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International Energy Agency

2. Energy efficient urban planning

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Pretoria, 14 October 2019

IEA #energyefficientworld

Training Overview

2. Energy efficient urban planning

Scenario: There is increasing urbanisation and increasing demand for urban services

Question: How can we design a more energy efficient urban system?

Training Overview

1. **Energy use due to urban form**
   - Role of urban design and energy use
   - Other non-energy impacts of poor urban form

10 mins

2. **Drivers of urban form**

10 mins

3. **Policies for an energy efficient urban form**
   - Policy options for more energy efficient urban design

10 mins

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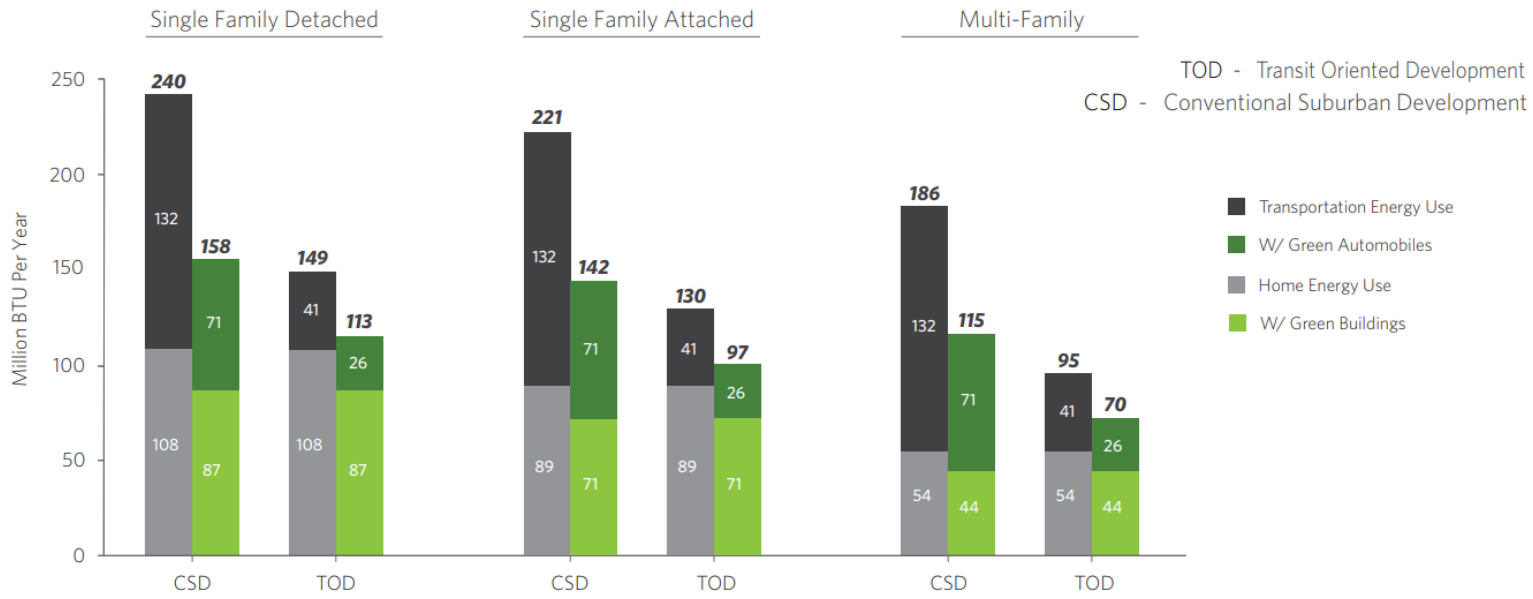
Training Overview

- This session is about the **urban form** and how it influences energy use. We discuss the impacts of poor urban form, what is the potential with better urban form policies and what is the impact of compact growth.
- We discuss what **drives urban form** in order to put in place policies that allow us to control/limit these drivers.
- Much of the urban planning activities are driven by socio-economic factors and hence much more difficult to control by energy-oriented policymakers.
- One of the biggest challenges to the difficulty of implementing spatial planning considerations is that the **impacts of energy use by a poor urban form is not directly felt by the planners**. This is the reason why the activity chosen for this is to map out the urban/spatial planning process and find ways where the energy consumption could be inserted.

