CDRI
Coalition for Disaster Resilient Infrastructure

Climate and Disaster Resilience of Urban Infrastructure

24 September 2022

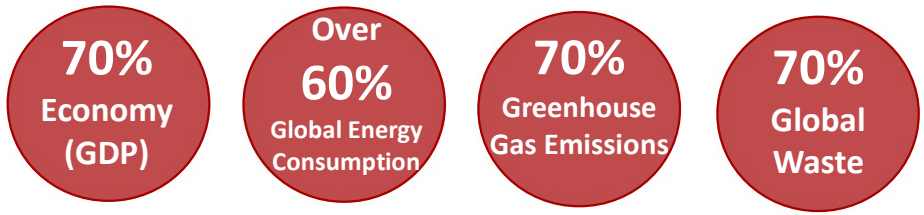

Smart Cities
Urbanization
Ease of Living
Governance
USD 1 Trillion
Disaster
Centrality of UP
Adaptive
Infrastructure
Equity
Legislation
Climate Change
Urban Planners
Capacity building

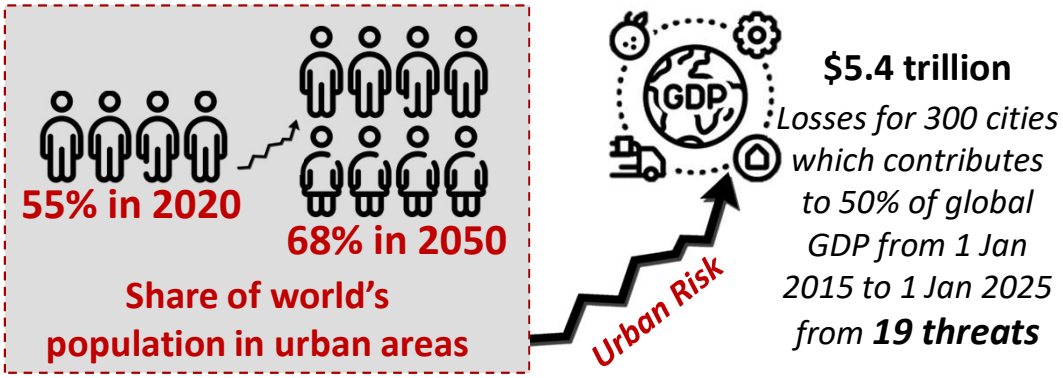
Contents

Background

THE GLOBAL CONTEXT

Cities today occupy approximately only 2% of the total land, however:



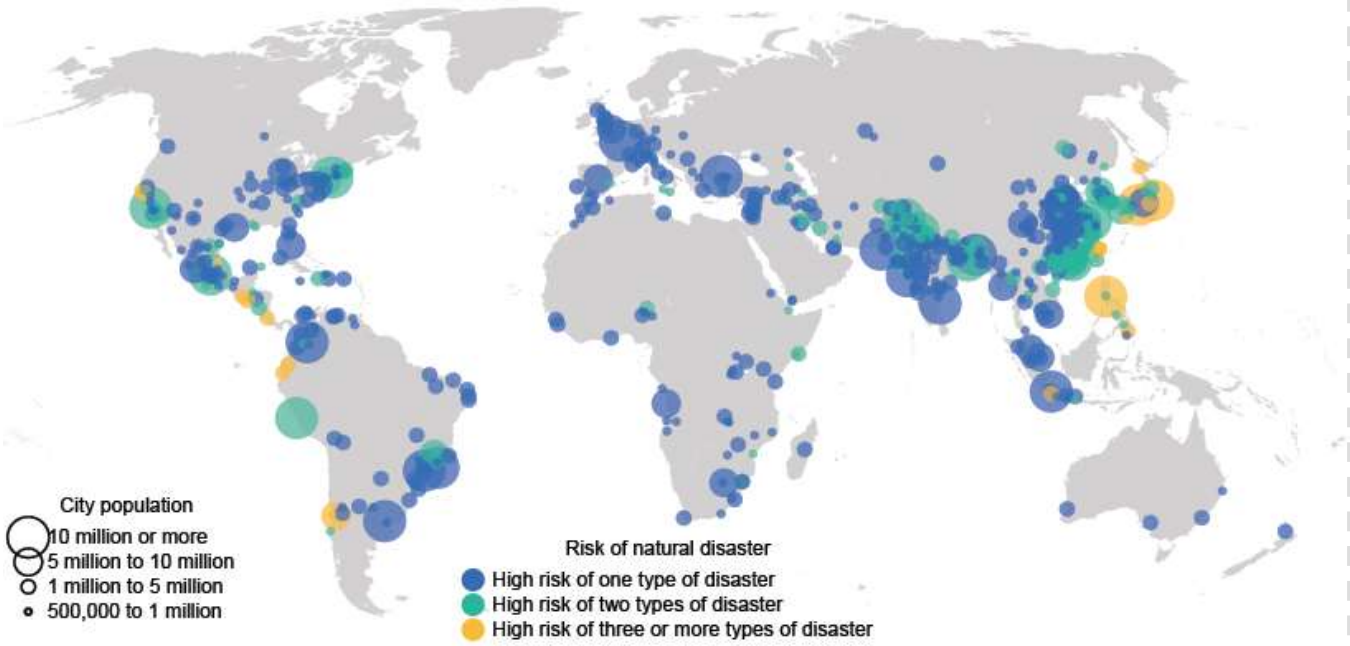


$5.4 trillion

*Losses for 300 cities which contributes to 50% of global GDP from 1 Jan 2015 to 1 Jan 2025 from **19 threats***

