Resilient cities and 1.5C climate change

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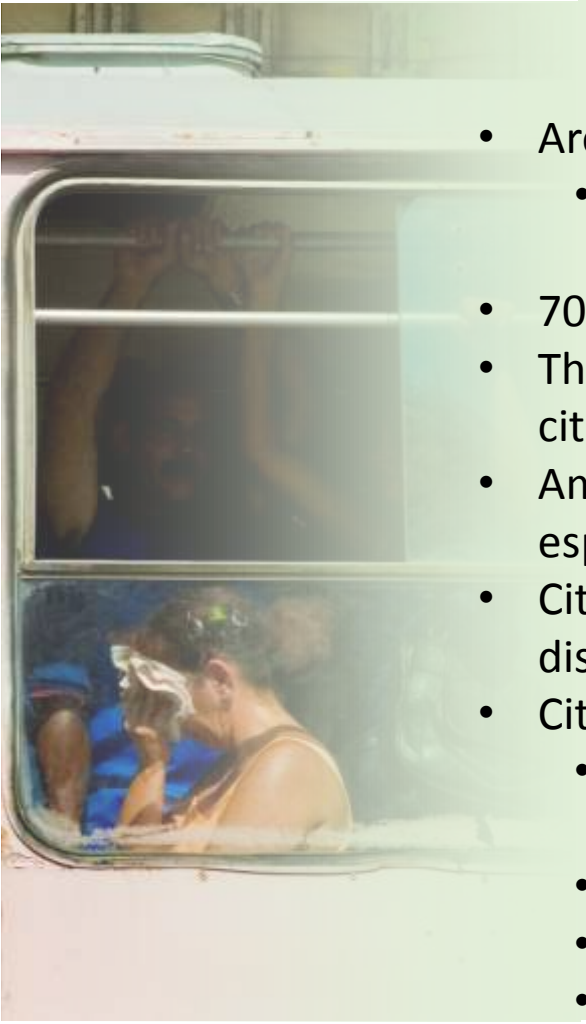
Cities are especially important



- Are among the most affected by CC:
  - "Small islands, **megacities**, coastal regions and high mountain ranges"
- 70 million new urban residents per year until mid-century
- The majority will reside in hazard-prone small and medium sized cities in low- and middle-income countries
- Among the worst affected by warming are **poor urban dwellers**, esp. in African cities
- Cities are where heat stress, terrestrial and coastal flooding, new disease vectors, air pollution and water scarcity, will **coalesce**
- Cities are at the **frontline of adaptation**:
  - reducing and managing disaster risks due to extreme and slow-onset weather and climate events,
  - installing flood and drought early warning systems
  - improving water storage and use
  - Reducing health impacts

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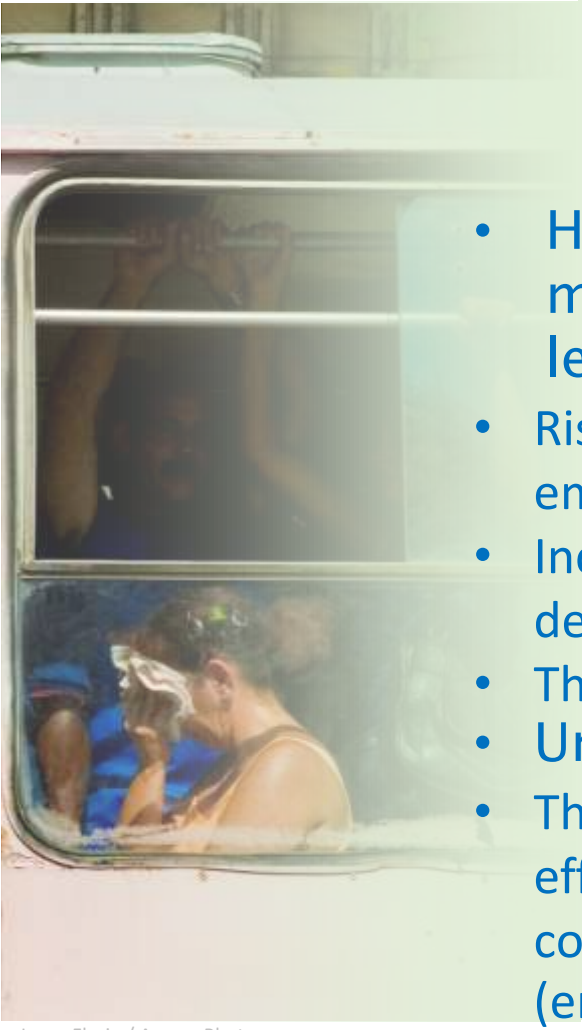