1. Energy use due to urban form

Energy use due to urban form

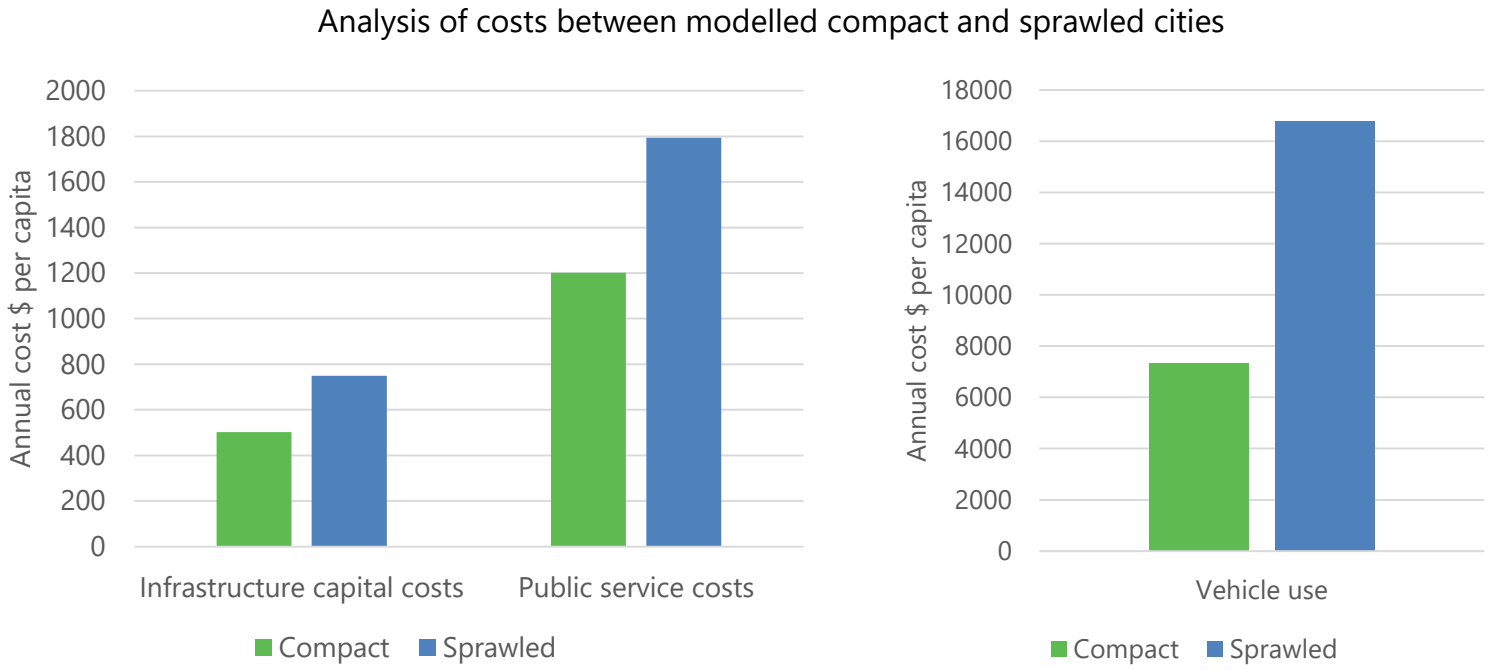
Energy use per household type based on urban form in the US



Compact, transit-oriented developments have significantly lower household energy use (residential + transport). Efficiency measures are more effective with better urban form

