The City Resilience Program
Using Global Data to Integrate Climate and Disaster Resilience in Urban Planning

7 September 2022
Session IV: Downscaling data at local level for Disaster Risk Reduction and Resilience Strategies
Second Expert Forum for Producers and Users of Disaster-related Statistics
Cities need to increase their investment in infrastructure but face budget and implementation constraints.

At the same time, urban infrastructure is becoming increasingly stressed by natural disasters, climate change and other threats.

The resulting lack of adequate infrastructure and land use planning exacerbate the risks to which urban dwellers are exposed.

Global average annual losses from weather-related and other disasters in cities estimated at $314 billion (2015) and expected to increase to $415 billion by 2030.

$15 trillion Infrastructure Gap by 2040.
THE CRP OFFER

A multi-donor initiative promoting urban resilience focused on three main areas of support.

Achieving goals through providing technical support, via World Bank Group teams, to cities across WBG beneficiary countries.

PLANNING for Resilience

- providing cities with increased access to tools and technical support to effectively plan for resilience

FINANCE for Resilience

- supporting cities increased access to private capital through technical assistance, guarantee instruments and viability gap financing

PARTNERSHIPS for Resilience

- helping cities leverage global partnerships to support their resilience objectives, including supporting co-financing opportunities
CRP Engagements
City Scan Introduction

CITY SCAN

Da Nang, Vietnam

June 2022
City Resilience Program
**What is the City Scan?**

- A **rapid assessment** of a city’s critical resilience challenges
- A package of maps, **geospatial analyses**, data visualizations, and narrative interpretation
- An examination of the interaction between the urban **built and natural environments**
- City Scans have been created for **110 cities** across all 6 World Bank Regions

<table>
<thead>
<tr>
<th>City Scan Structure</th>
<th>1 Setting the Context</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 Population &amp; Demographic Trends</td>
</tr>
<tr>
<td></td>
<td>3 City Competitiveness &amp; Economic Activity</td>
</tr>
<tr>
<td></td>
<td>4 Built Form</td>
</tr>
<tr>
<td></td>
<td>5 Climate Conditions</td>
</tr>
<tr>
<td></td>
<td>6 Risk Identification</td>
</tr>
<tr>
<td></td>
<td>7 Local Institutions &amp; Planning</td>
</tr>
<tr>
<td></td>
<td>8 Key Considerations for Investment Planning and Prioritization</td>
</tr>
</tbody>
</table>

**City Scan Data Sources**

- ARUP
- FACEBOOK
- OSHA
- MINES
- GEM
- GFDRR
- SOLARGIS
- Deltres
- DLR
- USGS
- NASA
- John Hopkins University
- Yale University
City Scan

What does the City Scan do?

- supports teams to build dialogue around a city’s key resilience issues
- enables spatial thinking across sectors to help officials develop risk-informed investment ideas
- drives consensus between stakeholders on the nature and location of potential projects
- facilitates deeper insights into climate and disaster risks in resilience planning workshops

Urban Economic and Demographic Statistics

<table>
<thead>
<tr>
<th>City</th>
<th>City share of national employment</th>
<th>City share of national GDP</th>
<th>City share of national population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangkok</td>
<td>20%</td>
<td>0%</td>
<td>40%</td>
</tr>
<tr>
<td>Manila</td>
<td>40%</td>
<td>20%</td>
<td>60%</td>
</tr>
<tr>
<td>Kuala Lumpur</td>
<td>60%</td>
<td>40%</td>
<td>80%</td>
</tr>
<tr>
<td>Jakarta</td>
<td>80%</td>
<td>60%</td>
<td>100%</td>
</tr>
<tr>
<td>Seoul</td>
<td>100%</td>
<td>80%</td>
<td>120%</td>
</tr>
<tr>
<td>Ho Chi Minh City</td>
<td>120%</td>
<td>100%</td>
<td>160%</td>
</tr>
<tr>
<td>Phnom Penh</td>
<td>160%</td>
<td>140%</td>
<td>200%</td>
</tr>
<tr>
<td>Yangon</td>
<td>200%</td>
<td>180%</td>
<td>260%</td>
</tr>
<tr>
<td>Shanghai</td>
<td>260%</td>
<td>240%</td>
<td>320%</td>
</tr>
<tr>
<td>George Town</td>
<td>320%</td>
<td>300%</td>
<td>400%</td>
</tr>
<tr>
<td>Semarang</td>
<td>400%</td>
<td>380%</td>
<td>500%</td>
</tr>
</tbody>
</table>

Benchmark comparison of major cities in East Asia according to their share of their respective countries’ employment, gross domestic product, and population.

Source: Global Cities Database, Oxford Economics

Urban Economic Spatial Analytics

Analysis of the intensity of the monthly change in nighttime light radiance, a proxy for economic activity, from 2013-2019 in Lima, Peru. Red areas represent the greatest increases in nighttime light emissions intensity.

Source: NASA Earthdata, Visible Infrared Imaging Radiometer Suite (VIIRS)
What is the City Scan’s added value?

