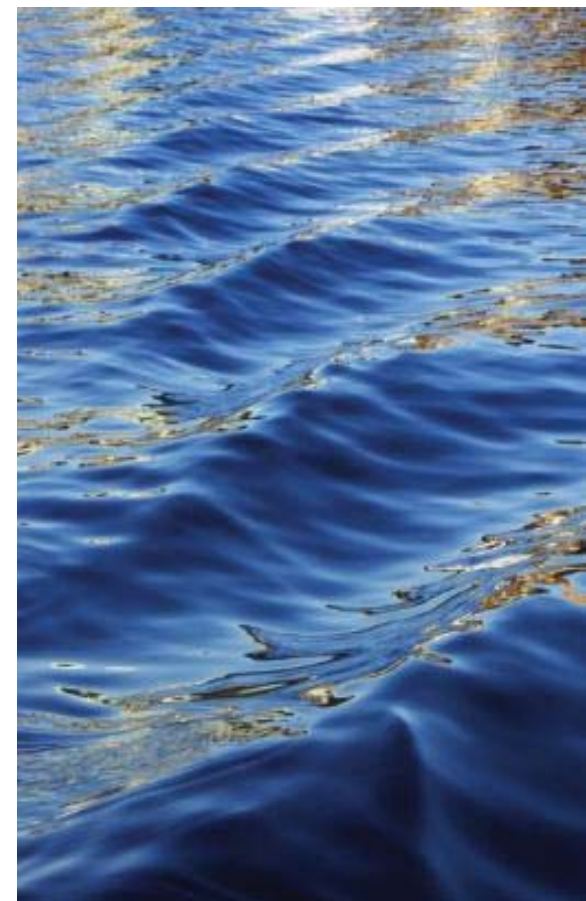


Science, Technology and Innovation for Sustainable Cities and Peri-Urban Communities

CSTD Inter-Sessional Panel
7-9 January 2013
Lima, Peru

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Director
Division on Technology and Logistics
UNCTAD



Cities are resource consumers

2 per cent of the world's surface

Today: 52 per cent of the world's population

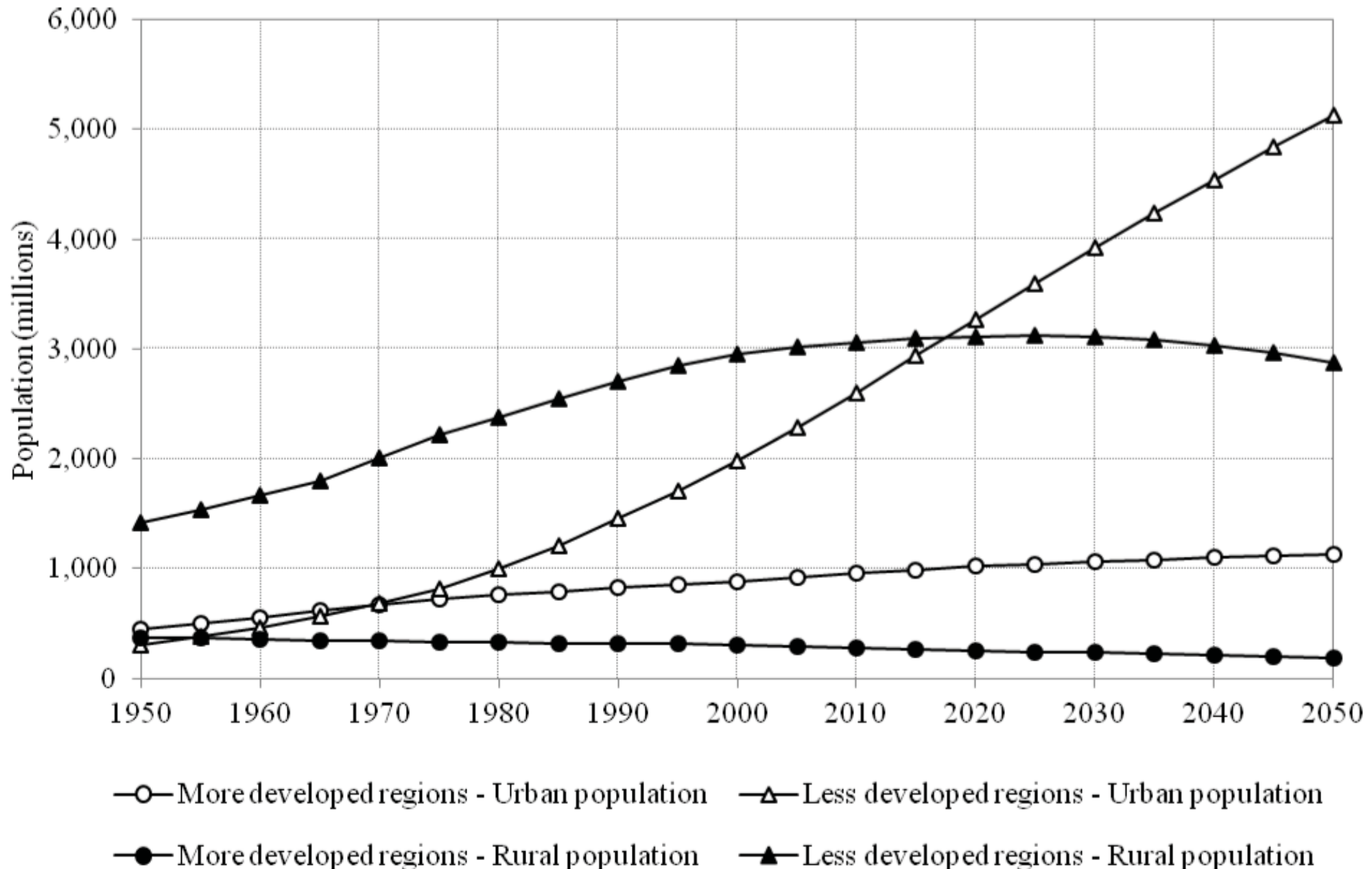
2050: More than 2/3 of the global population

