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# **Transformative Infrastructure and Economic Resiliency Puzzle:**

**Indicative lessons from the GCF project pipeline and  
a city in the LAC region**

Rabat, Morocco  
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# Introduction (1)

The rationale for (climate change transformative) urban investment is based on the **UNFCCC Technical Paper 13 (2014)** ...referring to integrated, cross-sectoral mitigation activities in urban areas, that illustrates **the transformational impact:**

“... through strong mitigation actions aimed at low-carbon, climate-resilient development at the local level across the key sectors such as buildings, transport and waste, cities in aggregate could reduce their GHG emissions in these core sectors by an estimated 24 per cent by 2030 and by 47 per cent by 2050 (Erickson et al., 2014)”.

**Urban Climate Change Resilience:** capacity of cities to function, so that the people living and working in cities—particularly the poor and vulnerable—survive and thrive in the face of shocks and stresses related to climate change (ADB: Urban Climate Change Resilience – A Synopsis, 2014).

# Introduction (2) - Medellin Collaboration on Urban Resilience (MCUR)

Ten institutions announced a global collaboration at the World Urban Forum in Medellin, Colombia, in April 2014 expressing their collective commitment to help cities improve resilience.

The collaboration aims to facilitate the flow of knowledge and financial resources necessary to help cities become

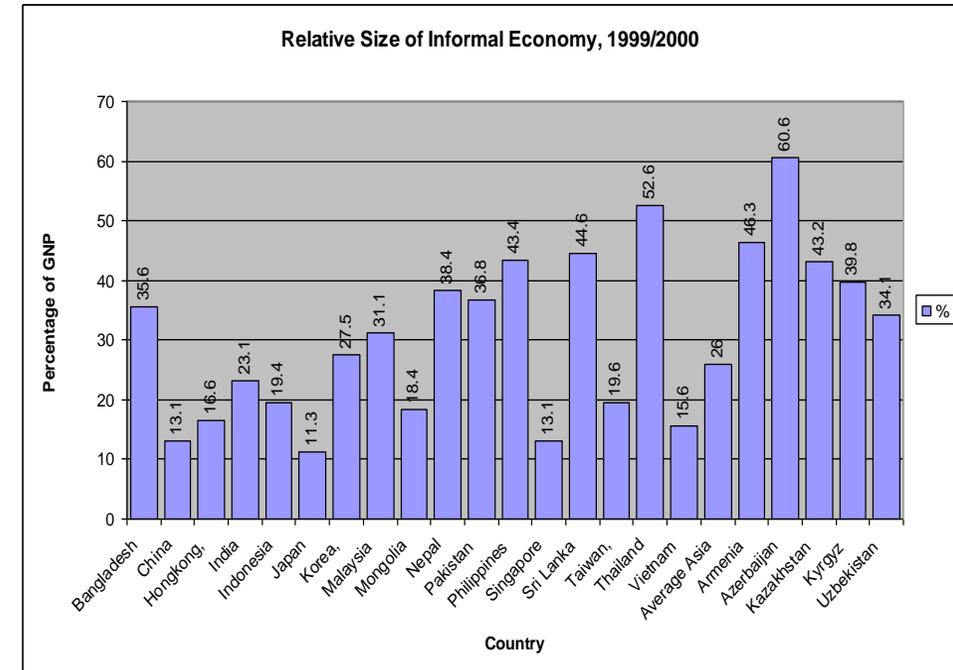
- more resilient to disruptions related to climate change,
- disasters caused by natural hazards,
- and other systemic shocks and stresses, including the socio-economic challenges associated with rapid urbanization.

- Primary objectives include:
  - **Fostering harmonization** of the approaches and tools available to help cities assess their strengths, vulnerabilities, and exposure to a multitude of natural and manmade threats in order to build their resilience;
  - **Catalyzing access to existing and innovative finance mechanisms**, including risk-based instruments, to reduce exposure and vulnerability to shocks and increase cities' adaptive capacity; and
  - **Supporting capacity development** of cities to achieve their goals by facilitating direct sharing of best practice and knowledge enhancement.



