



2. Energy efficient urban planning

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IEA #energyefficientworld

2. Energy efficient urban planning



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Trainer(s): John Dulac

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

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

1. Urban planning and design

- Role of urban design and energy use
- What designs allow you to consume energy less?

25 mins

2. How to get there?

- Development and planning concepts
- Additional strategies to reduce urban energy use

35 mins

1. Urban planning and design

Role of urban planning and design in energy use
Which designs consume energy less

1. Urban planning and design. Role of urban design



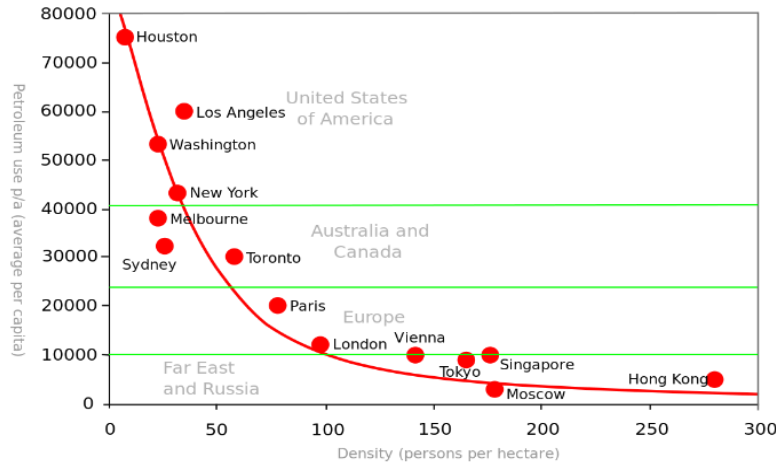
Where to start?

Tools

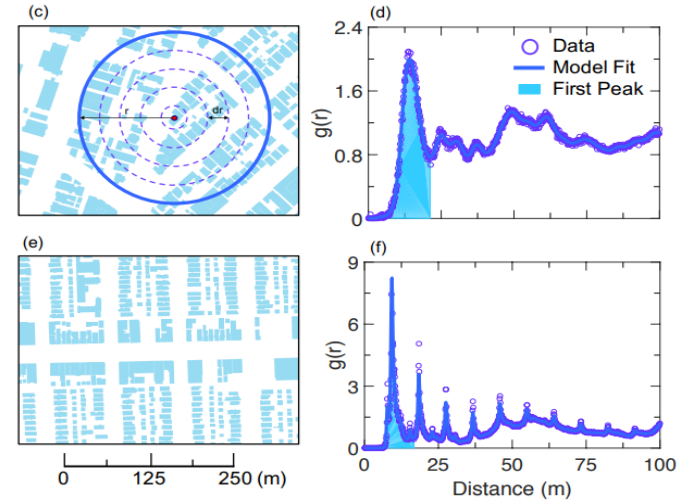
What are the steps?

- As discussed in Session 1, structural aspects from urban design affect energy use

- More sprawled cities use more energy than dense ones**



- The more grid-like, the more it traps heat**



Source http://cshub.mit.edu/sites/default/files/documents/CityTextureUHI_Feb2018.pdf

1. Urban planning and design. Role of urban design

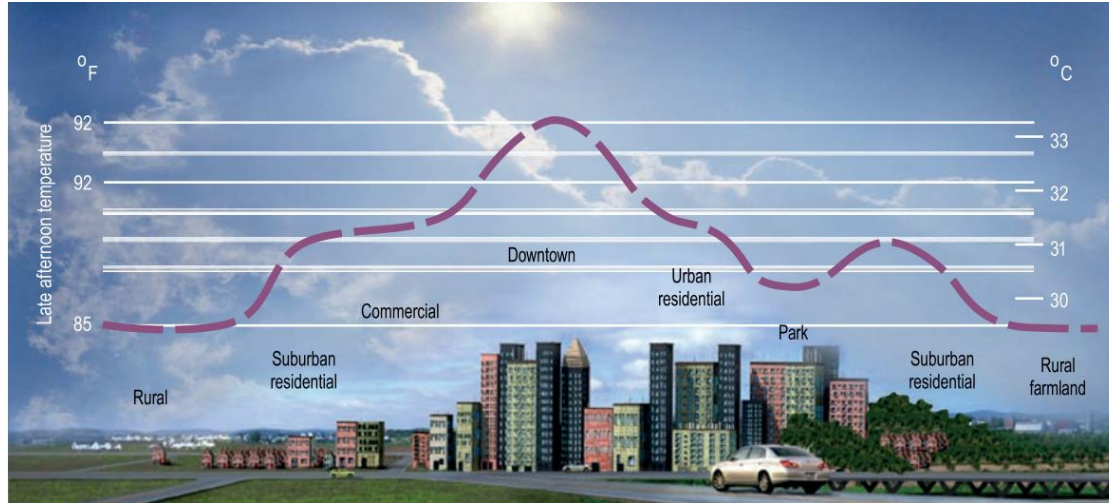


Where to start?

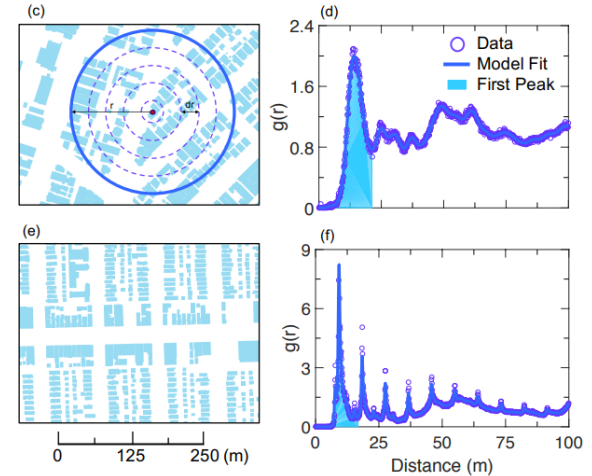
Tools

What are the steps?