Cities are especially affected by the additional 0.5C warming

- Health risks – e.g. heat related mortality and morbidity – will be especially reduced with 0.5C less warming due to the heat island effect
- Risks for ozone-related mortality if the ozone precursor emissions remain the same
- Increased risks for vector borne diseases such as malaria and dengue fever
- The impact of storms is aggravated in cities
- Undernutrition
- The extent of additional risk depends on vulnerability and the effectiveness of adaptation for regions (coastal and non-coastal), informal settlements, and infrastructure sectors (energy, water, and transport)

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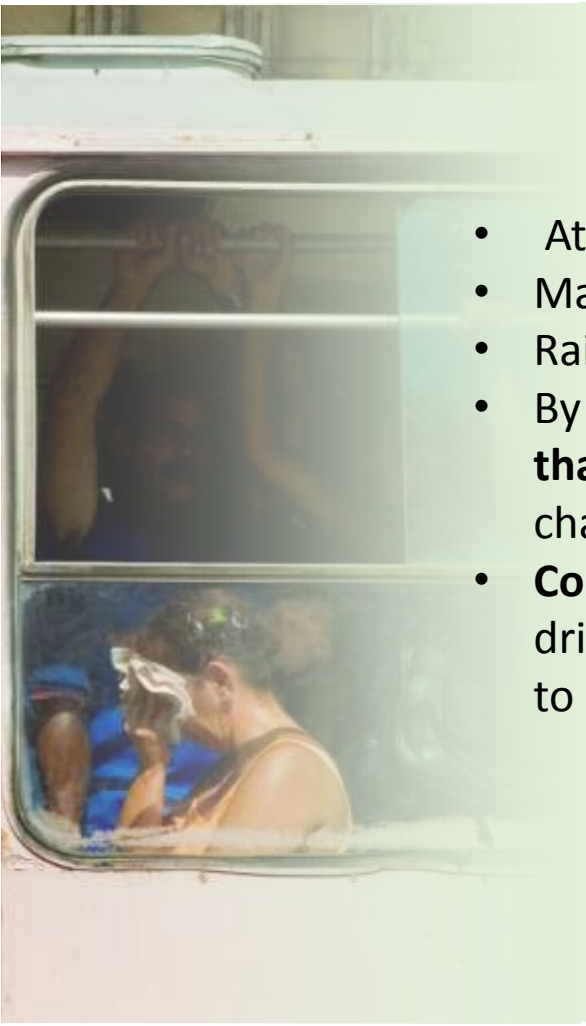
Cities and sea level rise



- At least 136 mega cities are at risk from flooding due to SLR
- Many of these cities are located in south and south-east Asia
- Raising existing dikes helps to protect against SLR
- By 2300, dike heights under a no-mitigation scenario could be **more than 2 m higher** (on average for 136 mega cities) than under climate change mitigation scenarios at 1.5°C or 2°C
- **Compound flooding** (the combined risk of flooding from multiple drivers) has increased significantly in major coastal cities and is likely to increase with further development and SLR at 1.5°C

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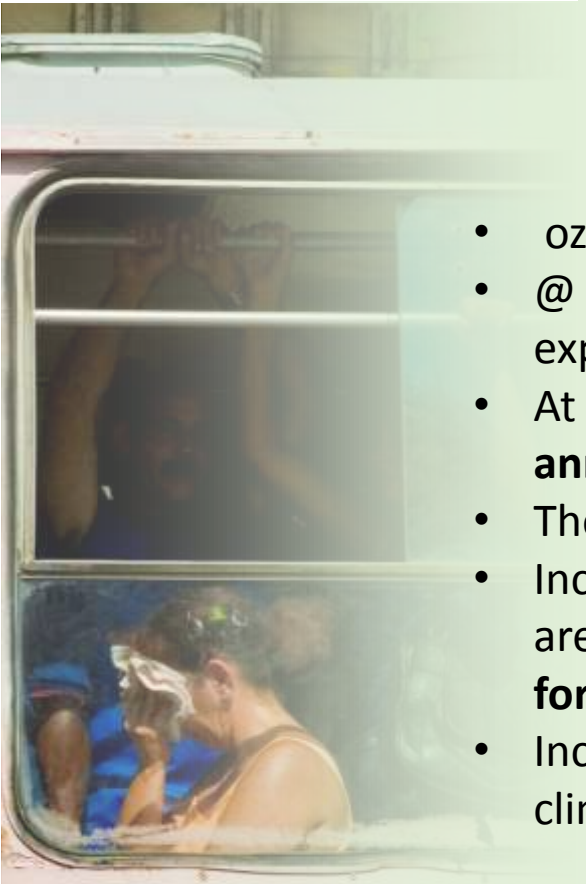
Heat stress