60-80 per cent of energy consumption

80 per cent of carbon emissions

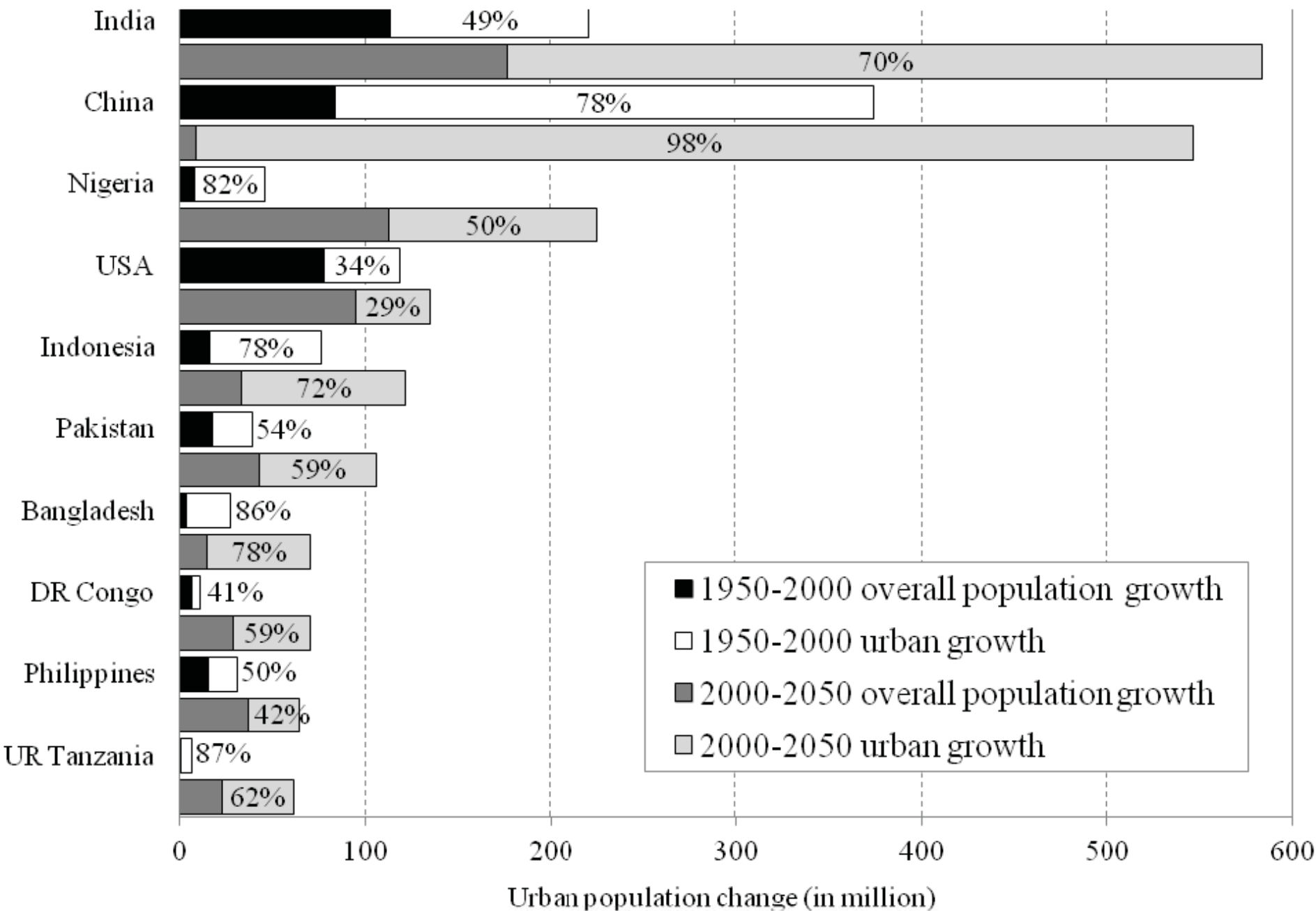
....City government has direct control over sectors that consume resources and generate emissions....