- For example: **Trapped heat** aggravates **urban heat island effect**, increases **air conditioning** use



- The more grid-like, the more it traps heat



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1. Urban planning and design



Where to start?

Tools

What are the steps?

So what designs are better?

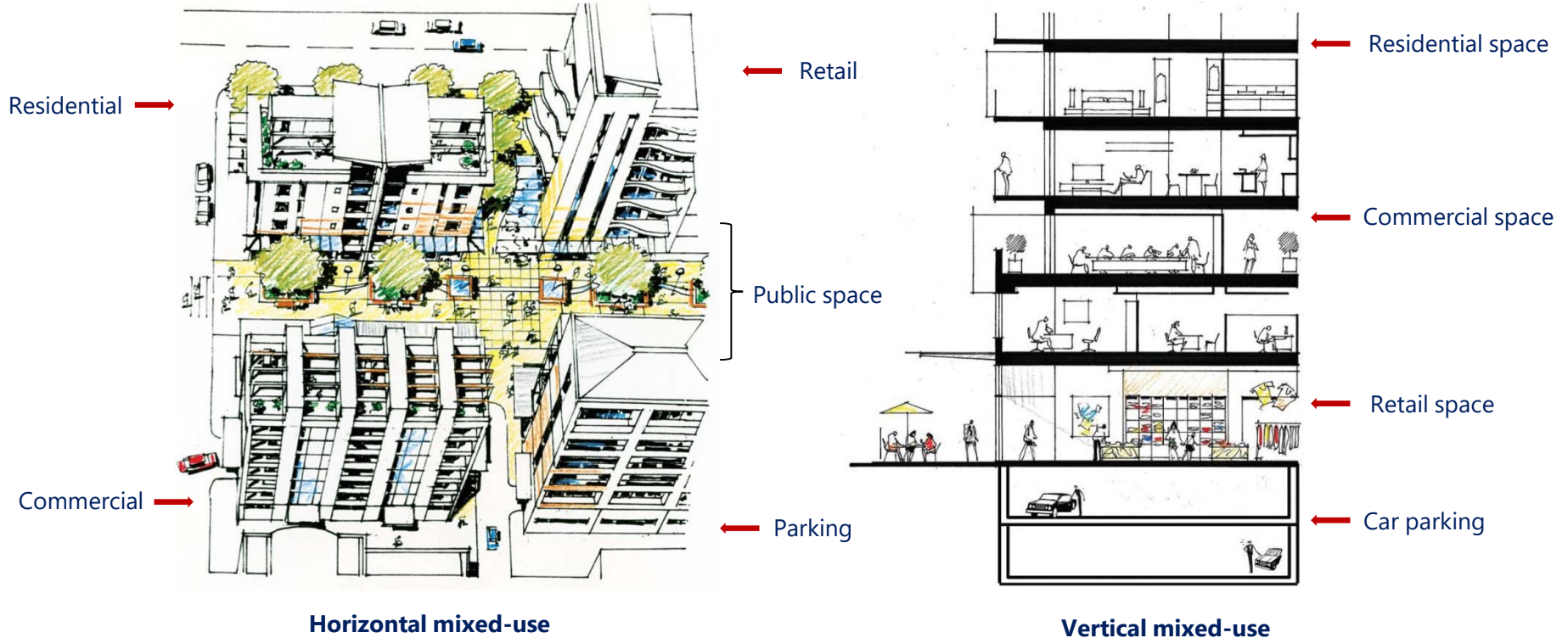
1. Urban planning and design. What designs work?

Where to start?

Tools

What are the steps?

- **Mixed-use design** instead of **sprawled design**



1. Urban planning and design. What designs work?

Where to start?

Tools

What are the steps?

- **Mixed-use design** instead of **sprawled design**



Horizontal mixed-use development in Auckland, New Zealand

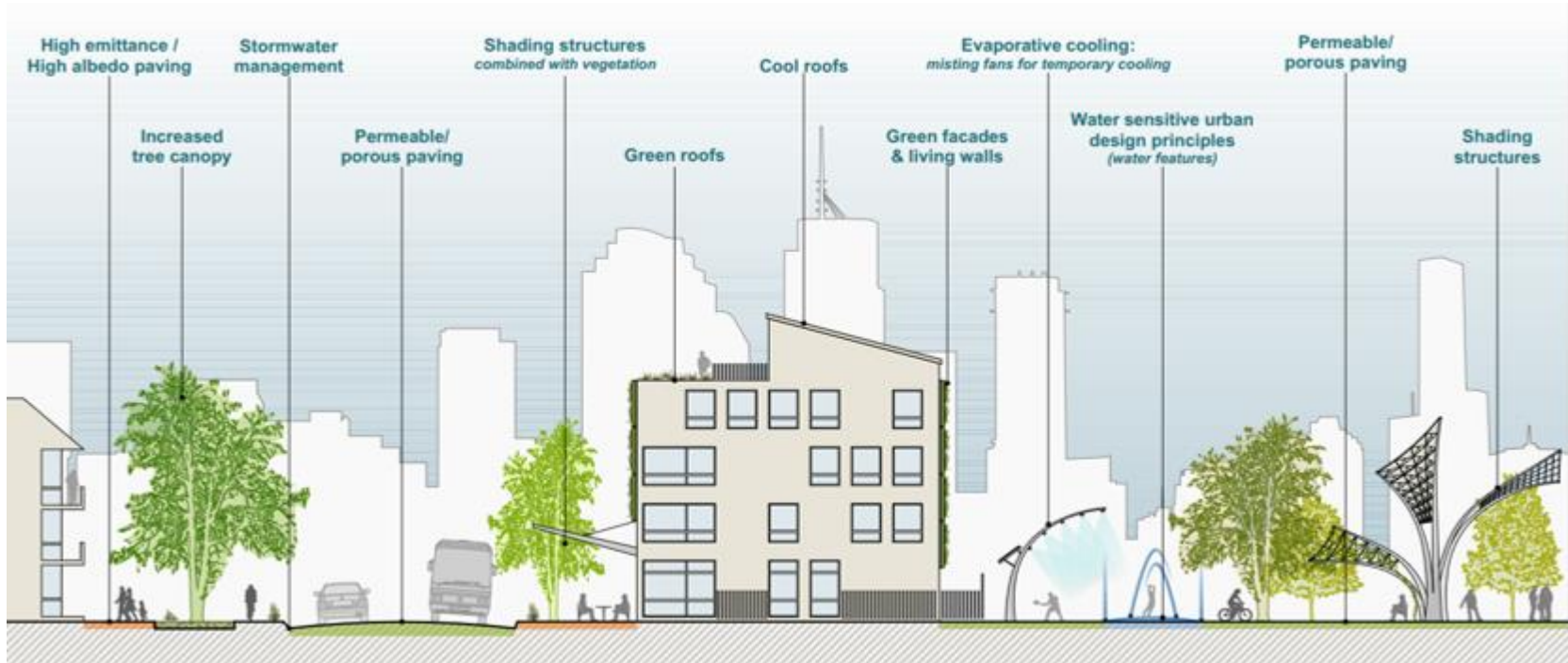
1. Urban planning and design. What designs work?

