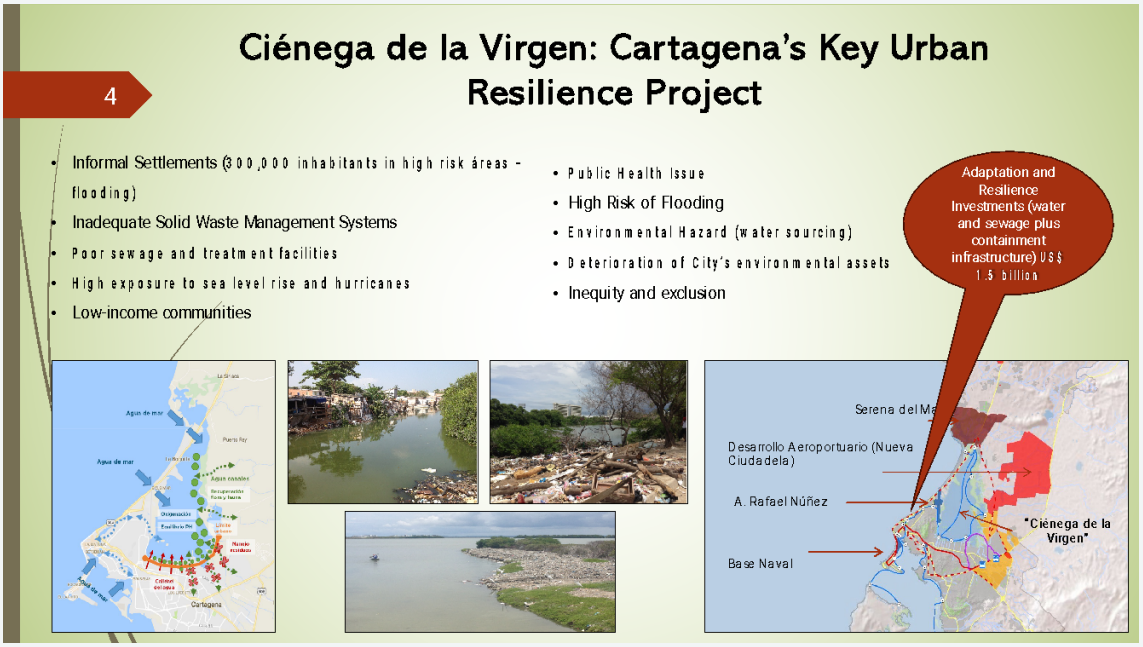
The Choluteca Urban – Environmental Corridor is a linear park designed to increase urban resilience and revitalize the heritage value of coastal areas that separate the historic centers of Tegucigalpa and Comayagüela (CHTC) after Hurricane Mitch destroyed the area's basic infrastructure in 1998. The project includes: (a) sanitation of River Choluteca (i.e., drainage, water treatment plans, etc.); (b) resilience infrastructure (i.e., flood designated areas, contention channels, etc.); (c) linear park with recreational areas to improve mobility (pedestrian and cycling); (d) citizen security systems (i.e., lighting, cameras, special area police, etc.); (e) two-lane rapid corridor for motorized mobility, (f) re-densification of the historic center and Comayaguela (affected by Hurricane Mitch in 1998).

Investment costs are estimated between US$150 million and US$ 200 million phased over a ten-year period (excluding real estate new developments). Financing for the project is expected to be structured from different sources, including public fiscal sources/1. It is estimated that new innovative fiscal schemes such as land-use value capture, and monetization of future property taxes will play an important role in financing. Preliminary estimates suggest that proposed interventions could yield US$121.3 million in increased land values, which would be recouped by imposing a levy on property owners and real estate developers.

Source: ESCI, IDB, Action Plan for the City of Tegucigalpa, Honduras, 2016

As described in section No. 2 of this sector note (i.e., case studies and experiences in LAC), several cities in the LAC region have develop their urban territories surrounding bodies of water achieving both the recycling of under-utilized real estate assets and funding for adaptation and resilience, concurrently with protecting such territories from the impact of climate events mitigating the amount of "losses and damages". Cases such as the development of 23 km of coastline in the River Parana in the City of Rosario, Argentina, or the linear park along the riverbed of river Medellin in Colombia, or the proposed adaptation and resilience project in the Cienega de la Virgen in Cartagena, Colombia (see figure No. 3) clearly illustrate the re-purposing of neglected public real estate to improve resilience and adaptation to climate change.