Urban / rural populations by development group



Next wave of urbanization in developing countries

Top 10 urbanizing countries



Source: World Urbanization Prospects 2011



Sustainable urbanization: An economic, social and environmental issue.

The future we want – Par. 134

“We recognize that, if they are well planned and developed, including through integrated planning and management approaches, cities can promote economically, socially and environmentally sustainable societies.”



The future we want – Par. 135

“We commit to promote an integrated approach to planning and building sustainable cities and urban settlements, including by supporting local authorities, increasing public awareness and enhancing participation of urban residents, including the poor, in decision-making. We also commit to promote sustainable development policies that

support inclusive **housing** and social services; a safe and healthy living environment for all, particularly children, youth, women and the elderly and disabled;

affordable and sustainable **transport and energy**; the promotion, protection and restoration of safe and green urban spaces; safe and clean

drinking **water** and sanitation; healthy air quality; the generation of decent

jobs; and improved **urban planning** and slum upgrading. We further

support the sustainable **management of waste** through the application of the 3Rs (reduce, reuse and recycle). We underline the importance of

considering **disaster risk reduction**, resilience and climate risks in urban planning. We recognize the efforts of cities to balance development with

rural regions.“

Key urban challenges



Unplanned urban growth → Urban sprawl → Low density → Increased infrastructure costs




Traffic congestion is hurting economies / Infrastructure not catching up with urban growth



Depletion of resources (water, energy, food)



Environmental deterioration, growing waste and sewage → health and sanitation risk



Buildings: Technology available, but market, financial, awareness, institutional challenges exist



Natural disasters induced by climate change



Pressure on the peri-urban

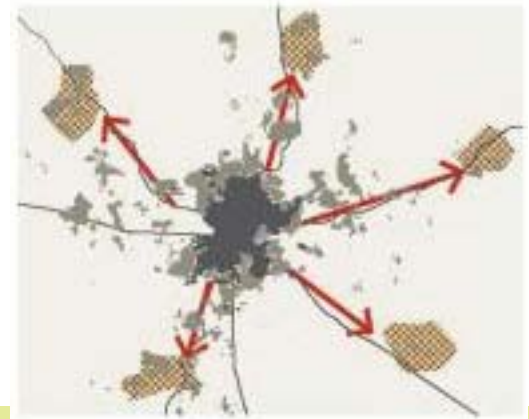
Density, land use and spatial planning

Spatial planning can save costs, enable public transport and prevent urban sprawl.

How to accommodate growth?

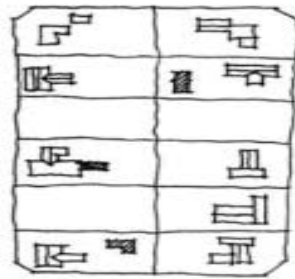
- Increasing density of existing area
- Extending city at its fringes
- Multiply nodes via satellite towns

ICT applications, such as geospatial tools, can facilitate spatial planning.



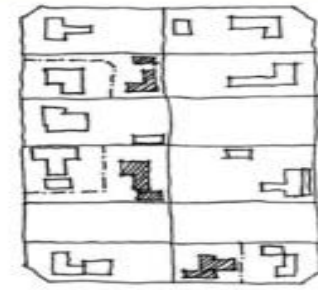
Generic means/ways of achieving densification

1. Construction of attached/detached second dwellings including the changing of non-residential buildings, or parts of buildings, to residential buildings (e.g. garages).