# Megacities, urbanization and sprawl

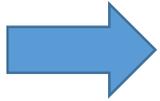
City	Country	National Population - mill 2012	National GDP - \$b 2012	City Population - mill 2012	Economic Product - \$b 2012	Percentage National GDP
<b>Shanghai</b>	China	1360.8	8358.4	18.6	516.5	6.18%
<b>Mumbai</b>	India	1239.8	1841.7	21.9	227.0	12.33%
<b>Jakarta</b>	Indonesia	249.9	878.0	19.2	224.7	25.59%
<b>Manila</b>	Philippines	99.1	250.3	20.7	153.7	61.41%
<b>Bangkok</b>	Thailand	65.9	365.6	10.1	262.4	71.77%
<b>Tokyo</b>	Japan	127.2	5959.7	37.7	1520.0	25.50%
<b>Sydney</b>	Australia	23.4	1520.6	4.0	203.0	13.35%
	Denmark	5.6	314.2			
	Bangladesh	152.5	115.6			



If not properly managed, urbanization can reduce resilience; increase pressure on energy and natural resources; increase pollution and production of greenhouse gas (GHG) emissions, which contribute to climate destabilization; and threaten ecosystems.

Recent 'Investing in Climate, Investing in Growth' report shows that bringing together the growth and climate agendas, rather than treating climate as a separate issue, could add 1% to average economic output in G20 countries by 2021 and lift 2050 output by up to 2.8%.

# Climate Change and Economic Growth: Evidence from the Last Half Century



The paper uses annual variation in temperature and precipitation over the past 50 years to examine the impact of climatic changes on economic activity throughout the world. Summary of findings:

[Melissa Dell](#), [Benjamin F. Jones](#), [Benjamin A. Olken](#)  
NBER Working Paper No. 14132  
Issued in June 2008

- Analysis of decade or longer climate shifts indicate that higher temperatures **substantially reduce economic level of output and economic growth rates** in poor countries but have **little effect** in rich countries.
- Higher temperatures have **wide-ranging effects** in poor nations, reducing agricultural output, industrial output, and aggregate investment, and increasing political instability.
- ECONOMIC VULNERABILITY RISKS ARE IMMENSE DUE TO CLIMATE CHANGE, ESPECIALLY FOR LDCs