- ozone related mortality increases in cities with warming
- @ 1.5°C, **twice as many megacities will become heat-stressed,** exposing more than 350 million more people by 2050
- At +2°C warming, Karachi (Pakistan) and Kolkata (India) could expect **annual conditions equivalent to their deadly 2015 heatwaves**
- The urban poor is expected to be especially affected
- Increases in the intensity of UHI could exacerbate warming of urban areas, with projections ranging **from a 6% decrease to a 30% increase for a doubling of CO2**
- Increases in population and city size, in the context of a warmer climate, are projected to increase UHI

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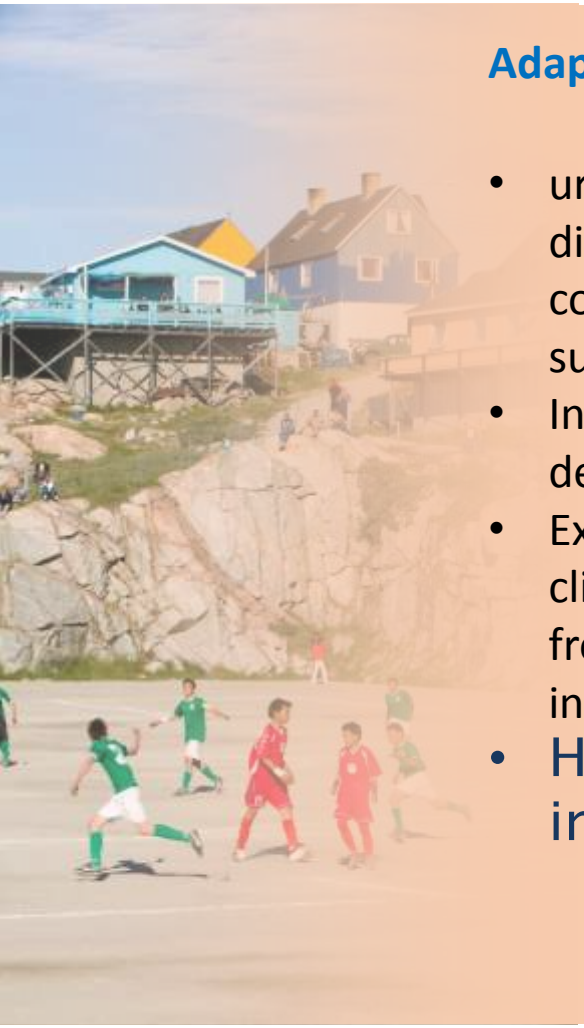

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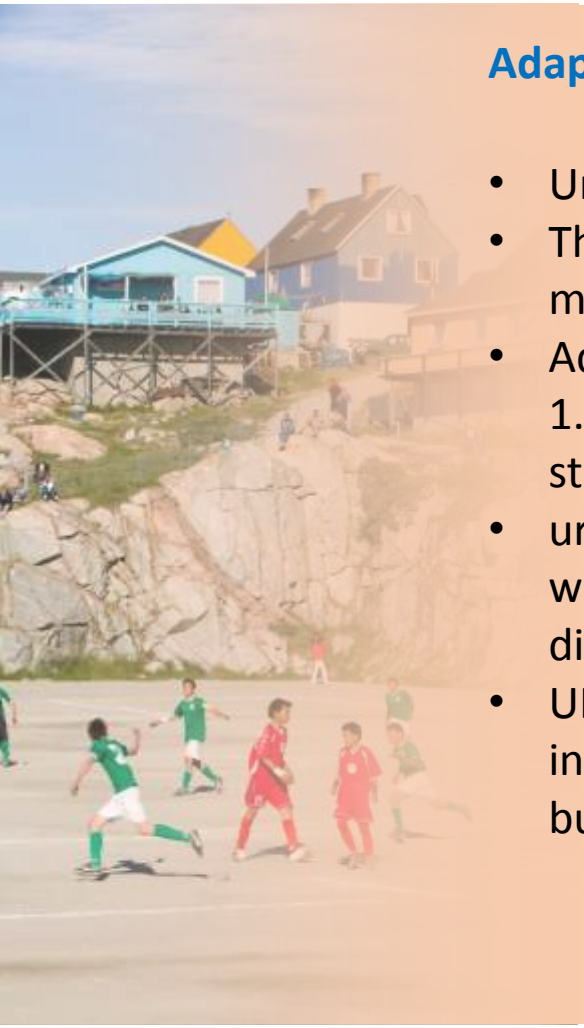
Adaptation: opportunities for cities