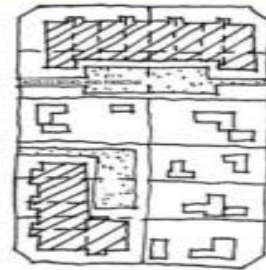
□ Existing ■ Second Dwelling

2. Increasing the existing bulk rights through the extension of the building or adding on of floors to accommodate an increased number of units.



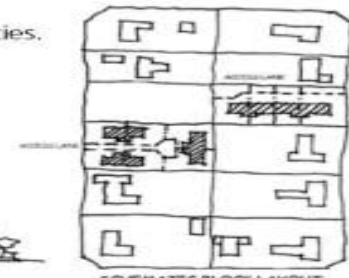
--- New Subdivision ■ New Dwelling

3. Block consolidation of erven with redevelopment at higher densities.



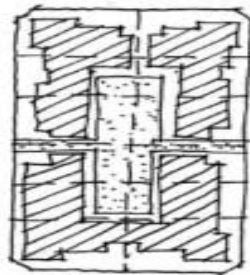
□ Existing ■ New

4. Subdivision of land and redevelopment at higher densities.



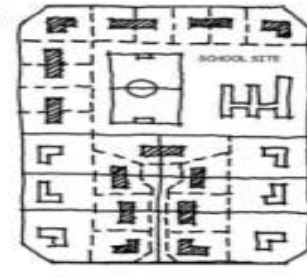
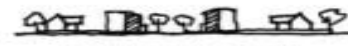
--- New Subdivision ■ New Dwelling

5. Consolidation with re-development at higher densities including the demolition and integration of existing structures.



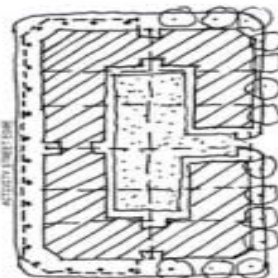
■ New Building □ Court

6. Higher density infill on vacant and under-utilised land throughout the built area of the City.



--- New Subdivision ■ New Housing

7. Consolidation of sites within a street block to create a single larger parcel for redevelopment into multi-storey units.