# Structural transformation argues that *sustained economic growth* is closely related to structural change

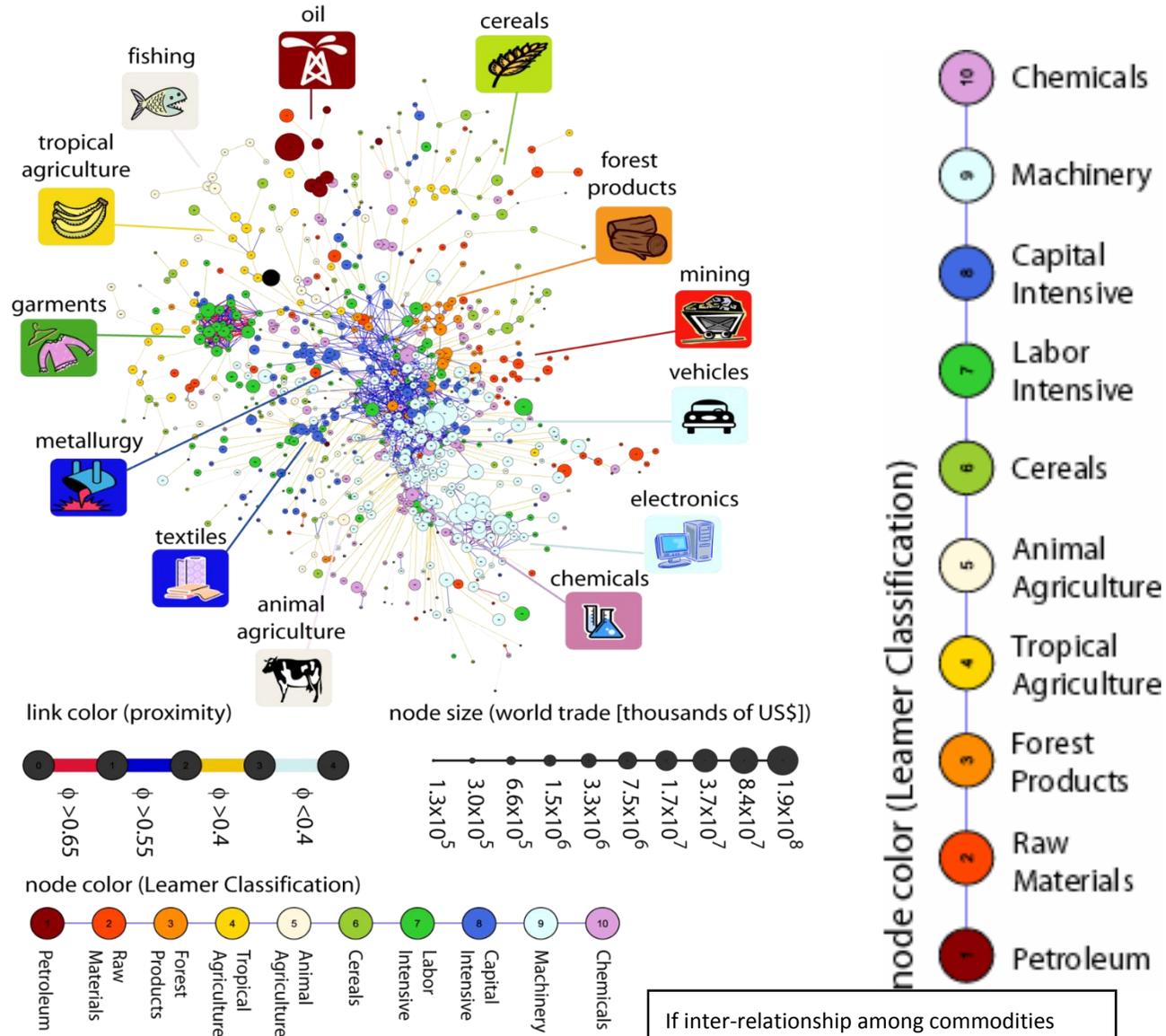
- **Economic growth** is not just more of the same:
  - “A growth miracle sustained for a period of decades clearly must thus involve the continual introduction of new goods, not merely continued learning on a fixed set of goods” (Robert Lucas, 1993)
- **Structural change** is about the transformation of the economy by **transferring resources to higher productivity** activities:
  - Diversifying production
  - Upgrading exports & production
  - Increasing labor productivity
- A country’s capabilities for structural change can be revealed by its position in **the product space**.

# Structural change of today and tomorrow needs to be driven by green, low carbon AND resilient interventions

- Developing countries, in particular, are keen to learn what are the policy interventions that will lead to faster structural changes, i.e. significant changes in **the output and employment structure**, focusing primarily on cities as engines of growth.
- However these structural changes and ‘catching up / leveling-off’ competition cannot happen any more in a ‘business as usual’ fashion, given how fast the global carbon budget is being depleted.
- **Structural change needs to be decisively and irrevocably resilient & low carbon to be transformational.**

This is where the space for GCF intervention in the urban sector is being defined: seeking and intervening to develop “capabilities” and “resilience” to undertake the required changes that will lead to the transformation of the decarbonized and sustainable (hence resilient) economy

# The Product Space



The product space is an application of the network theory that yields graphical representation of all products exported in the world. It shows the 'proximity' of all products to each other