Figure No. 27: Adaptation Investment Costs, Cienega de la Virgen, Cartagena, Colombia



Source: ESCI, IDB, Cartagena Action Plan, Updated 2021

Private Sector Participation in Urban Adaptation and Resilience

"Public" Nature of investments in adaptation and resilience

As previously described in section No. 3 (" economics of the sector"), investments in adaptation and resilience are not financially bankable given the restrictions defined with respect to the pricing mechanism. Most of the investments in the adaptation and resilience arena are public sector based and concessional finance based (also public sector but from richer countries). The development of innovative and creative disaster risk insurance products is helping mobilize more private sector funding and catalyzing more public sector funding due to the monetization of the future costs of inaction (i.e., "losses and damages").

Private sector role

Still, despite the "public" nature of adaptation finance, private sector is increasingly playing a role supporting private capital mobilization and private sector management via different mechanisms:

- **Private sector management and operations :** Private sector has a technical advantage executing public funds to develop sustainable infrastructure to improve resilience and adaptation to climate change events. Under public contracting and relying on public funds (fiscal budget) and concessional finance, the private sector can contribute with new technologies and efficiency in planning and construction in the development of resilient urban infrastructure in cities.

- **Private Financial Markets :** Development of creative and more financially efficient disaster risk insurance products will contribute to mobilize additional funding from local and global institutional investors (via the monetization of the future costs of inaction). Also, in recent years these types of new disaster risk insurance products are also tapping into a new segment of the market, with non-financial incentives in climate change impacts (i.e., impact investors).

- **Real Estate Developers :** The monetization of under-utilized real estate assets and its recycling of proceeds to fund adaptation and resilience is more effective when the sustainable development of the neglected urban territory is executed via an experienced private real estate developer as illustrated in the cases and examples in the Latin American Region (section No. 2). The private sector has a clear role as a partner of the public sector (owner of the underutilized real estate assets.