■ New Development □ Court

Source: Cape Town Densification Strategy - Technical Report

Portland Urban Growth Boundary

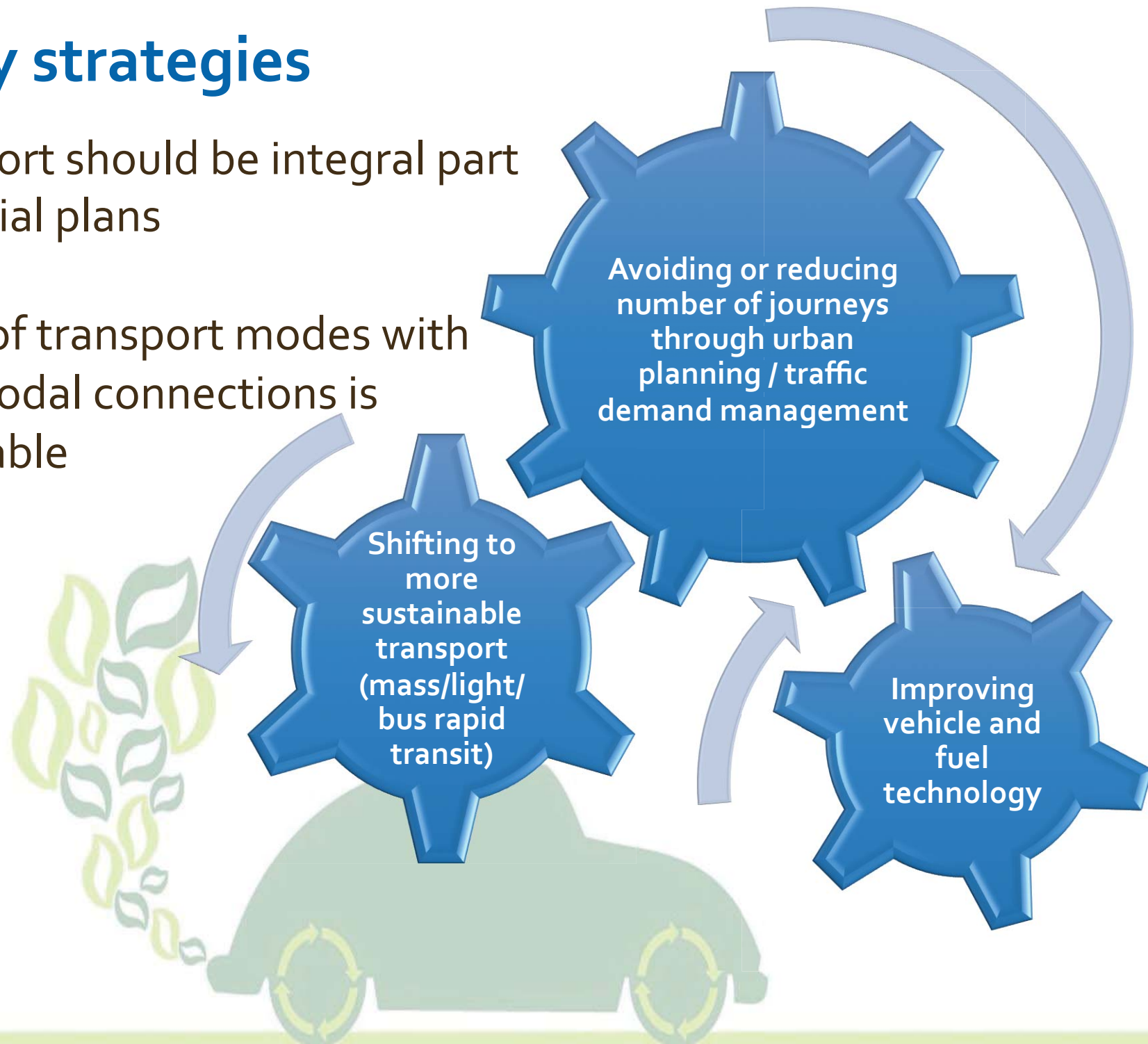


PAM MARTIN/THE OREGONIAN

Prioritizing urban growth via infill development

Mobility strategies

- Transport should be integral part of spatial plans
- A mix of transport modes with intermodal connections is preferable



Bus Rapid Transit: Can be implemented in relatively short time with lower cost



- Feeder systems are important
- Selective coverage not useful – can create social exclusion
- Should not run in parallel with legacy transport for a long time

Cheonggyecheon – Urban Renewal



- 2003 - Removal of motorway / improvements to public transport: intermodal transit, incorporating dedicated bus-lanes and a unified fare system
- New tourist attraction and removal of an urban fault line
- 300 thousand new jobs

Smart Work Centers



Belgium



Republic of Korea



The Netherlands

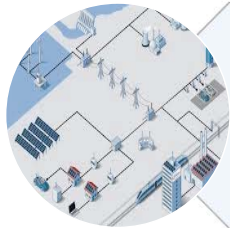
Energy-efficient cities



Local regulatory support for leapfrogging to renewable energy



SMEs for decentralized, off-grid generation



Smart grids



Combined heat and power / District heating



Availability of information drives efficiency and fundamentally changes the energy business

Hammarby Sjöstad, Sweden



Green roofs bind rainwater so that it evaporates.

Solar cells convert solar energy into electricity.

Solar panels heat water.

All frontage and roofing materials are free from heavy metals.

Low-flushing toilets and tap aerators reduce water consumption by half.

Car pools reduce private motor travel.

Safe footpaths and bikeways.

Household refuse is sucked down into automatic underground waste collection systems.

Organic food is served.

Combustible waste is used to produce district heating and electricity in the area's own system. Organic waste is turned into biogas.

Dressed in eco-fashion.

Heat exchangers in water treatment.

"Farmer's Market" enables residents to buy local produce.

Ecological fashion for the environmentally aware.

Street rainwater is treated locally and flows into the lake instead of to a treatment plant.

Rizhao, China



Energy-generating pavements (West Ham Tube Station, London)