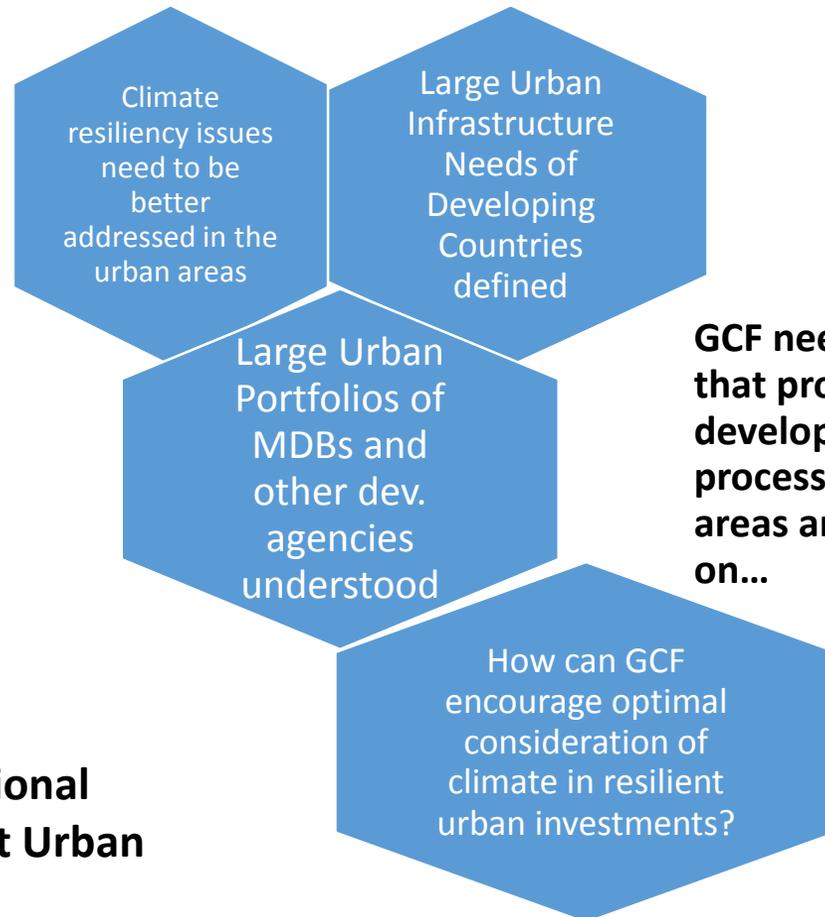
A country's position within the product space signals its **capacity to expand** to more sophisticated products, laying the groundwork for future growth. **Have climate change effects have been considered?**

A country that exports products that are mostly in the periphery will find it difficult to jump from one product to another since the redeployment of production to nearby products is more challenging as no other set of products requires similar capabilities.

Due to the difficulty of moving from peripheral to core products, policies that lead to accumulation of **capabilities** to enable this move are needed and should be encouraged. However, policies also need to take into consideration **resilience** sensitivities related to climate change.

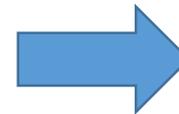
If inter-relationship among commodities exported will be plotted based on the conditional probability that they will be co-exported by the same country, then we can come up with this product space map.