Background

Cities' risk of exposure to natural disasters



Of the 1,146 cities with at least 500,000 inhabitants in 2018, 679 (**59 per cent**) were at high risk of exposure to at least one of six types of natural disaster, namely **cyclones, floods, droughts, earthquakes, landslides and volcanic eruptions**

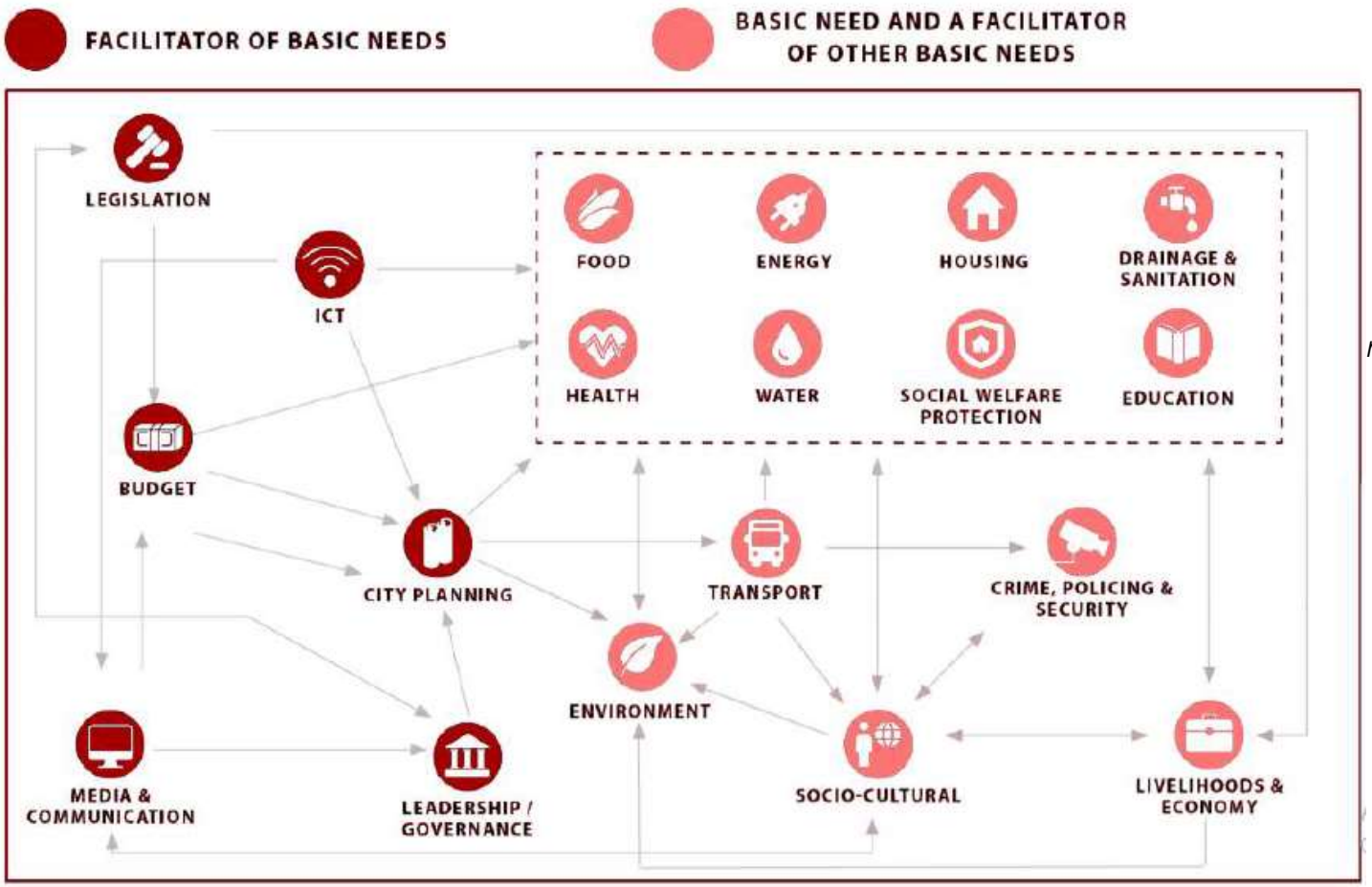
International goals and agendas

SDG 9 — **Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation**

SDG 11 — **Make cities and human settlement inclusive, safe, resilient and sustainable**