Source: JRC(2011) Location Efficiency and Housing Type

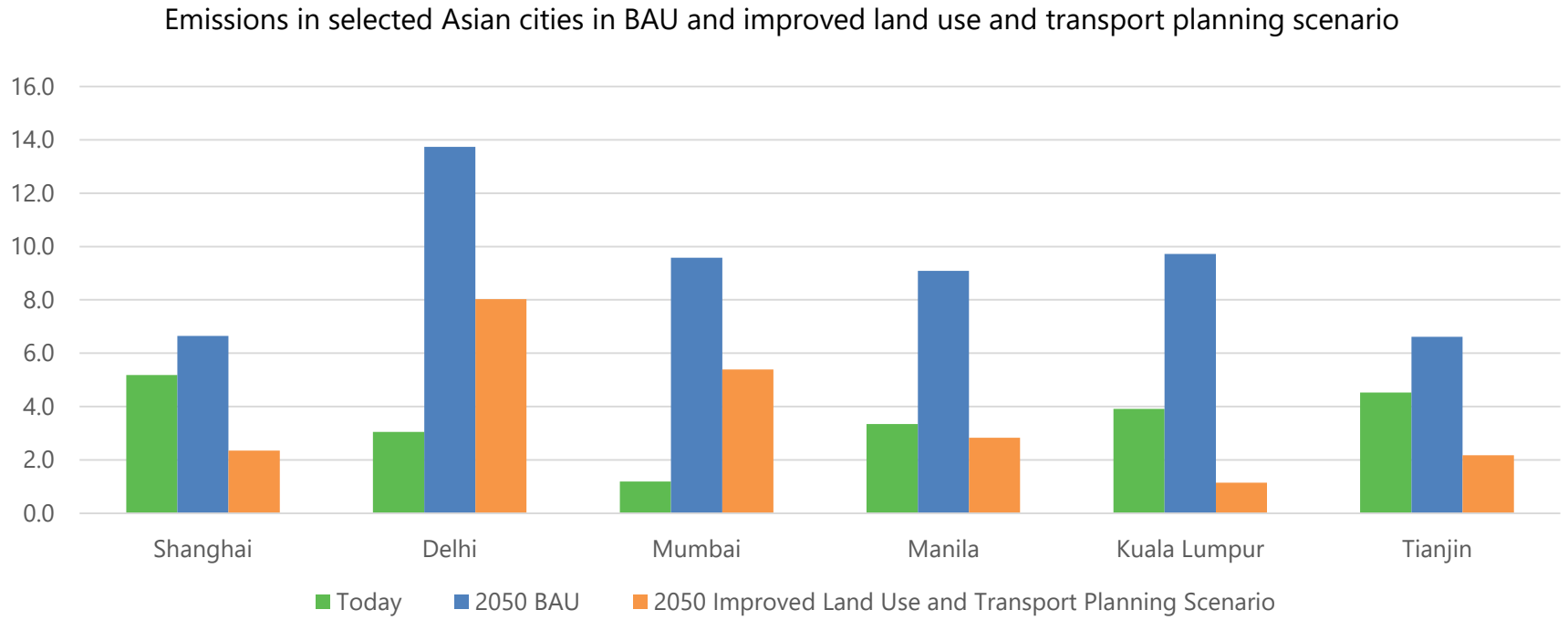
Impacts: costs to the municipality and inhabitants



Sprawled developments increase costs in terms of providing more public infrastructure and services

Source: Litman (2015) Analysis of Public Policies That Unintentionally Encourage and Subsidize Urban Sprawl