Where to start?

Tools

What are the steps?

- **Natural design (trees, colours, shading, spacing) instead of concrete jungles**



1. Urban planning and design. What designs work?



Where to start?

Tools

What are the steps?

- **Natural design (trees, colours, shading, spacing) instead of concrete jungles**



Vertical greenery and green roofs in Singapore



Permeable and reflective block pavers for cool surfaces



White reflective coating for cool roofs in New York, USA

1. Urban planning and design. What designs work?



Where to start?

Tools

What are the steps?

- **Case study: Amsterdam**



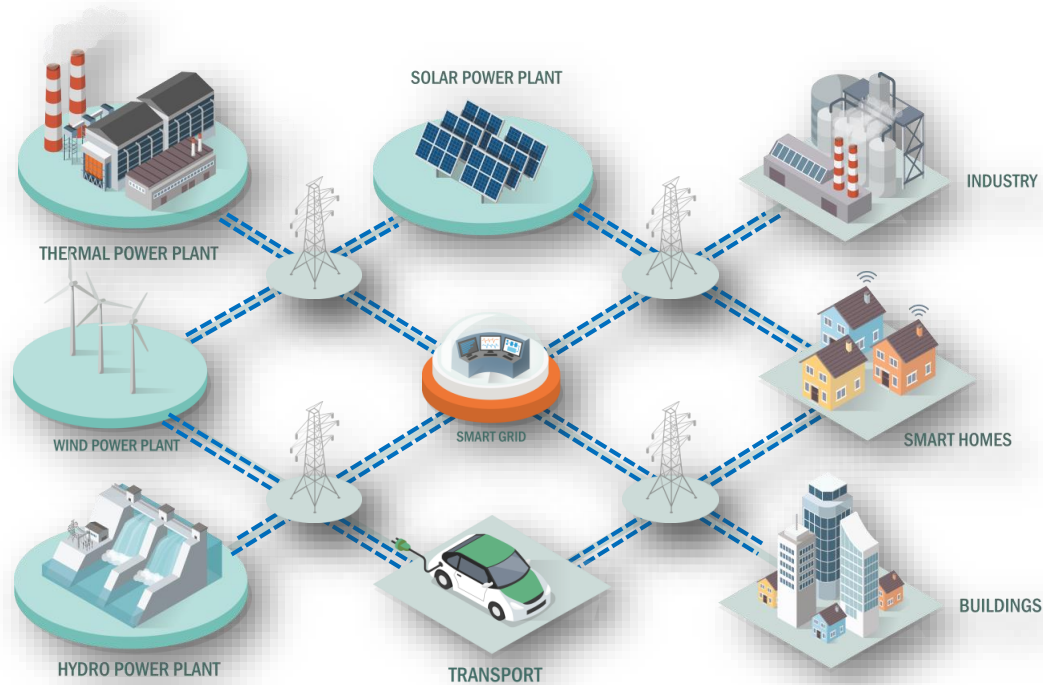
1. Urban planning and design. What designs work?

Where to start?

Tools

What are the steps?

- What does an energy efficient energy system look like?



2. How to get there?

Development and planning concepts

Additional strategies to reduce urban energy use

2. How to get there?



Where to start?

Tools

What are the steps?

Complexity

Land use planning

Mixed-use development

Transit-Oriented Development

Integrated Urban Energy Planning

Where to start?

Tools

What are the steps?

Promoting walkable cities with **non-motorised options** and **increased public transport** use



Where to start?

Tools

What are the steps?

Sustainable streets on Times Square



Where to start?

Tools

What are the steps?

Shared Streets Program in Auckland, New Zealand



Land-use: Sustainable Streets (encouraging public transport)

Where to start?

Tools

What are the steps?