Waste management

Integrated Solid Waste Management

PPPs can produce win-win for local governments, citizens and business

Community initiatives

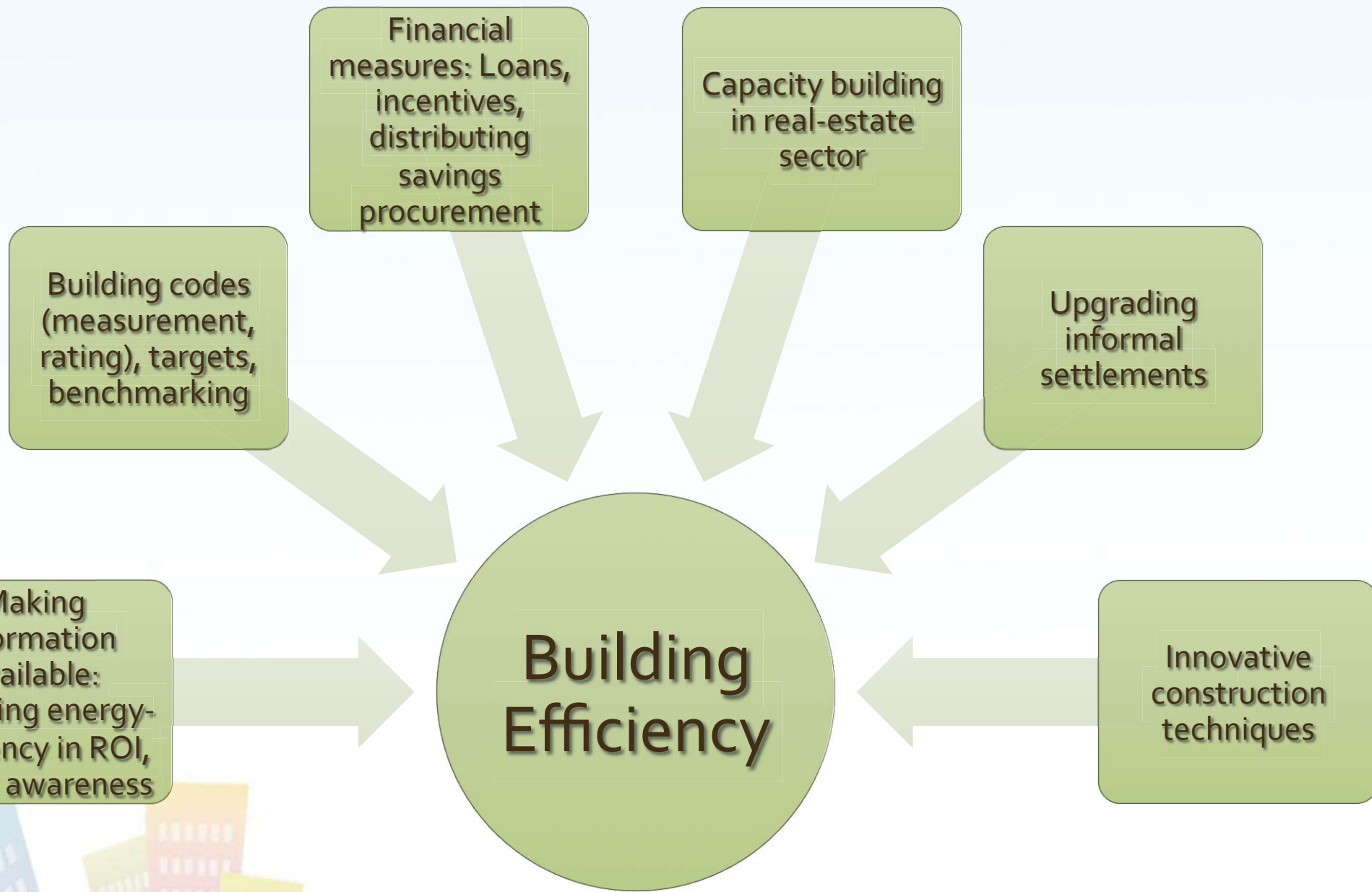
Formalizing waste pickers



Ciudad Saludable - Peru



Resource-efficient buildings



In the long term, green buildings can save costs

Source: Adapted from IBE – Driving transformation to energy efficient buildings

Multitude of technologies for resource-efficient buildings

PRACTICAL TOOLS

→ Sustainable houses are built with a range of solutions to create resource-efficient, healthy environments for people. Solutions differ according to the type of house, the climate zones and the surrounding society (e.g. access to district heating or not).

Design

Design for sustainability can dramatically reduce energy consumption and create settings that encourage us to be more physically active.

Windows

Create views and provide daylight, passive solar energy and natural ventilation to the building windows. By optimal orientation and use windows can provide net energy to the building. Automated shading is essential in warmer climates to keep out heat from the sun. Natural light is beneficial to productivity, wellbeing and health.

Green roofs and walls

Adding plants to rooftops, walls and balconies offers many benefits: added insulation, reduced runoff of water during heavy rainfall, aesthetic qualities, noise reduction and reduced heat island effect.

Heat pumps

Earth to water or air to water heat pumps can draw energy from the surroundings into the buildings, multiplying the energy used. 1 kWh of electricity can deliver 2-4 kWh of heat.