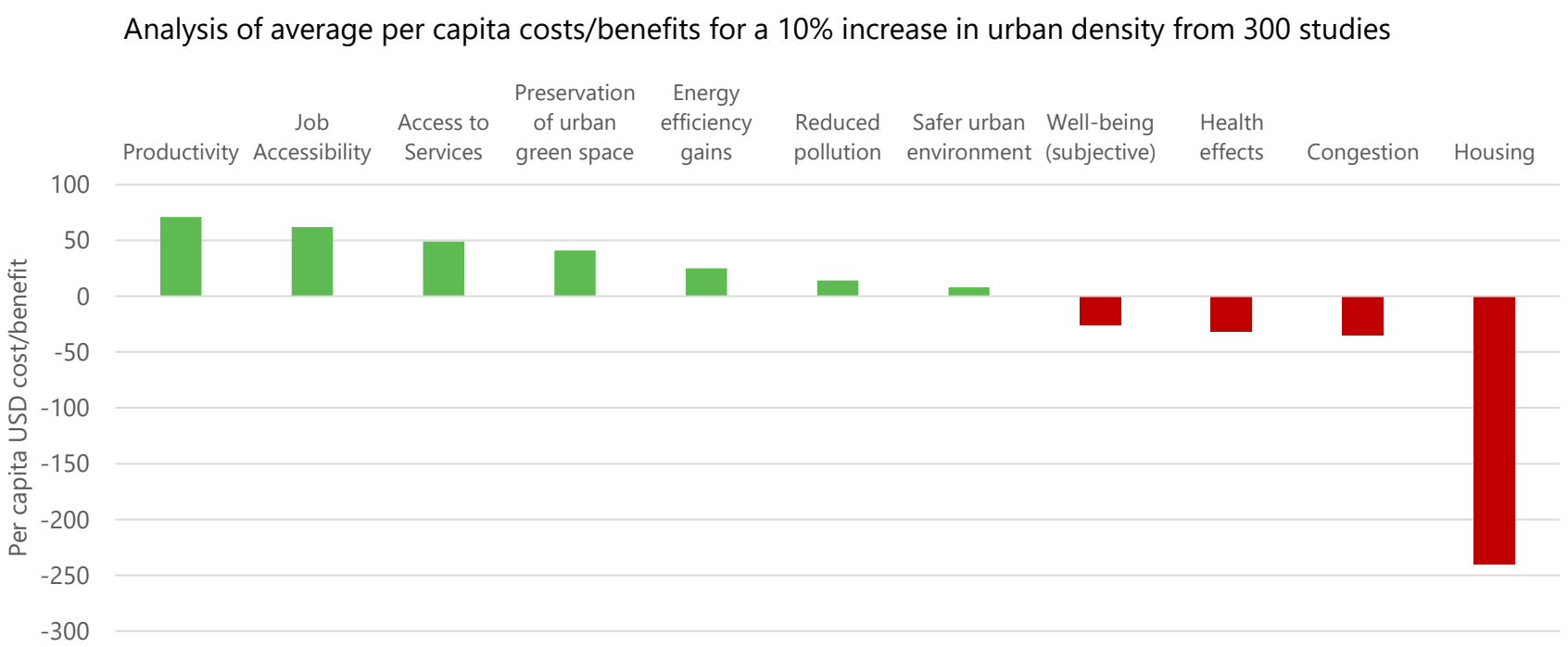
Potential of improving urban form



Improving land use and transport planning can reduce urban emissions in highly urbanising cities and in some cases even lower than today

Source: ITF Transport Outlook 2017

Impacts: benefits, and costs to watch out for



Case studies in the past have shown higher productivity and energy efficiency gains associated with compact growth. However, public transport and supply of housing could still be improved

Source: Ahlfedlt and Pietrostefani (2017) Demystifying Compact Urban Growth: Evidence from 300 Studies From Across the World

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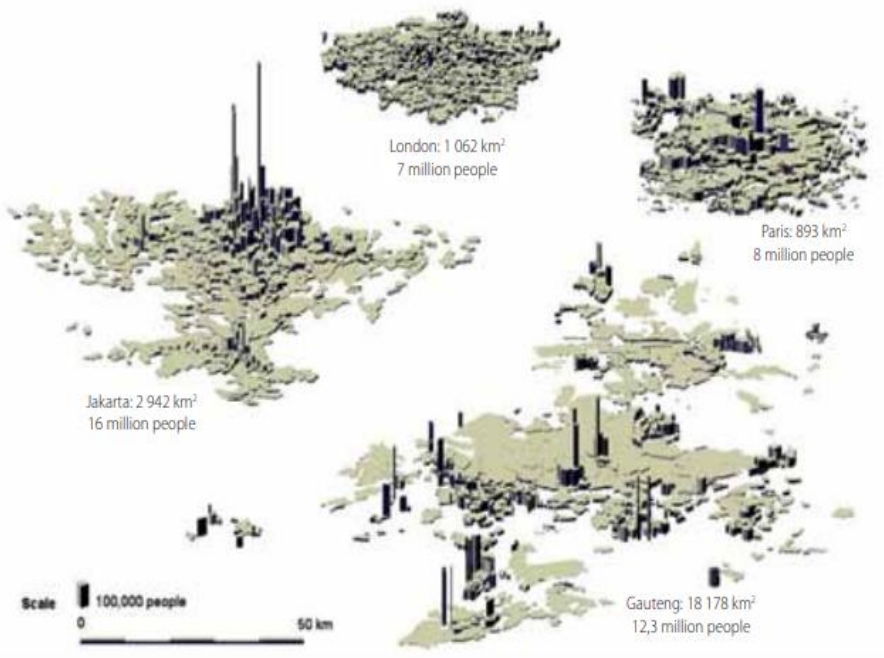
2. Determinants of urban form

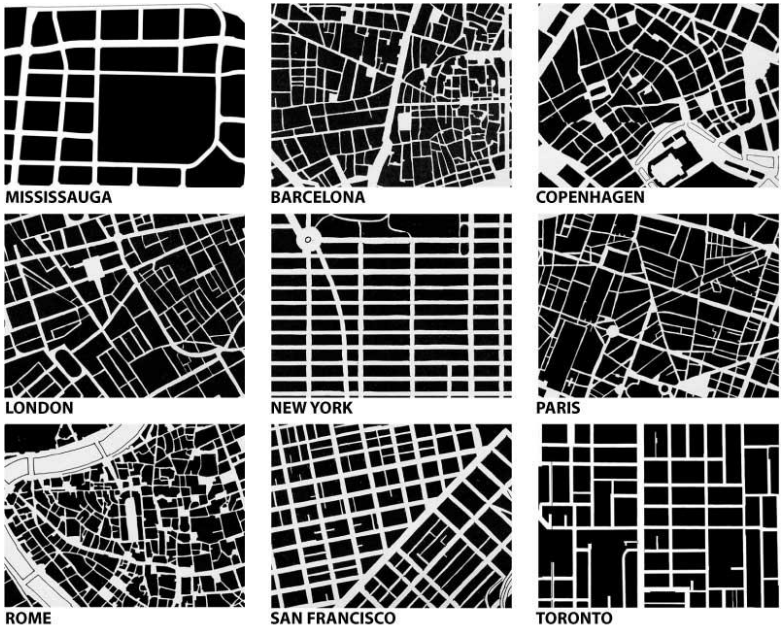
Determinants of urban form

Spatial distribution of population



Source: SAMSET (2015) Energy and urbanisation in South Africa
http://www.cityenergy.org.za/uploads/resource_262.pdf