Dublinbikes located close to residential homes and alternative public transport

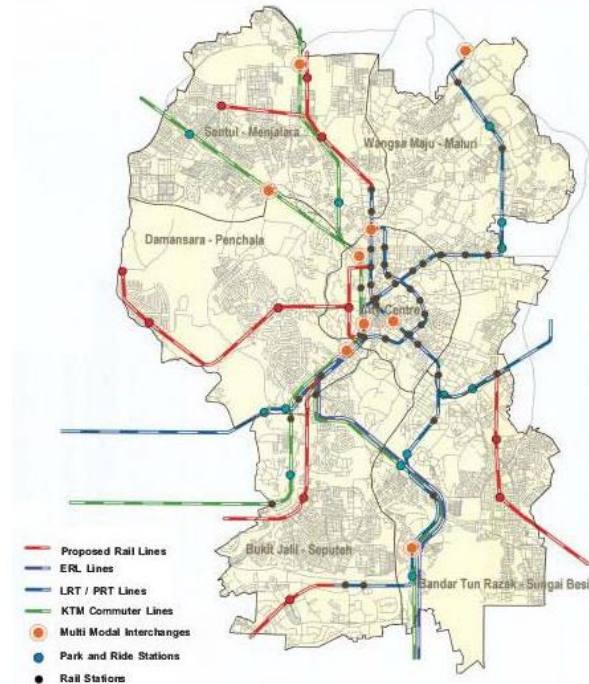
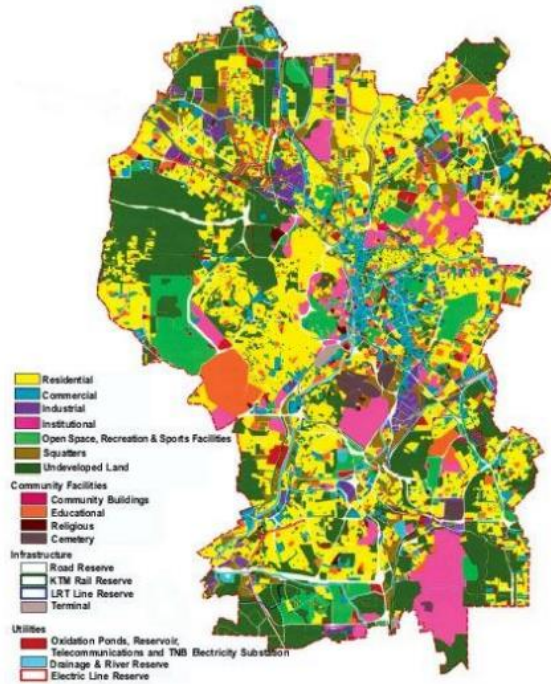


Land-use > Mixed-use > Transit-Oriented Development

Where to start?

Tools

What are the steps?



Kuala Lumpur embraces Transit-Oriented Development in its 2020 City Plan. Mixed-use planning to be done around stations to promote public transport.

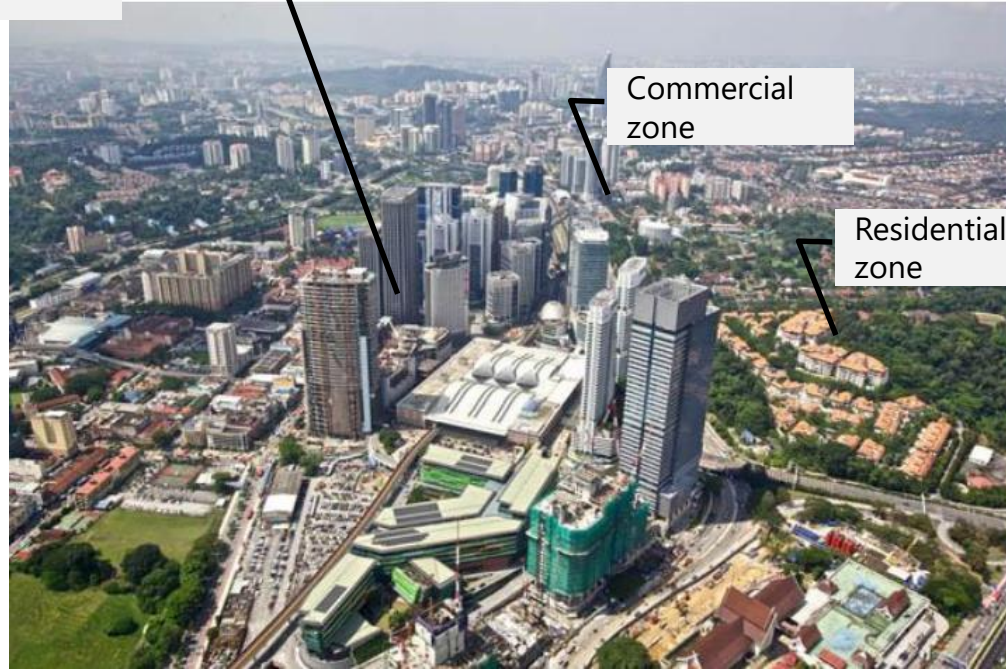
Land-use > Mixed-use > Transit-Oriented Development

Where to start?

Tools

What are the steps?

Transit hub, KL Sentral



Kuala Lumpur embraces Transit-Oriented Development in its 2020 City Plan. Mixed-use planning to be done around stations to promote public transport.

- 2008/2009: massive traffic jams in KL, currently 30% public transport 70% private-> goal set is 60% public to 40% private,
- **Park and ride schemes:** 30% developer discount on zones near train stations if they build parking areas to encourage Park and Ride
- **Direct planning requirements:** Zones must be placed between 200m to 400m of the train stations (similar to Singapore model)
- **Direct development guidelines:** Residential zones to build homes at 800 sq. ft. (~75sq. m), at USD 112 600
- More Transit-Oriented-Development Focus for Bandar: although recently there has been **no successful bids** so far

Transit-oriented development: the context of cities

Where to start?

Tools

What are the steps?