# How can GCF support to Mainstreaming Transformational Resilient Investments in Urban Areas?



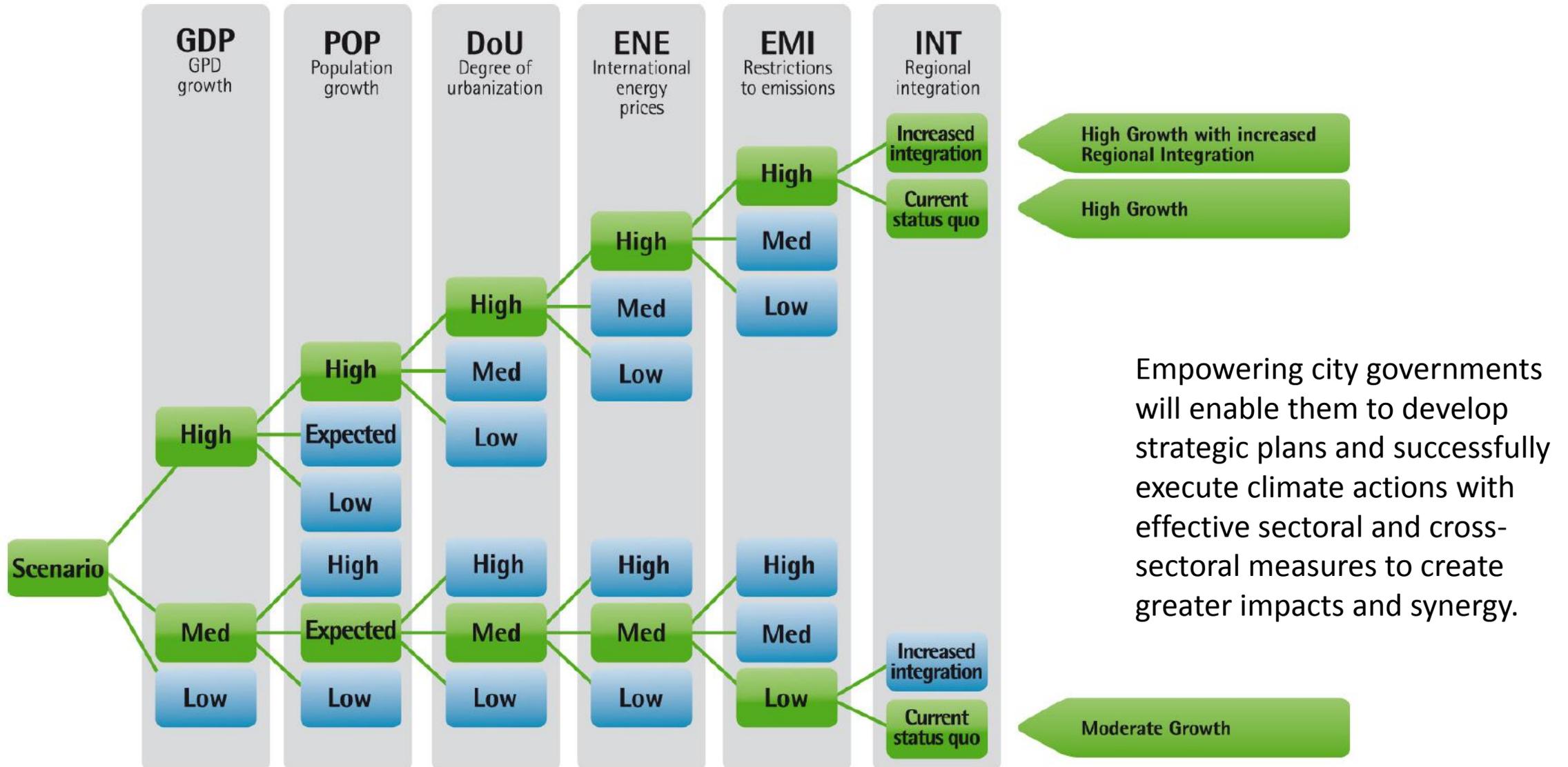
## Transformational And Resilient Urban Puzzle

**GCF needs to ensure that project development processes in urban areas are focused on...**



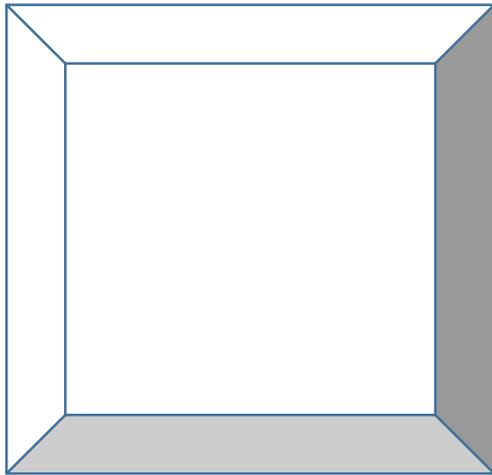
- early consultations around the intervention design process;
- properly addressing climate resilience considerations, including significant social development issues and safeguards;
- achieving synergies across sectors, requiring broad levels of capacity and more resource intensive project preparation process
  - making use of the full spectrum of GCF and other climate project preparation and finance facilities;
- Implementation complexity can be matched by complexity in funding: value capture, social/housing finance, micro-credit (eg for recycling), and sector-focused funds;
- Adaptation investments always involve additional stakeholders – issues to be addressed in the project preparation and structuring process.