References

- Alemany Llovera, J. (2010). La reconversión portuaria en América Latina. Experiencias, problemas y perspectivas. Portus, 19, 54-59. Recuperado de: http://retedigital.com/wp-content/themes/rete/pdfs/portus/Portus_19/La_reconversi%C3%B3n_portuaria_en_Am%C3%A9rica_Latina.pdf
- Alemany Llovera, J. (2015). Incidencia del puerto en la ciudad. La experiencia latinoamericana de renovación de los waterfronts. Transporte y Territorio, 12, 70-86. Recuperado de: http://revistascientificas.filo.uba.ar/index.php/rtt/article/view/1222/1184
- Academic Star. (2020). Urban Project Issues: Dealing with Porto Maravilha Project in Rio de Janeiro http://www.academicstar.us/UploadFile/Picture/2020-11/2020114224219369.pdf
- Bilbao, H. (2013). Estamos entre el modelo country y el modelo Puerto Madero. Revista Ñ. Recuperado de: https://www.clarin.com/literatura/maristella-svampa-el-muro-entrevista_0_By8GvGiwXe.html
- Climate NASA. (s.f.). Adaptation and Mitigation. Recuperado de: https://climate.nasa.gov/solutions/adaptation-mitigation/
- EPACartagena Ambiente Urbano. (2014). Recuperación Ambiental de la Ciénaga de la Virgen: Reto Cumplido. Recuperado de: https://epacartagenaambienteurbano.wordpress.com/2014/02/08/recuperacion-ambiental-de-la-cienaga-de-la-virgen-reto-cumplido/
- Findeter. (s.f.). Planear el Territorio: Montería, Ciudad Sorpresa. Recuperado de: https://www.findeter.gov.co/blog/planear-el-territorio/monteria-ciudad-sorpresa
- Global Asset Management “The Future of Emerging Markets: Climate Change” at https://www.rbcgam.com/en/ca/article/the-future-of-emerging-markets-climate-change/detail
- Humboldt Institute. (s.f.). BiodiverCities by 2030: Rivers of Change. Recuperado de: https://proyectos.humboldt.org.co/biodivercitiesby2030/pdf/exp-rivers-of-change.pdf
- Institut Gouvernance. (s.f.). Fiche Expérience 33. Recuperado de: http://www2.institut-gouvernance.org/es/experienca/fiche-experienca-33.html
- Inter-American Development Bank. “Plan de Acción Tegucigalpa.” [Online] Available: https://webimages.iadb.org/PDF/Plan+de+Accion+-+Tegucigalpa.pdf
- Inter-American Development Bank. “Plan de Acción Cartagena”
- Inter-American Development Bank. “Plan de Acción Monteria”
- Inter-American Development Bank. “Emerging and Sustainable Cities Program Methodoogy”
- Infobae. (2019). La transformación de Puerto Madero: de una costa desolada y tierra de nadie a uno de los barrios más exclusivos de Buenos Aires. Recuperado de: https://www.infobae.com/sociedad/2019/11/15/la-transformacion-de-puerto-madero-de-una-costa-desolada-y-tierra-de-nadie-a-uno-de-los-barrios-mas-exclusivos-de-buenos-aires/
- Landscape. (s.f.). Parques del Río Medellín. https://landscape.coac.net/parques-del-rio-medellin
- Lincoln Institute of Land Policy. (2013). Puerto Madero: From the Ashes of Crisis to a Model of Urban Transformation. Recuperado de: https://www.lincolninst.edu/sites/default/files/pubfiles/2289_1629_puerto_madero_0713llsp.pdf
- MDE Urban Lab. (2021). Cuaderno de Ciudad No. 3: Parques del Río. Recuperado de: https://mdeurbanlab.com/wp-content/uploads/2021/06/Cuaderno-de-Ciudad-No-3.Parques-del-Rio_compressed.pdf
- Martínez, B., Ramo-Díaz, R., Honorato, L., & Bentes, M. (2022). Los centros de abasto popular en la ciudad neoliberal: Las transformaciones de los mercados tradicionales, periodo 2013-2021. Anales de Investigación en Arquitectura, 12. Recuperado de: https://www.researchgate.net/publication/361658175_Los_centros_de_abasto_popular_en_la_ciudad_neoliberal_Las_transformaciones_de_los_mercados_tradicionales_periodo_2013-2021
- OECD Environmental Outlook to 2050: The Consequences of Inaction - Key Facts and Figures
- https://www.oecd.org/env/indicators-modelling-outlooks/oecdenvironmentaloutlookto2050theconsequencesofinaction-keyfactsandfigures.htm
- Pinheiro Machado, D. B. (s.f.). Urban Project Issues: Dealing with Porto Maravilha Project in Rio de Janeiro. Recuperado de: http://www.academicstar.us/UploadFile/Picture/2020-11/2020114224219369.pdf

- Rio On Watch. (s.f.). Porto Maravilha: Three Perspectives on a Transformative Project. Recuperado de: https://rioonwatch.org/?p=56700
- The Global Platform for Sustainable Cities. (s.f.). Porto Maravilha. Recuperado de: https://www.thegpsc.org/sites/gpsc/files/2._porto_maravilha.pdf
- UNCTAD 2020 – "Adaptation of Maritime Ports to Climate Change in Support of the 2030 Agenda for Sustainable Development." [Online] Available at: https://unctad.org/system/files/official-document/cimem7d23_es.pdf
- Urban Age. (s.f.). Port Redevelopments: Rio de Janeiro - Porto Maravilha. Recuperado de: https://urbanage.lsecities.net/data/port-redevelopments-rio-de-janeiro-porto-maravilha
- Urban Coalitions. (s.f.). City Profile: Buenos Aires. Recuperado de: https://urbancoalitions.org/sites/default/files/publications/files/Digi_230226_TUC_City_Profile_BuenoesAires_ES.pdf
- World Monuments Fund. (2014). Fundidora Park Project. Recuperado de: https://www.wmf.org/project/fundidora-park

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