- Travel demand management programmes

- Improved travel-managed technologies

Private motorised travel

Sprawled cities

Congested cities

Developing cities

Multi-Modal cities

- Discouraging private motorised travel

- Dedicated facilities for bus/cycling lanes

Urban density

City contexts within the urban land-use and travel framework

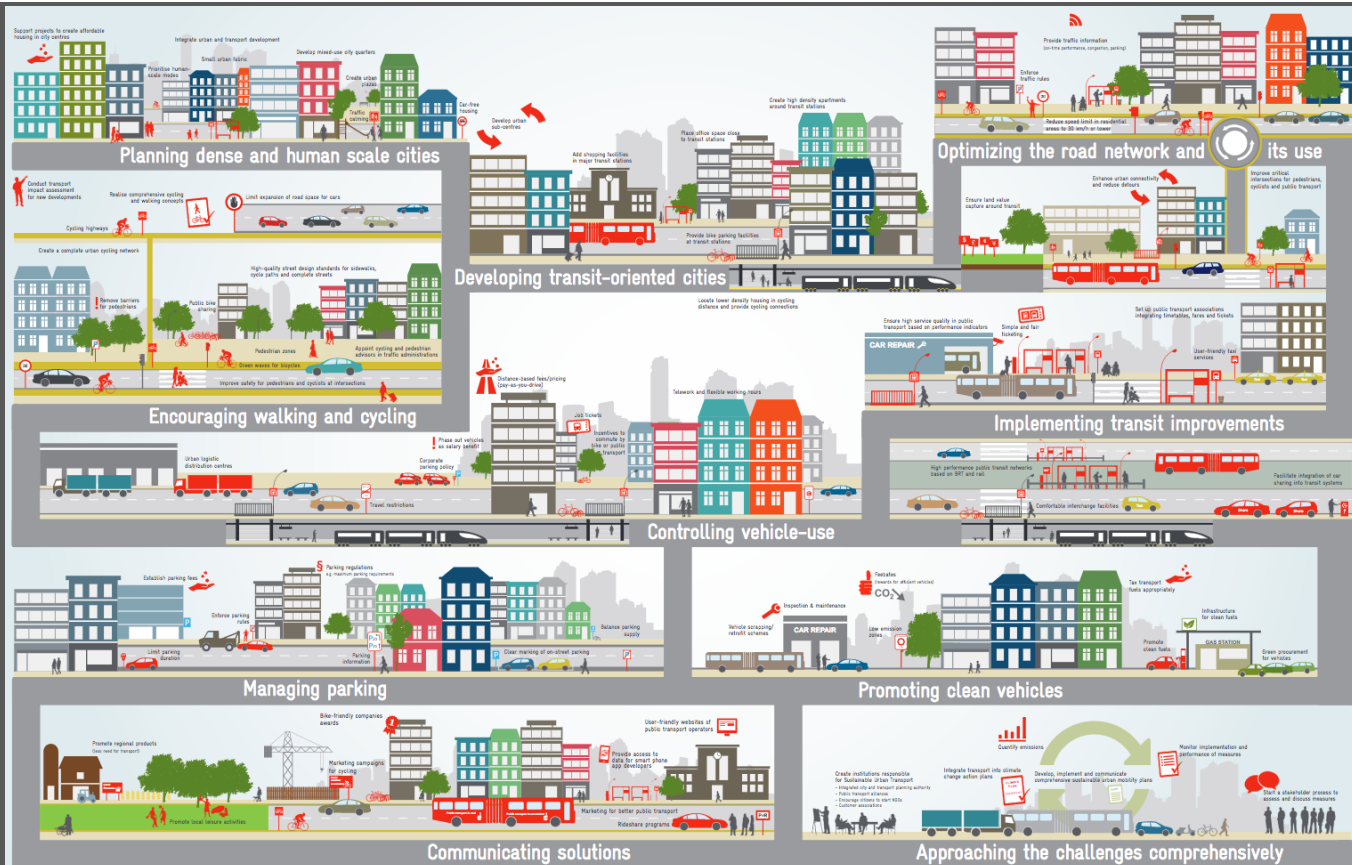
Specific opportunities for cities



Where to start?

Tools

What are the steps?