"strengthening the **resilience** of cities and human settlements, including through the development of **quality infrastructure** and spatial planning, by adopting and implementing integrated, age- and gender responsive policies and plans and ecosystem-based approaches"

Urban Infrastructure Systems



Systems

Physical

E.g.: *energy infrastructure, road and bridges, housing and shelter or ecosystems*

Non-physical/social processes/practices or behaviors

E.g.: *labour standards and legal rights, building codes & standards, culture, community cohesion or social relationships*

complex web of **infrastructure, institutions, and information systems** for essential functions in a city.

Exposure and vulnerability of infrastructure systems

RISK = **HAZARD** X **EXPOSURE** X **VULNERABILITY** / **CAPACITY**

Infrastructure Resilience Challenges

Urbanisation and Population Growth

55% in 2020

68% in 2050

Underinvestment

$18 trillion

Gap in infrastructure investments globally by 2040

Ageing and stranded assets

RESILIENCE

*'the ability of a system or community, exposed to hazards, to **resist and absorb** the hazard; **recover** from it or transform if conditions require it to, in a **timely and efficient** manner, including through the **preservation and restoration of its essential basic services and functions'***

Coalition for Disaster Resilient Infrastructure

Launched at the UN Climate Action Summit on 23 September 2019.

CDRI Secretariat is based in New Delhi, India.

A multi-stakeholder partnership of national governments, UN agencies and programmes, multilateral development banks and financing mechanisms, the private sector and knowledge institutions that aims to promote the resilience of infrastructure systems to climate and disaster risks, thereby ensuring sustainable development.

CDRI Membership

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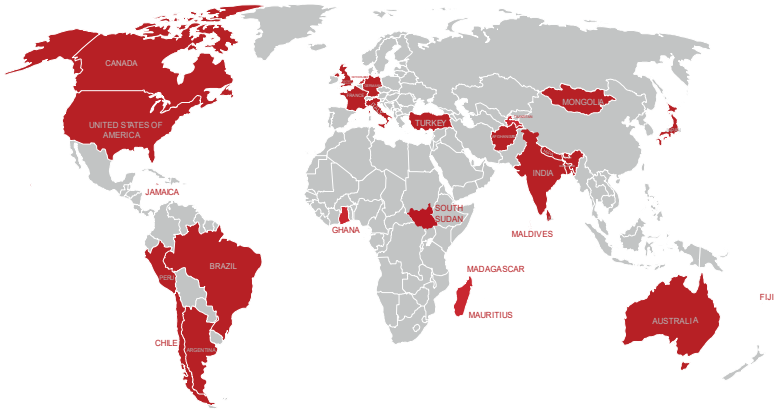
As of August **2022**

- AFGHANISTAN
- ARGENTINA
- AUSTRALIA
- BANGLADESH
- BHUTAN
- BRAZIL
- CANADA
- CHILE
- DOMINICAN REPUBLIC
- FIJI
- FRANCE
- GERMANY
- GHANA
- HAITI
- INDIA
- ITALY
- JAMAICA
- JAPAN
- MALDIVES
- MADAGASCAR
- MAURITIUS
- MONGOLIA
- NEPAL
- NETHERLANDS
- PERU
- SOUTH SUDAN
- SRI LANKA
- TAJIKISTAN
- TURKEY
- UNITED KINGDOM
- UNITED STATES OF AMERICA