- delivered fast: 2–3 weeks from start to finish
- low cost
- continually upgraded and augmented with new analytics and the best available global datasets
- a standardized, off-the-shelf product that can still be customized to team needs
- lays the groundwork for better prioritization and coordination of investments

Emphasis on Exposure to Hazards

Overlay of 1-in-1000-year fluvial flood hazard on built-up area temporal change in Almaty, Kazakhstan. While 104 sq. km of the built-up area was exposed to this flood hazard in 1985, by 2015 it grew to 158 sq. km.
Sources: World Settlement Footprint Evolution, DLR; Fathom–Global

Spotlight on Localized Climate-Related Stressors

Analysis of surface temperature over composited 2018 wintertime months in Dammam, Saudi Arabia. The graph illustrates how surface temperature changes with variation in land cover along a line drawn through the city.
Source: USGS Landsat Surface Temperature, Landsat 8
What are the City Scan’s limitations?

- Rapid delivery and low cost criteria entail using global data, which may not be the most detailed for a specific context.

- Serves as a high-level conversation-starter, rather than a direct investment decision-making tool.
5 BUILT FORM

5.1 URBAN EXTENT AND CHANGE

Since at least 1985, Da Nang’s built-up area has grown steadily over time. The oldest parts of the city, predating 1985, are the also the densest, in Thanh Khê, Hải Châu, and Sơn Trà, as well as the coastal portion of Ngũ Hành Sơn to the south. In the late 1980s and early 1990s, Da Nang grew northward along the bay, and then, later, westward and inland. The city’s built-up area grew at an average annual rate of 4.2%, or roughly 3 km², between 1985 and 2015.
While Da Nang's land is still 73% tree cover, deforestation is significant in the city, especially in the inland south, where urbanization is spreading.

Loss of forest areas and wetlands in urban catchments contributes to a reduction in green land cover. As soils are then more likely to be saturated with water, more precipitation runs off, increasing the risk of flash flooding. Halting the loss and degradation of natural systems and promoting their restoration can therefore be critical.
7 RISK IDENTIFICATION
7.12 COASTAL EROSION

Da Nang’s coast line has stayed relatively consistent from 1984 to 2016, as show on the map. The most extreme erosion has occurred in northern Liên Chiểu, on the western end of Da Nang Bay. In the southeastern portion of the bay, on the shores of Hải Châu, Thanh Khê, and Sơn Trà, land has accreted (whether naturally or through reclamation).

Coastal erosion refers to the loss or displacement of land along coastlines, owing to the action of waves, currents, tides, wind, or other forces, including human intervention. Abrupt changes in weather, sea level, salinity, or tides can result in the loss of vegetation that protects against erosive action. Erosion can be slowed by hard and soft infrastructure interventions, though in severe cases, it may require retreat.
7 RISK IDENTIFICATION

7.20 ROAD NETWORK CRITICALITY

This layer visualizes an approximation of road network criticality. It highlights segments within a road network that, if blocked due to flooding or other hazards, would cause a high degree of disruption to travel across the city. Segments in red are the most critical for the overall connectivity of the city. In Da Nang, the most critical road segments are found along Bà Nà - Suối Mơ, which connects the urban core to the rural western district, and a brief stretch of Trường Chinh, which runs along the airport.

Note that cities vary substantially in their probability of disruption due to failure of a small number of road segments; for example, when a street network follows a grid pattern or has many alternative routes between destinations, the risk of disruption owing to the failure of key road segments is lower. In contrast, other cities have particular road segments whose failure would affect a large proportion of journeys across the city.
Country-Level Urban Climate Risk Analysis

Sea Level Rise
10% Annual Chance Flood Given Projected Sea Level Rise

The compound disasters of coastal flooding and sea level rise could yield catastrophic impacts for coastal cities in China. In Shanghai, especially, a 10% annual chance flood in 2100 could reach all corners of the city, creating massive disruptions and damages. In Tianjin, as well, any area from the downtown to the Tianjin Port would be covered in floodwater should such a flood event happen, and a 10% annual probability means that it will not be a rare occurrence. Even in Guangzhou, where the flood may not necessarily affect all parts of the city, it could still lead to disastrous consequences for many lives and livelihoods.

Cities will likely already witness the full scale of impact by 2050, rather than 2100. Although the maps shown here are of 2100, the 2050 flood maps already look very similar. The graph of settlements exposed to 10% annual chance flood given sea level rise shows that by 2050, Shanghai is already expected to have over 3,500 sq km of exposed settlements, which is almost the entire settlement area in the city. The story is nearly identical in other coastal cities, as well as in cities along the Yangtze River (i.e., Nanjing and Wuhan) that would nevertheless bear the consequences of sea level rise. The dire projections and the compressed timeline require that cities take immediate, bold actions on both mitigation and adaptation to prepare for potential large-scale flooding by the middle of the century.
Country-Level Urban Climate Risk Analysis
Interactive Planning Exercises

Map Your City's Future: a spatial data for resilience workshop - Greater Banjul
Interactive Planning Exercises