Urban morphology and street grid



Source:
https://spacing.ca/toronto/2008/01/26/urban-fabricform-comparison/

Determinants of urban form

1. Land use pattern

- Land value drives the conversion of relatively cheaper rural land into urban land
- Left unchecked, urbanisation pressure on land use leads to changing urban form
- Without proper land use planning and value controls (e.g. land/property taxes), urbanisation tends to result in urban sprawl

2. Transport technologies

- Urban boundaries are also defined by destinations that can be reached in 1 hour
- Older cities (Europe/Asia) tended to be more compact as they were built when travel was done on foot.
- Newer cities (US/Australia) tend to sprawl as they were built when private car travel was widely available
- High private motorisation rates without proper planning tend to lead to urban sprawl

3. Political framework

- Regional/spatial planning authorities, stakeholders involved in the process, and their views on urban development
- The role of national and local government in planning, level of decentralisation and main functions
- Use/existence of spatial development policies

Source: https://www.esmap.org/node/55381

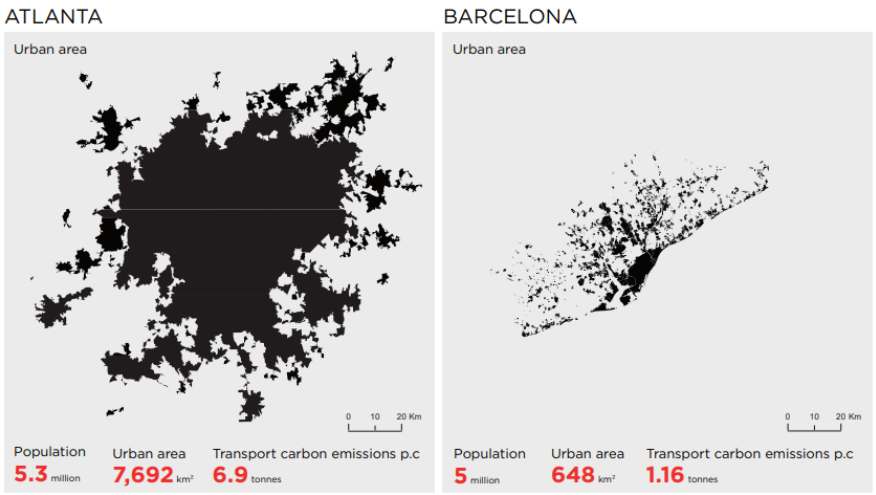
3. Policy recommendations

Policy recommendations: direct tools for local authorities

Increasing complexity

Land use planning	**Mixed-use development**	**Transit-oriented development**	**Integrated Urban Energy Planning**

- Using zoning to increase density and to mix residential, commercial, and industrial zones
- Transport energy use, and the associated carbon emissions can be significantly reduced by increasing density



Source: LSE Cities 2014

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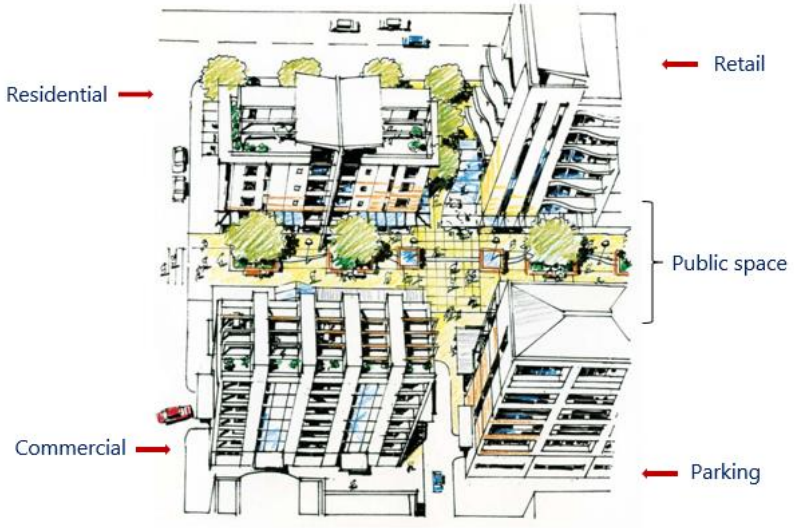
Policy recommendations: direct tools for the local authority