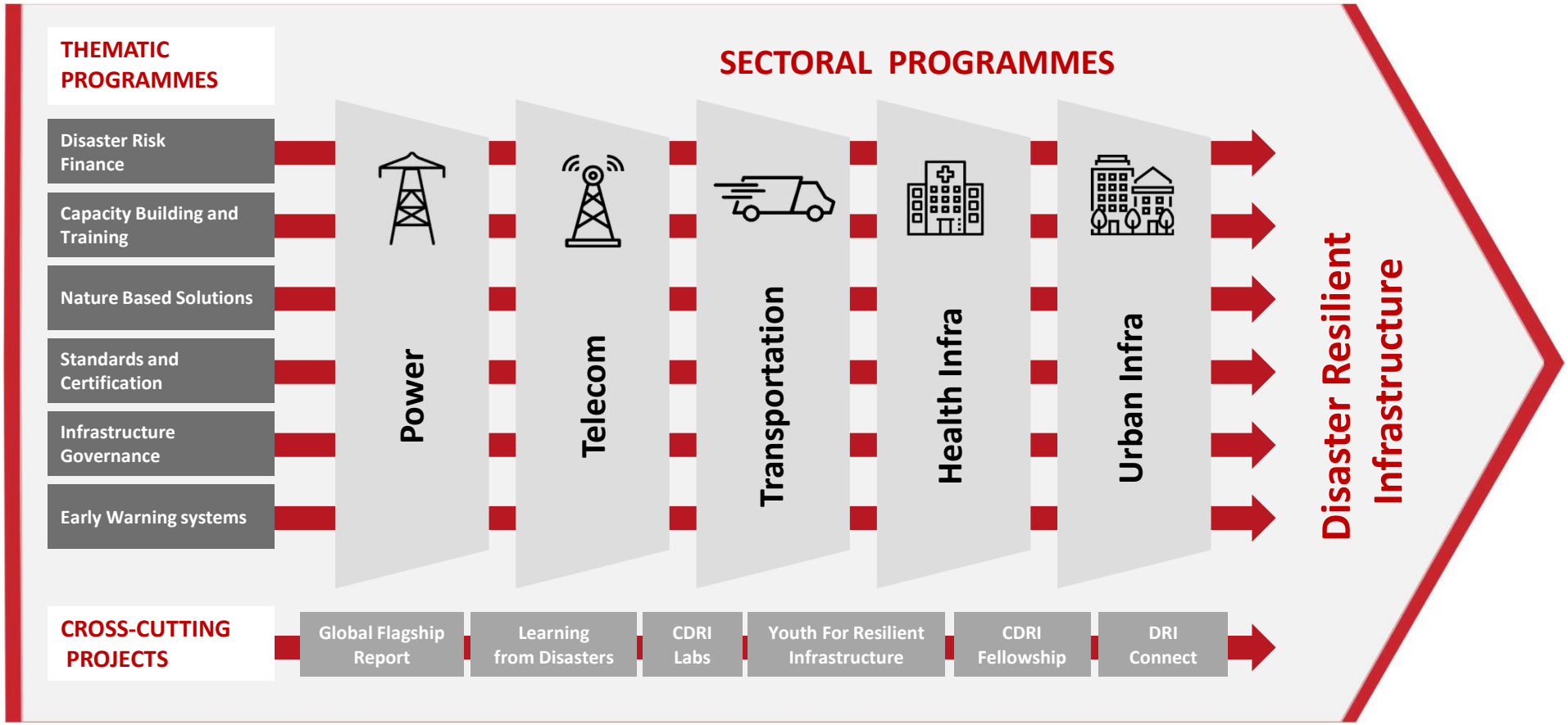


31
COUNTRIES

6
INTERNATIONAL ORGANIZATIONS

2
PRIVATE SECTOR ORGANIZATIONS

CDRI Programme Approach



Urban Flooding

Urban flooding is the inundation of land or property in a built environment, particularly in more densely populated areas, caused by rainfall overwhelming the capacity of drainage systems, such as storm sewers.

The occurrence of floods is the most frequent among all natural disasters. *(Cities and Flooding, WB Report,2011)*

The world's urban settlements have grown by

85 %

from 693,000 km2 in 1985 to over 1.28 million km2 in 2015

In 2015,

11 %

of all settlement areas – or 145,000 km2 – were located in zones with high or very high flood risk – roughly equivalent to the area of Bangladesh.

Since 1985 the settlements exposed to the **highest flood hazard level** have increased by

122 %

Risky growth has been fastest in the **East Asia & Pacific region**

growth of flood exposure…

settlements built in highest flood risk zones

- **1 %** low-income countries (LIC)
- **81 %** middle-income countries (MIC)
- **18 %** high-income countries (HIC)