- urban systems can harness the mega-trends of urbanisation, digitalisation, financialization and growing sub-national commitment to smart cities, green cities, resilient cities, sustainable cities and adaptive cities
- Increase in urban climate responses driven by cost-effectiveness, development, work creation and inclusivity considerations
- Expanding networks of cities sharing experiences on coping with climate change and drawing economic and development benefits from climate change responses represent a recent institutional innovation
- However, their effectiveness has been questioned in the literature



Adaptation: resilient infrastructure

- Urban land use influences risk exposure and adaptive capacity
- Thus good urban land-use planning can contribute to climate mitigation and adaptation
- Adaptation plans can reduce exposure to urban flood risk that, in a 1.5□C world, could double relative to 1976–2005, reduce heat stress, fire risk, sea level rise
- urban design and spatial planning policies should consider extreme weather conditions and reduce displacement by climate related disasters
- UHI can be mitigated through reflective surfaces, green infrastructure, good urban design in terms of land use, zoning and building codes and the reduction in mechanical cooling needs

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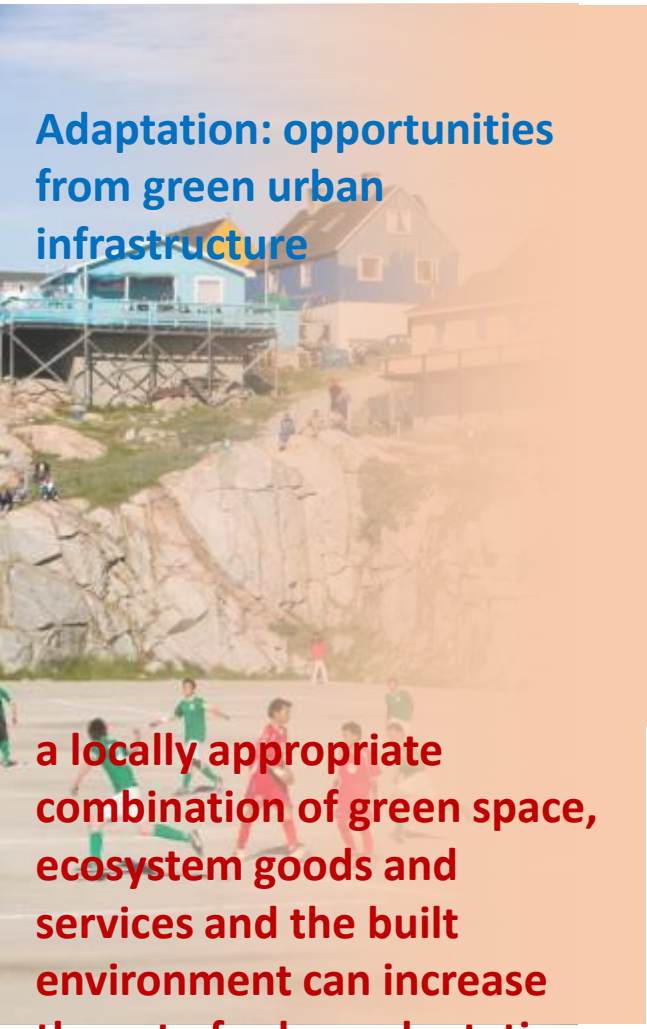
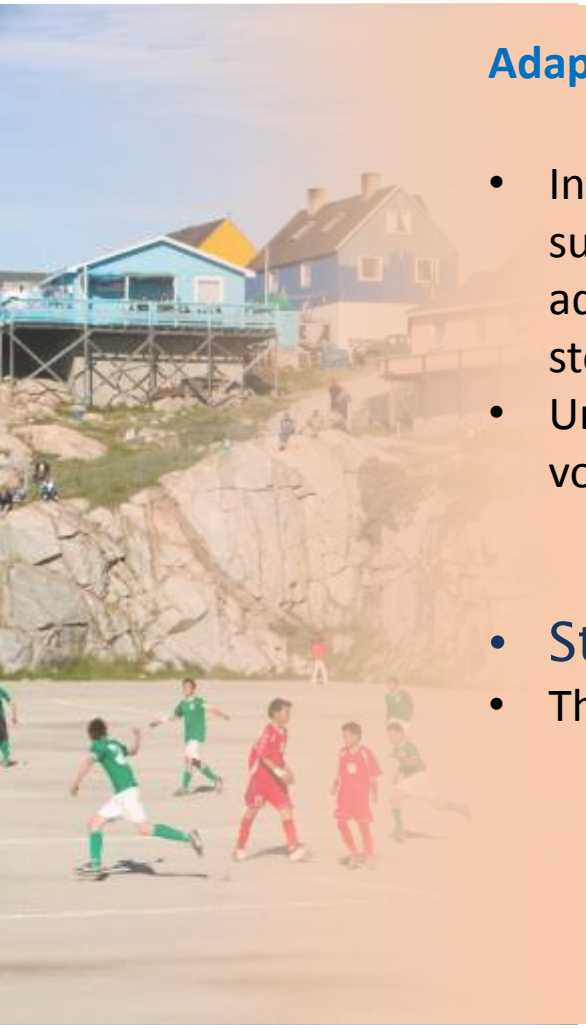
Adaptation: opportunities from green urban infrastructure