# Scenarios of Climate Sensitive Urban Growth



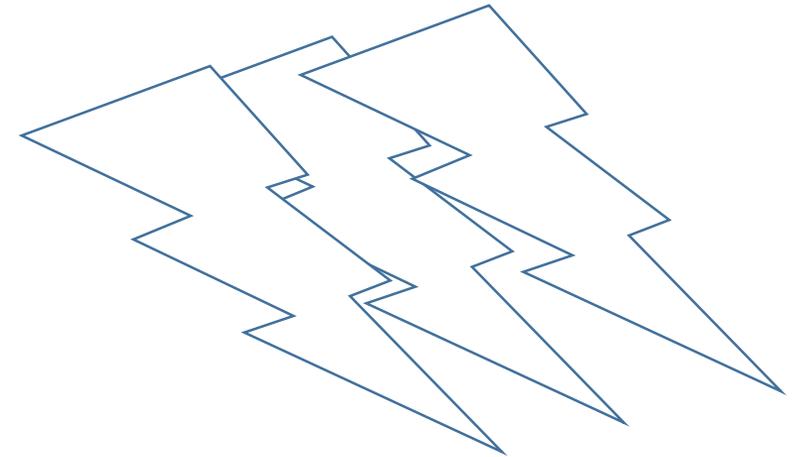
# What should resilience-conscious cities do?

## Managing climate services and mapping vulnerabilities:



Downscaled climatic information and projections

How significant Co-relation?



Mapping vulnerabilities on the ground

**DEVELOPMENT OR ADAPTATION / RESILIENCE PROJECT?**

**THE CORRECT USE OF CLIMATE FINANCE ARCHITECTURE IS A MUST!**

The relatively new IPCC approach defines Representative Concentration Pathways (RCPs), which provide concentrations of atmospheric greenhouse gas (GHG) and the trajectory that is taken over time to reach those concentrations.

- Downscaling is the general name for a procedure to take information known at large scales to make predictions at local scales. The two main approaches to downscaling climate information are dynamical and statistical.
- Dynamical downscaling requires running high-resolution climate models on a regional sub-domain, using observational data or lower-resolution climate model output as a boundary condition

## What should cities do (2)? Downscaling climate information:

- Statistical downscaling is a two-step process consisting of i) the development of statistical relationships between local climate variables (e.g., surface air temperature and precipitation) and large-scale predictors (e.g., pressure fields), and ii) the application of such relationships to the output of global climate model experiments to simulate local climate characteristics in the future.

# What should resilience-conscious cities do (3)?

## Managing / adopting climate services and information:

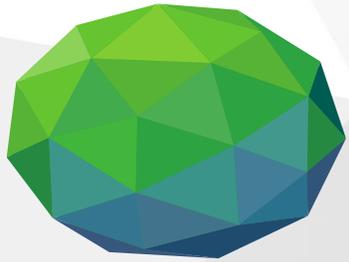
- Nations and cities worldwide face rising variability and uncertainty in future climate;
- A core adaptation strategy would be to equip national, regional and city governments and leaders with climate predictions, forecasts,
  - and the capacity to empower them to confront rising variability
  - and anticipate shorter-term climate shocks, at the intra-seasonal to inter-annual timescales,
  - in support of **a culture of forward planning and prevention** ahead of forecast extreme events.
- Forecast skill at shorter timescales is higher than over longer time climate change projections,
  - and therein lies the potential of using climate services to prevent catastrophes, in a context where climate change is already predicted to exacerbate current levels.
- Mapping vulnerabilities
  - various stages of vulnerability mapping include identification of local hazards, assessment of local vulnerabilities, and production of maps showing risk zones as well as threatened sites within those zones.
  - Vulnerability mapping can improve a municipality's ability to promote disaster reduction thereby protecting inhabitants and their livelihoods, the natural environmental, the municipal infrastructure and property.