Urban Flooding

Urban Flooding

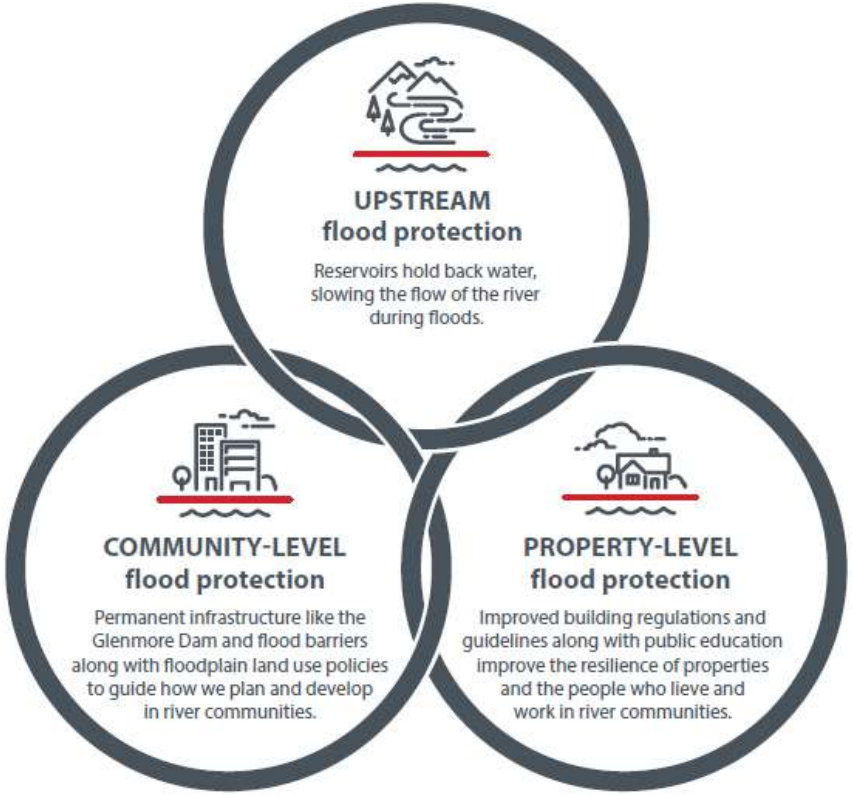
Urban Flooding – Best Practices

1. Calgary's Flood Resilience Plan

Calgary

Calgary is a city in Canada with a population of 1.3 million and a 1,592.4/km2 population density. The city is located at the meeting point of two rivers, Bow and Elbow. Since the Bow and Elbow rivers, as well as several small creeks, have short, steep river systems that run from the mountains to Calgary, flooding can occur quickly and without warning. The floodplain is home to about 75,000 Calgarians

Calgary's flood resilience plan is three-tiered, with all elements working together to reduce flood risk and make Calgary more resilient