Orientation towards the sun

Homes are placed with large facades facing east and west, letting in morning and evening sun. Offices have large facades north and south, letting in high quality daylight (with shielding from direct sun to avoid overheating).

Solar heating

Solar heating system can provide heat and hot water and can be combined with heat pumps to create heat depots in hot periods for use when the weather gets colder.

Solar power

Photovoltaic cells can deliver clean energy to the building on site, eliminating transmission losses. Combined with a heat pump this can create heating too. Falling prices of photovoltaic cells have made them feasible solutions in many parts of the world.

Insulation

From mineral wool to aerogel, insulation materials are essential in every climate for keeping heat either in or out of the building.

Building materials

Using building materials without harmful chemicals has a large positive impact on the health of the user. Recycling building materials can reduce the environmental impact of the building process dramatically.

Using water several times

Reusing water from wash basins or showers to flush toilets reduces water consumption.

Smart homes

Monitoring and controlling energy demand in the house can reduce energy consumption by 5-10 per cent.

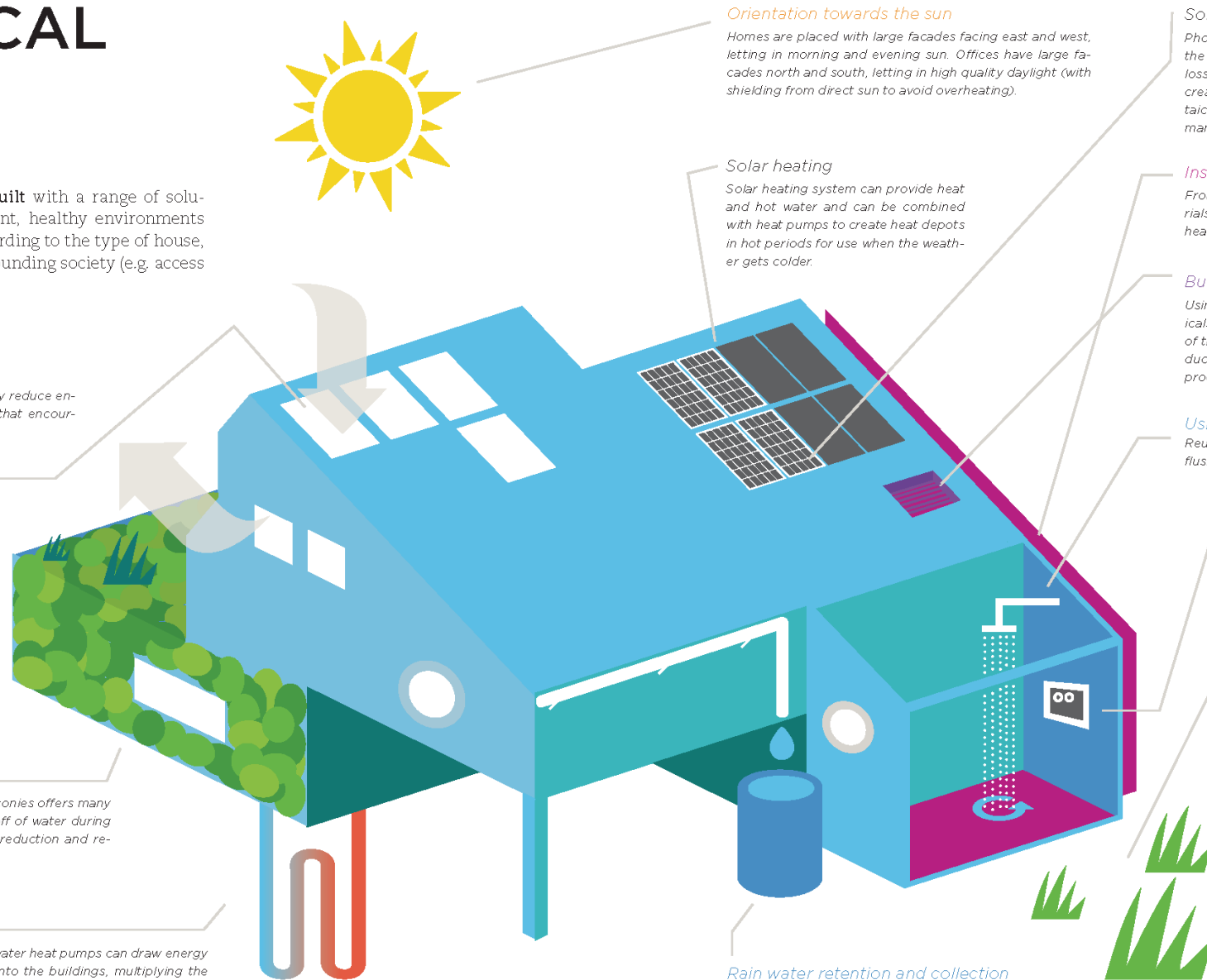
Reduce covered ground

Reducing the amount of ground covered in buildings, pavements, roads, parking lots etc. reduces both the local heat island effect and the pressure on sewage and drainage, as the earth can soak up more rain water under heavy rainfall.