Increasing complexity

Land use planning	Mixed-use development	Transit-oriented development	Integrated Urban Energy Planning

- Require mixed-use for property developers
- Create development guides for easy access for planners (example: City of Adelaide Mixed-Use Development Guide)



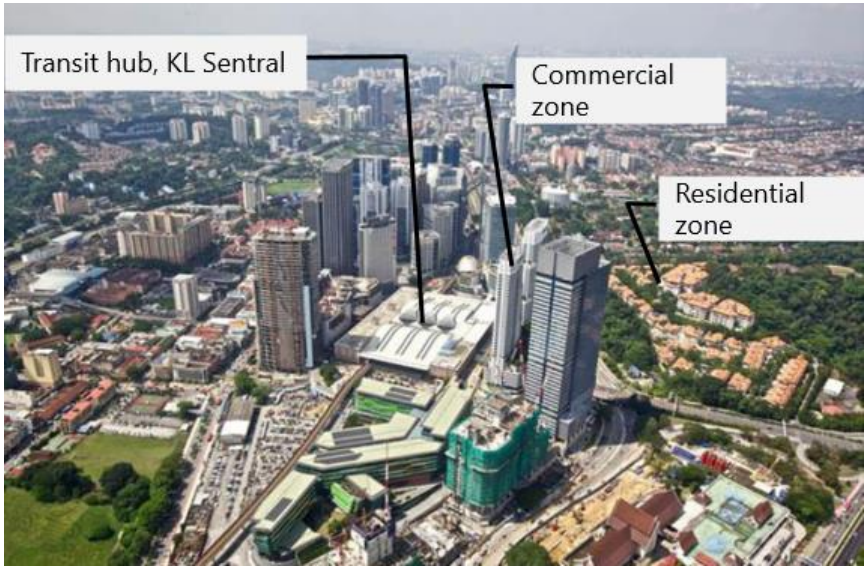
Horizontal mixed-use

Policy recommendations: direct tools for the local authority

Increasing complexity

Land use planning	Mixed-use development	Transit-oriented development	Integrated Urban Energy Planning

- Organizing mixed-use development around transit hubs to integrate districts with public transport
- Example is Kuala Lumpur, TOD in 2020 City Plan with the features:
  - Goal of 60% public transport vs 30% today
  - 30% developer discount on zones near train stations if they provide park-and-ride schemes
  - Zones located 200m-400m from train stations
  - Residential zones to build homes at 75 sqm at USD 112600 (price cap)



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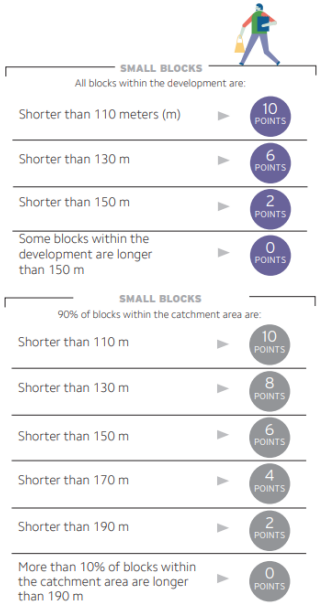
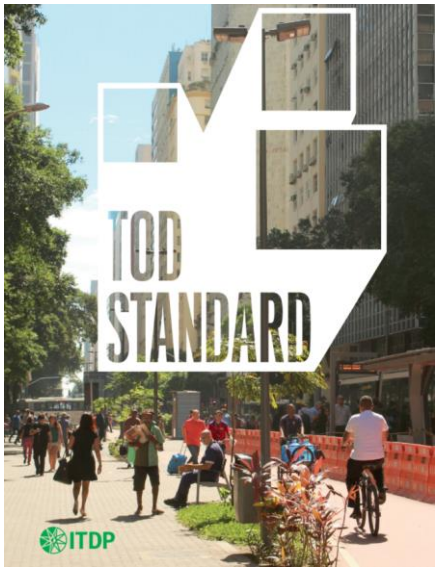
Policy recommendations: direct tools for the local authority

Increasing complexity

Land use planning	Mixed-use development	Transit-oriented development	Integrated Urban Energy Planning

- ITDP Developed a TOD Standard where the different principles of Transit Oriented Development are simplified
- Metrics are available to give more direct guidance on implementation on what would work





Source: ITDP (2017) TOD Standard

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Policy recommendations: direct tools for the local authority

Increasing complexity

Land use planning	Mixed-use development	Transit-oriented development	Integrated Urban Energy Planning

Voortrekker Road Corridor TOD in Cape Town

Source: http://futurecapetown.com/2016/06/voortrekker-road-corridor-holds-the-key-for-cape-towns-future-growth-future-cape-town/