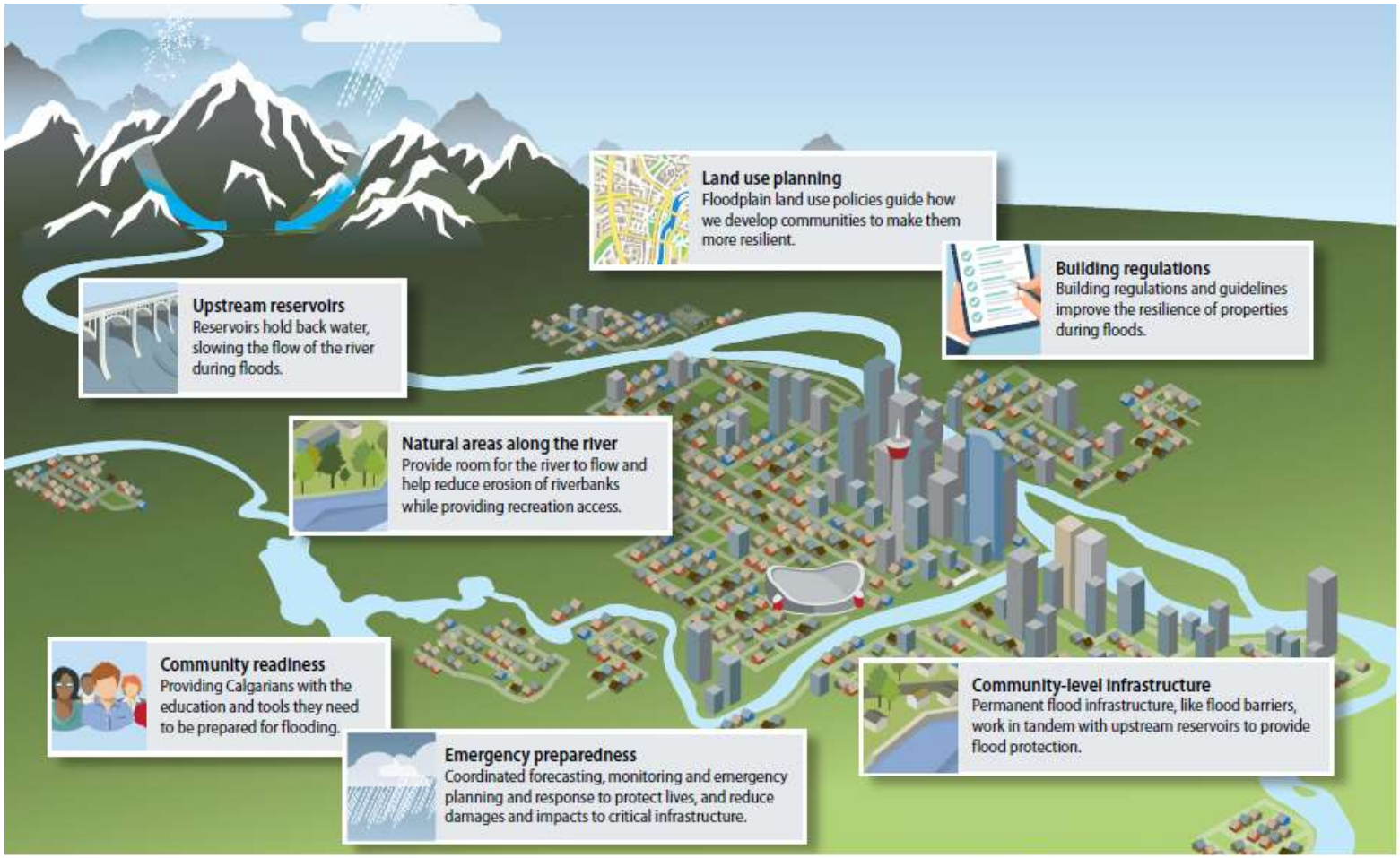
Urban Flooding – Best Practices

1. Calgary's Flood Resilience Plan

Upstream flood protection measures includes reservoirs on Elbow and Bow rivers

Community-level flood protection includes higher gates at the dams to improve storage capacity, flood barriers, pumping stations, flood inundation and flood hazard maps, Floodplain land use policies and building regulations

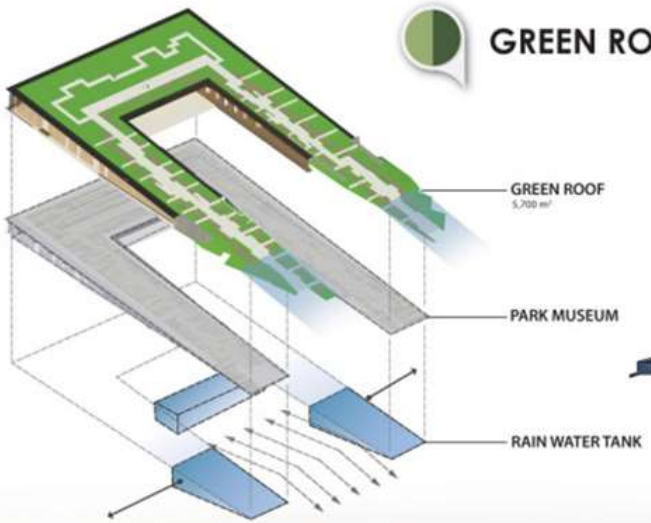
Property-level flood protection includes public education tools, financial support for property owners, recovery assistance



Urban Flooding – Best Practices

2. Centennial Anniversary Park of Chulalongkorn University, Bangkok

The 30-rai (12 acre) park with 1.3 km. green avenue is designed with many ecological functions that sustainably collect and treat water, decrease flood risks, reduce the urban heat island, and promote pedestrian and bicycle transportation.



Centennial Park acts as tree roots for the city to absorb and control water, and as a tree canopy to provide shade and climatic relief to the neighborhood.

3 major components to water treatment system: the green roof, the rain water tank, the constructed wetlands, detention lawn and the retention pond.

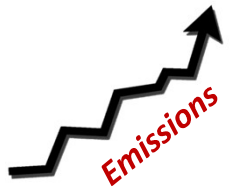
Urban Heatwaves

Urban Heatwaves are a local and temporary phenomenon experienced when certain pockets within an urban area experience higher heat load than its rural counterparts. This city specific phenomenon is known as an urban 'heat island effect'. This phenomenon is even more pronounced at night.

It is estimated that 74 per cent of the global population will be exposed to lethal heatwaves worldwide by 2100 (RCRC, 2021)

Heatwaves are already by far the deadliest weather-related disasters in Europe; 140,000 deaths associated with 83 heatwaves have been recorded since the beginning of this century.

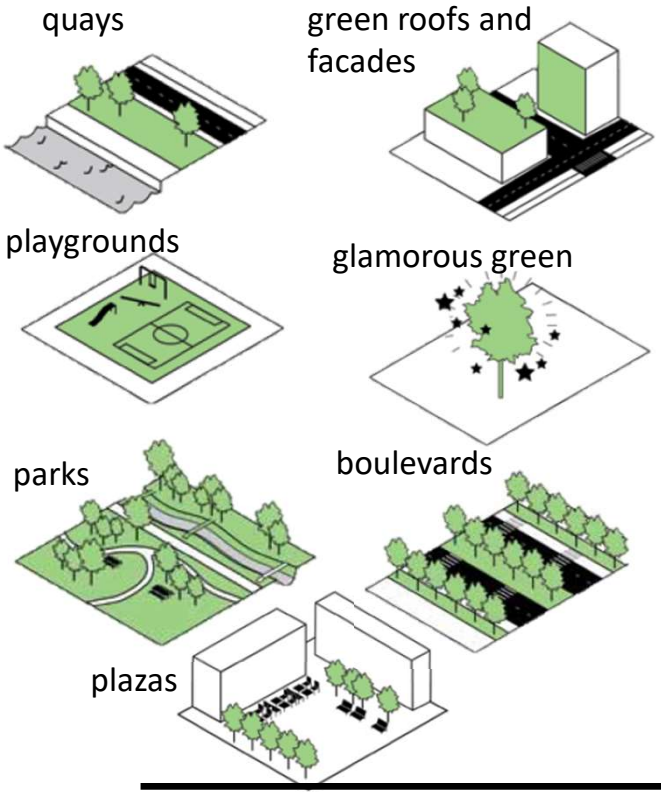
3.6 billion ⇨ 9.5 billion



number of cooling appliances in use expected by 2050

Urban Heatwaves – Best Practices

Rotterdam has strategies to combat the Urban Heat Island (UHI) effect by incorporating more urban flora.