Green infrastructure	Adaptation benefits	Mitigation benefits
Urban trees planting, urban parks	Reduced heat island effect, psychological benefits	Less cement, reduced air-conditioning
Permeable surfaces	Water recharge	Less cement in city, some bio-sequestration, less water pumping
Forest retention, and urban agricultural land	Flood mediation, healthy lifestyles	Air pollution reduction
riparian buffer zones	skilled local work, Sense of place	energy spent on water treatment
Biodiverse urban habitat	Psychological benefits, inner-city recreation	Carbon sequestration

a locally appropriate combination of green space, ecosystem goods and services and the built environment can increase the set of urban adaptation options



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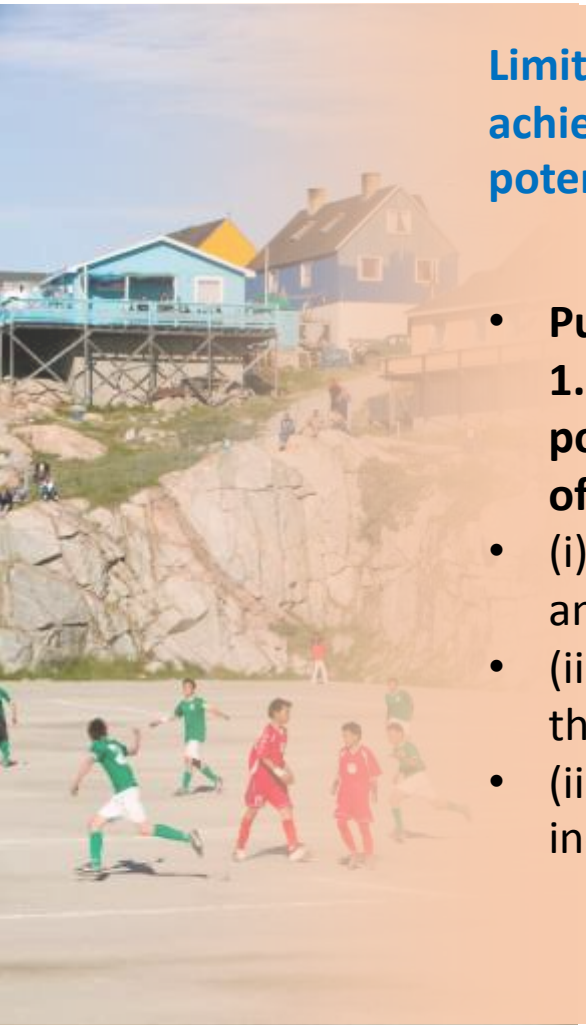
Adaptation: sustainable water resource management

- Integration of sustainable water resource management and the supply of water services in ways that support mitigation, adaptation and development through waste-water recycling and storm water diversion
- Urban surface sealing with impervious materials affects the volume and velocity of run-off and flooding
  - but urban design in many cities now seeks to mediate run-off, encourage groundwater recharge and enhance water quality
- Still, urban flooding is expected to increase at 1.5°C warming
- This risk falls disproportionately on urban women and urban poor



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Limiting global warming to 1.5°C rather than 2°C makes it easier to achieve many aspects of sustainable development, with greater potential to eradicate poverty and reduce inequalities in cities

- **Pursuing place-specific adaptation pathways toward a 1.5°C warmer world has the potential for significant positive outcomes for well-being, in countries at all levels of development.**
- (i) diversity of adaptation options based on people's values and trade-offs they consider acceptable,
- (ii) maximise synergies with sustainable development through inclusive, participatory, and deliberative processes
- (iii) facilitate equitable transformation. entrenched social inequalities

Strengthening the Global Response in the Context of Sustainable Development and Efforts to Eradicate Poverty