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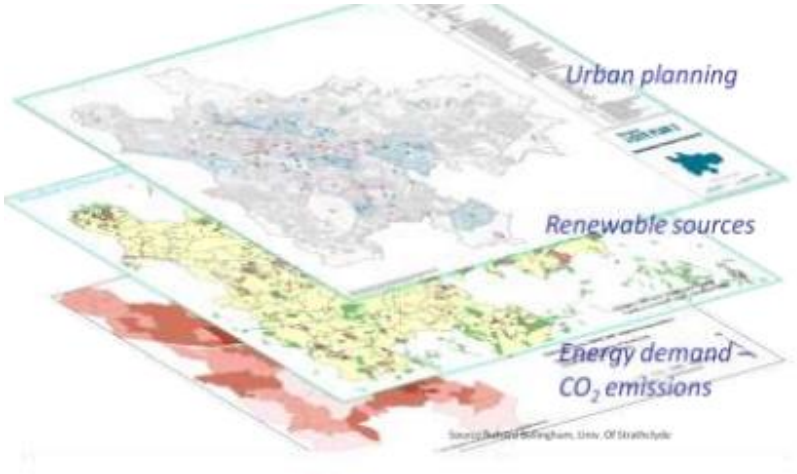
Policy recommendations: direct tools for the local authority

Increasing complexity

Land use planning	Mixed-use development	Transit-oriented development	Integrated Urban Energy Planning

- Use of combined expertise on energy planning and spatial planning, taking advantage of other resources as well (e.g. water)

- There are tools which support this such as the one developed by Univ. of Strathclyde



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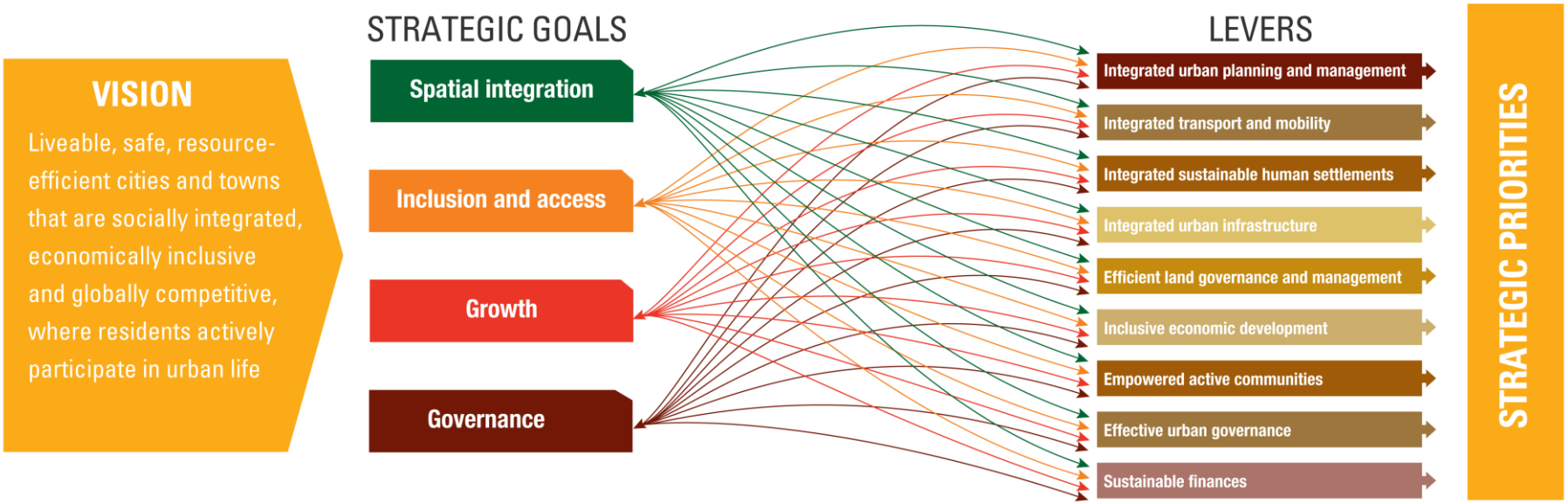
Policy recommendations: direct tools for local authorities

South Africa's Integrated Urban Development Framework (IUDF)