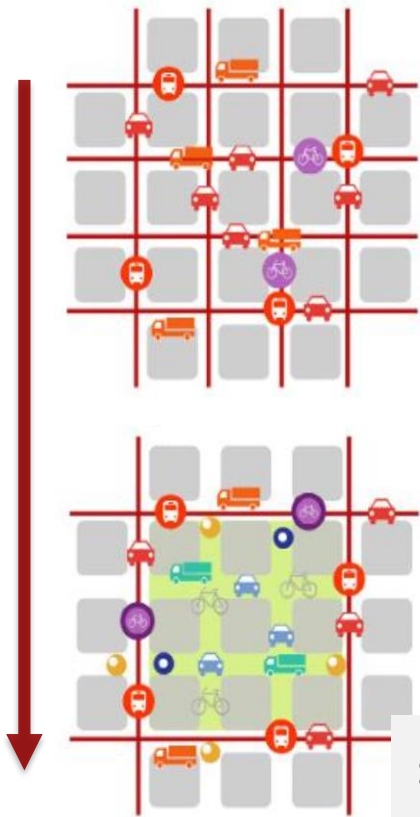


Sustainable streets & access and proximity to transit

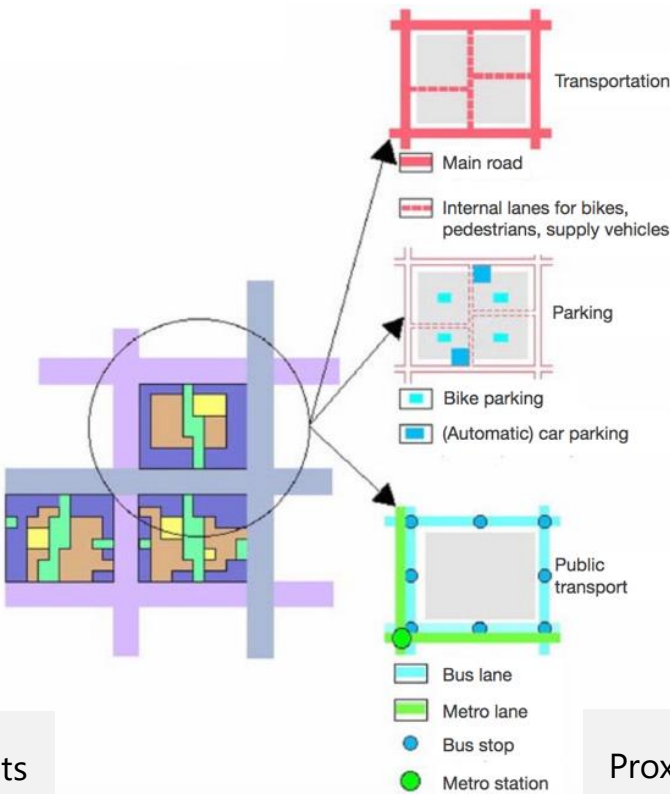
Where to start?

Tools

What are the steps?



Sustainable Streets



Proximity to Transit

Where to start?

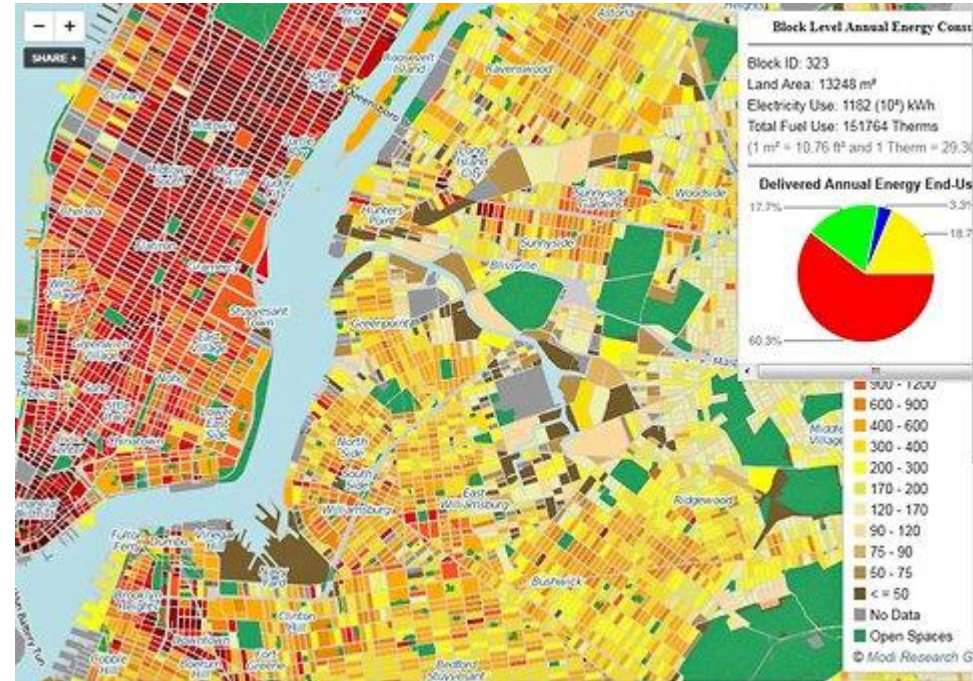
Tools

What are the steps?

Mapping of energy intense areas in cities for more informed planning



Map of energy balance in municipalities through an E-City platform



Spatial distribution of urban building energy consumption by end use using GIS

Where to start?

Tools

What are the steps?

- Improved ICT connections for virtual mobility, e.g. teleworking



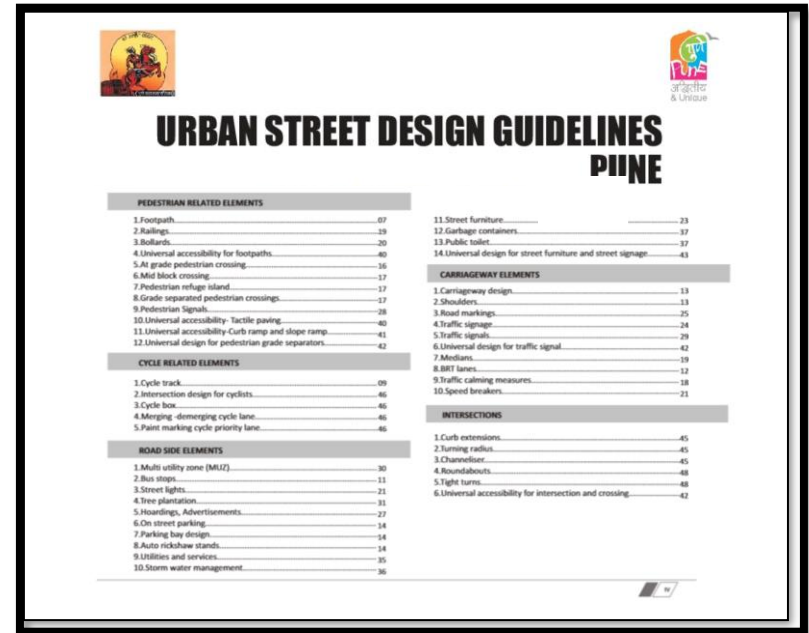
Additional strategies to reduce urban energy use

Where to start?

Tools

What are the steps?

- Mixed-use development and sustainable streets
 - Zoning **by-laws** and **development regulations**
 - Urban planning and street design **guidelines**
 - Street **codes** to favour walking and cycling



Where to start?