# City in the LAC region – A Case Study

- The proposed program focuses on building a resilient and adaptive community around the historical downtown district, which hosts a combination of highly vulnerable population, historical and cultural landmarks and potential real estate developments.
- Currently this district suffers from a lack of infrastructure, poor sanitary and environmental services and a fading sense of community in one of the most historically important areas of the city.
- The program will center on adapting and strengthening the resiliency of district and its adjacent floodplain, of great cultural and environmental value.
- This will be achieved through the promotion of **sustainable housing practices; transport oriented development, educational and training programs, flood protection infrastructure, construction of new public parks and environmental ecosystems restoration.**
- The intervention will be divided into 4 main components
  - 1) Rehabilitation of streams, restoration and creation of public parks, construction of flood protection structures, and the urbanization of informal housing developments along the floodplains.
    - This component will strengthen resilience of 1,200 hectares alongside flood prone area and provide adequate housing and urban infrastructure, developing public parks and restoring the natural floodplain that is currently inhabited by irregular settlers.
  - 2) Rehabilitation and conservation of the biodiversity and ecological structure of the area through soil movement, landscaping and relocation of irregular residents living in the ecological reserve. Around 700 hectares of a natural ecosystem will be restored.
  - 3) Strengthening resilience of the adjacent port infrastructure to sustain high flood events, construction of new floodable parks in the old port grounds, and reduction of energy intensity through implementation of LEED certification standards.
  - 4) Promoting densification of the historical downtown district by refitting it with ecological and dynamic corridors, new street designs, rehabilitation of public parks, urban infrastructure to promote multi-modal transport (i.e. secure bus stops and transfer stations), and the rehabilitation of green areas throughout the downtown district.

# LAC City Case (2)

- **The anticipated outcomes are indicated as follows:**
- Increased resilience of the city and its adjacent floodplains to extreme climatic events.
- Improved quality of life (health and social inclusion) of more than 1,000 families living in flood prone areas through the construction of proper urban infrastructure, access to water and sanitation services, inclusion of alternative sources of energy, and promotion of sustainable and resilient income sources in a changing urbanized area – through community programs.
- Reduction of costs associated with flood events due to relocation of affected population. Approximately, every 5 years there is a flood event that costs affected families (which are the most economically vulnerable ones) a total of USD 1.2 million, without considering governmental expenses.
- Diversification of the energy matrix through installation of solar cells and solar heaters in mix-use buildings in the adjacent port and promotion of energy efficient architectural design (green buildings).
- Strengthened sense of community by embracing the cultural and historical value of the historical downtown district while improving public areas, constructing riverside parks, a network of connected bike lanes and walkways, and developing organized street commerce.
- Restoration of more than 700 hectares of protected ecological areas and water bodies, which compromise a natural ecological reserve that hosts a vast number of migratory birds that use it as a nesting ground.
- A significant boost in the medium-term city goal of reverting the horizontal expansion model of urban development by providing adequate conditions to repopulate downtown. These conditions will include organizing streets and sidewalks, relocating street vendors into formal booths and spaces, installing appropriate lighting, and empowering the general public to use and visit the downtown district by promoting cultural activities.
- Flood return periods calculated in 2004 indicate that on average every 5 years flood events surpass the 60 meters above mean sea level (mamsl) line. Most of the affected area is below the 60 mamsl.
- Potential energy savings and associated costs are still being estimated, but are likely to be significant.



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