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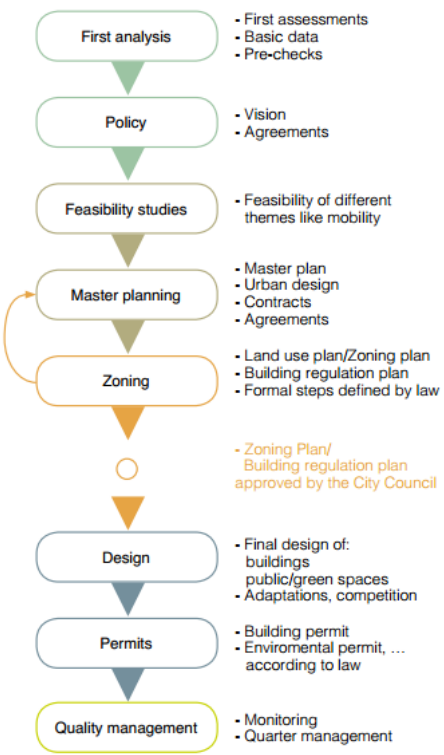
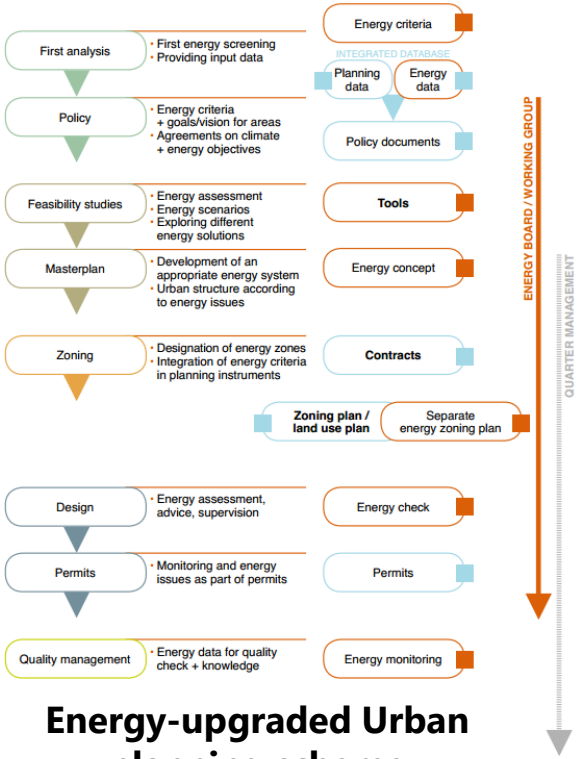
Policy recommendations: modify planning processes

1. **Map out** urban/regional spatial planning schemes as well as energy planning schemes
2. Check if there is any **intersection of actors** in the stakeholder consultation phase, and analyse the capabilities of planners
3. **Analyse the timing** of the planning duration
4. Propose upgrades to one or both



Urban planning scheme City of Vienna



Energy-upgraded Urban planning scheme

Source: http://www.urbanlearning.eu/

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Additional References

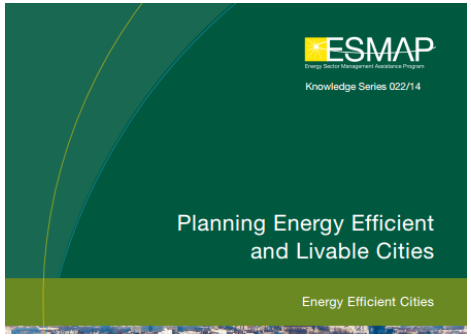
https://www.iea-ebc.org/ebc

EBC

Energy in Buildings and Communities Programme

IEA EBC Annex 51 and 63 work on urban planning

https://www.esmap.org/node/55381



ESMAP work on planning EE cities

http://www.urbanlearning.eu/

Urbanlearning work on integrating energy planning with urban planning

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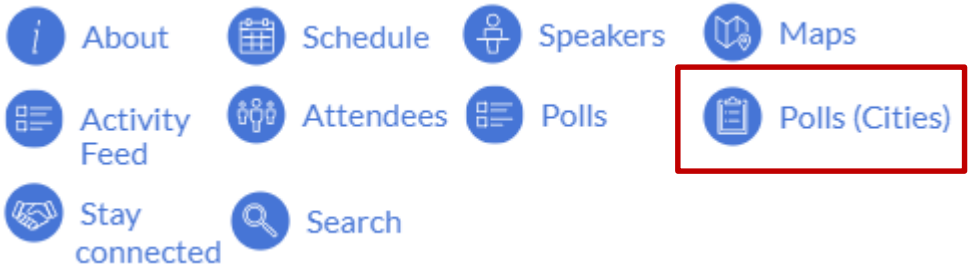
Poll Time! Cities 2: Urban Form

Access the polls here:



Q: What are the common challenges in your city surrounding compact urban growth?

- ❑ Expensive land / rent
- ❑ Safety
- ❑ Congestion
- ❑ Pollution
- ❑ Lack of green space
- ❑ Lack of public transport

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