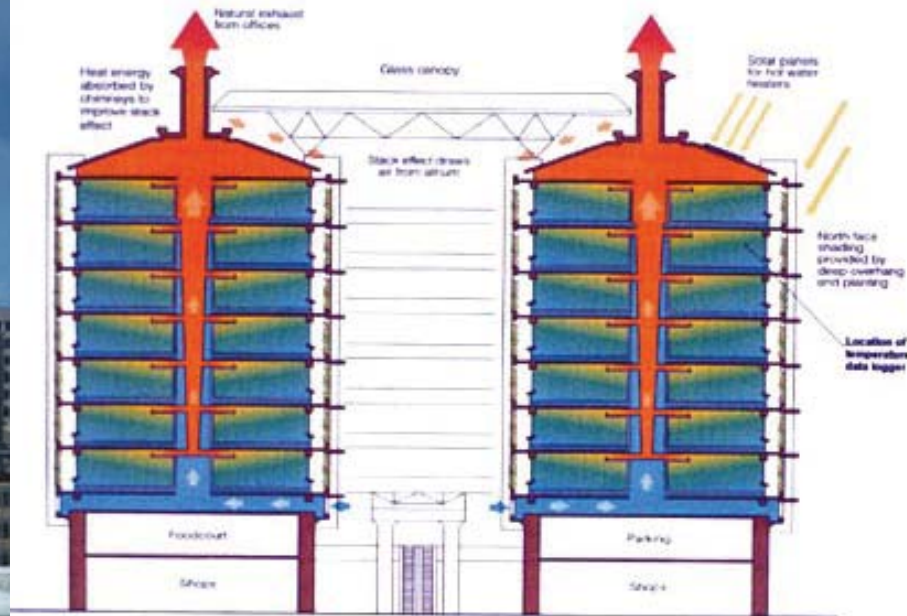
Rain water retention and collection

Rain water can be held in fascines or tanks, reducing runoff of water during heavy rainfall, and the water can be used as toilets.

*Luhmann, H.J. (2007) Smart metering as neue Energi-(effizienz)quelle, Energi & Management 6.




Eastgate Shopping Center, Harare, Zimbabwe



Natural ventilation for passive cooling.
No air conditioning devices.

Resilient cities



Increasing frequency of storms, extreme rain, heat, water scarcity, air pollution

STI for monitoring and assessing risks

Spatial planning that avoids risk zones

Mainstreaming adaptation into urban plans

Rio Operations Center



- PPP between City of Rio and IBM
- The Center integrates information from 30 government agencies to improve responsiveness to incidents

Peri-urban communities

- The peri-urban should be part of urban planning – Means of public participation and ecosystem assessments can help.

STI:

- Market gardening for healthy, lower cost nutrition
- Green roofs
- Using wastewater / solid waste in peri-urban agriculture

Maputo, Mozambique – Urban green belt



Market gardening: An employment opportunity to empower women

Solar water pumps



Sunlabob (Laos)



Grundfos LifeLink (Kenya)

Suncheon City – ecosystem protection



Conclusion

An **integrated** approach is necessary. Local governments can launch cross-sectoral sustainability goals.

Mainstreaming sustainability into urban development plans can avoid costly and difficult policy adjustments later on.

A **coalition** of key stakeholders is necessary. The right institutional setup should be in place to support this.

Regulation should ensure equality of opportunities and foster creativity (SMEs)

Technology requires a **sound business model** for broad adoption. Targeted **incentives** (smart taxing, feed-in tariffs) can drive change in current business models

Discussion Questions



Do cities in your country have long-term plans to absorb a rapidly growing population in a socially, economically and environmentally sustainable manner?

Which regulation, incentive and business models can promote public transport, sustainable buildings and energy/water conservation?

What type of public-private partnerships could succeed in fostering access to and application of science, technology and innovation in your cities?





Source: visibleearth.nasa.gov

Thank you for your attention
unctad.org/cstd