Tools

What are the steps?

- Sustainable transport
 - Travel demand management
 - Development **standards** to address transport efficiency
 - **Subsidies/tax incentives** for low-carbon transport city design/planning
 - Freight logistics



Where to start?

Tools

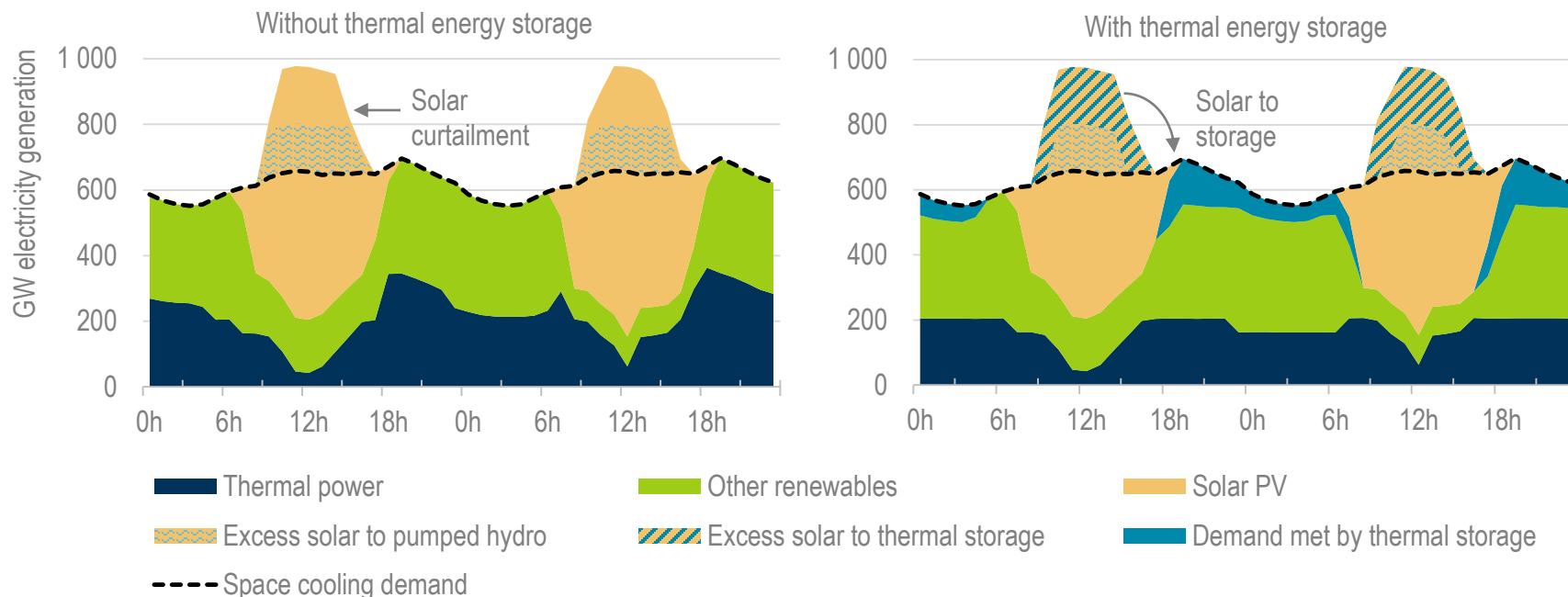
What are the steps?

- Improved ICT
 - **Mobility management** & marketing (e.g. IT-based communications)
- **Information tools** to raise awareness of real travel costs



Demand-side management: what is the potential?

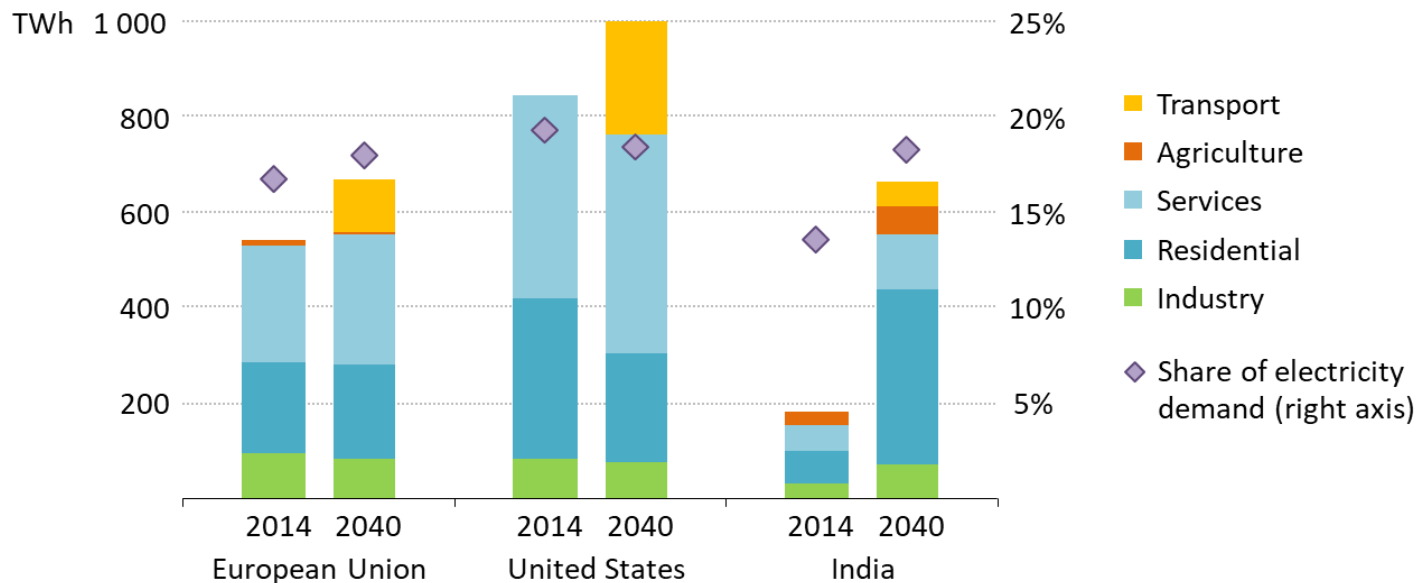
The potential role of storage and renewables in India



Thermal storage – for example using a district cooling network – could take advantage of solar output to meet cooling energy demand and alleviate peak strain on the power system

Demand-side management: what is the potential?