1. Green Roofs in the city of Rotterdam

Green rooftops take many shapes — lush gardens, potted plants, solar panels, urban farms, wildflower meadows and community spaces painted in light colors that absorb less sunlight — and can help combat heat islands

According to the EPA, citywide ambient temperatures can be **lowered by 5 degrees Fahrenheit** with green roofs, reducing building energy use by up to 0.7 percent and thus lowering energy demand

In Rotterdam, green roofs are mandatory for municipal buildings and there is a subsidy programme in effect for private buildings that provides 30€ for every square metre of green roof installed.
In 2013, Rotterdam had over 130,000 m2 of Green Roofs

Urban Heatwaves – Best Practices

2. Blue green infrastructure in Paris to tackle heat

More than 800 locations throughout Paris, including parks, forests, swimming pools, and museums, provide a network of cool "islands" connected by naturally cool walkways and are 2°C to 4°C cooler than surrounding streets due to more vegetation and water bodies

Cool islands

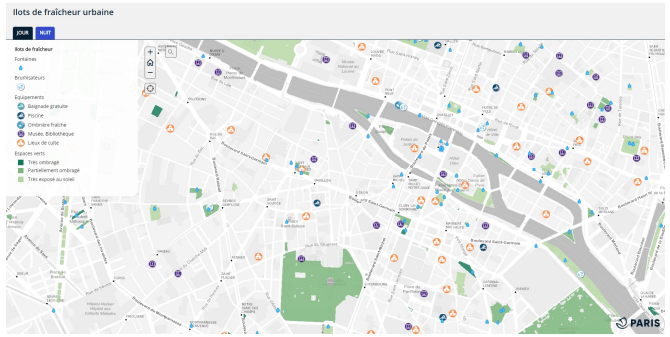
EXTREMA App

Pop-up Cool islands

Drinking Fountains

The city is deploying pop-up cool islands with misting areas from fire hydrants, and extending the operating hours of municipal swimming areas for heat emergencies

The city has developed a mapping app EXTREMA to guide residents to cool islands



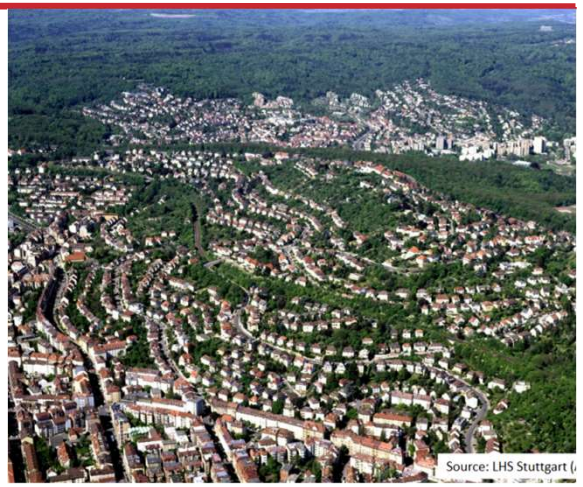
1,200 drinking fountains have been installed in the city allowing residents to keep cool for free and reducing the use of plastic water bottles.

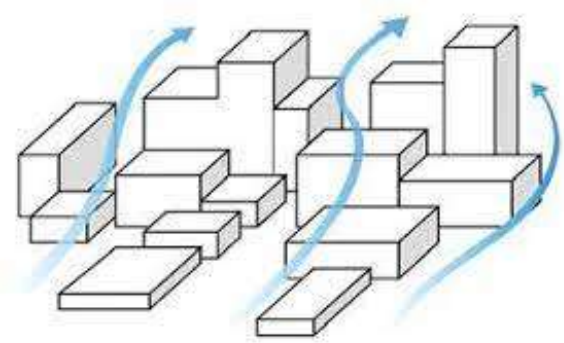
Urban Heatwaves – Best Practices

3. Stuttgart's Air Ventilation Corridors

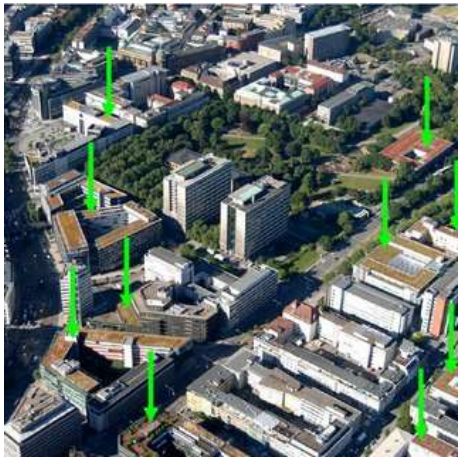
Stuttgart in Germany has planned air ventilation corridors to tackle heatwaves. Development of settlements on the valley slopes has prevented air from moving through the city, which worsens the air quality and contributes to the urban heat island effect.