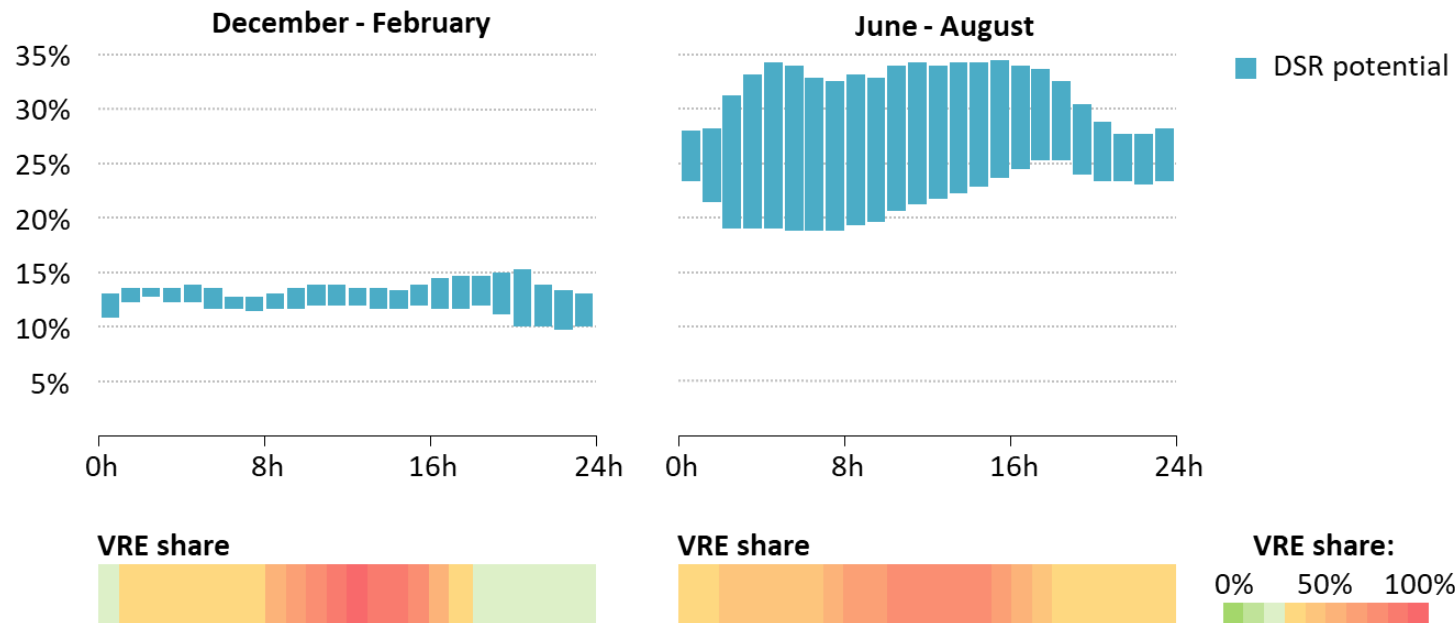
Technical potential of demand-side response by region in the 2 °C scenario



The technical potential for demand-side response is up to 20% of demand, with electric vehicles set to play a larger role through 2040

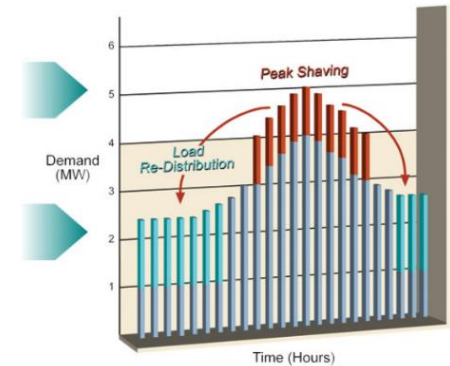
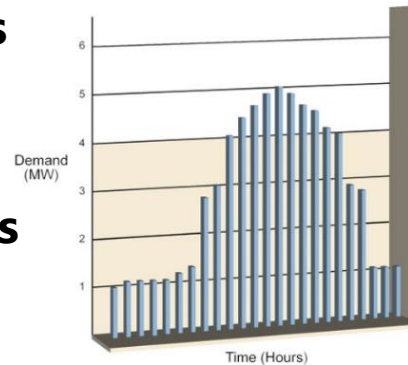
Demand-side management: what is the potential?

Share of load that can be shifted for typical days in two seasonal periods in India in the 2°C scenario, 2040



Almost a third of electricity demand in India could be shifted in summer, while highest VRE share are observed in winter

- Utilities can implement demand-side management programmes:
 - Strong **institutional capacities**
 - Sufficient **technical/admin capabilities**
 - Sufficient **implementation capacity**
 - Thorough **understanding of customers**
 - **Incentivised** to manage peak load, electricity demand



Demand side management opportunities:

Demand Response	Rate-induced demand response
	Incentive-based demand response
End use energy efficiency	Incentives to customers/manufacturers to purchase/provide energy efficient products
Distributed generation close to consumption	E.g. roof mounted solar PV systems



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