A Climate Atlas was also developed for the Stuttgart region and several planning and zoning regulations were recommended to preserve and increase open space in densely built-up areas.





The Green corridors create pathways for cool air, produced through evapotranspiration from trees, to sweep down the valley slopes and enhances exchange air exchanges and cool air flow within the city



Urban Heatwaves – Best Practices

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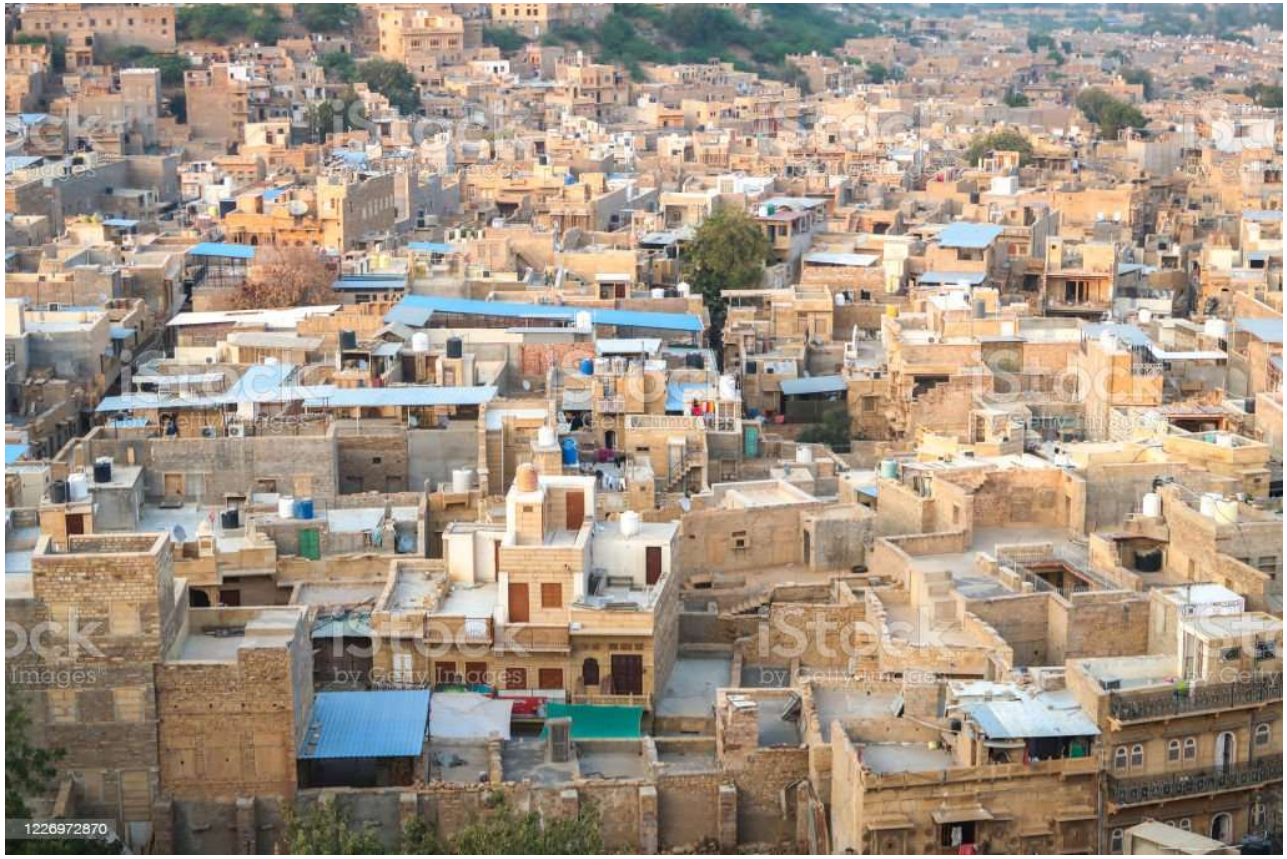
4. Havelis in Rajasthan



Components and spatial layering in the Haveli helps in the reduction of heat intake.

Key Messages

01	02	03	04	05
To make our cities future ready, focus on 'urban infrastructure as a system'.	Identify actions that can be taken immediately with little effort to manage risk e.g., maintenance of infrastructure	Identify actions that can be taken in the near future – with some effort to address risk e.g., retrofitting of old infrastructure.	Identify actions that must be undertaken for reducing risk In the long term e.g., understanding risk and building resilient infrastructure	Build in 'adaptiveness' and coordinated action for resilient infrastructure systems

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THANK YOU