Where to start:

Energy use in municipalities

Municipal & Utility Services: Session 1

John Dulac

New Delhi, 10 December 2018

#energyefficientworld

Energy Efficiency Training Week: Municipal and Utility Services

1. **Where to start:** Energy use in municipalities
2. **Where to start:** Energy efficiency potential in municipalities
3. **Toolkit:** Energy-efficient municipal planning
4. **Toolkit:** Energy-efficient technologies

   Where do I get help? IEA's Technology Collaboration Programmes
5. **What are the steps:** Implementing energy efficiency programmes – target setting
6. **What are the steps :** Implementing energy efficiency programmes – implementation
7. **What are the steps:** Enabling public energy efficiency investment
8. **What are the steps:** Enabling private energy efficiency investment

   Special session: Multiple benefits of energy efficiency for municipalities
9. **Did it work:** Evaluation and energy efficiency indicators

   Special session: International and regional initiatives that can help
10. **Energy Efficiency Quiz:** Understanding energy efficiency in municipal and utility services

1. **Where to start:** Energy use in municipalities

Trainer(s): John Dulac

Purpose: To teach the fundamentals and dynamics of energy use in municipalities

Scenario: Your mayor/commissioner is under pressure to reduce energy consumption to meet national targets.

Question: How do you help the commissioner understand the drivers of energy consumption in the municipality?

1. **Why is municipal energy use important?**

2. **What are examples of drivers of energy use in municipalities?**
   A. Public buildings
   B. Transport
   C. Utilities
   D. Waste

3. **Activity: Drivers influencing energy consumption in municipalities**

1. Why is municipal energy use important?

1. Why is municipal energy use important?

A few of the main responsibilities of municipalities…

- **PLANNING**
  - Urban planning
  - Regulation of land-use, construction of buildings
  - Roads, bridges, crossings
- **BASIC NECESSITIES**
  - Water supply
  - Public health, sanitation, solid waste management
- **OTHER SERVICES**
  - Street lighting
  - Municipal and public buildings, social housing, slum improvements
  - Protection of the environment
  - Public transport, parking

1. Why is municipal energy use important?

… and they involve energy consuming sectors below in one way or another

Buildings

Public administration buildings, schools, hospitals, libraries, museums, social housing

Transport

Public transport, street design, traffic signals and signage

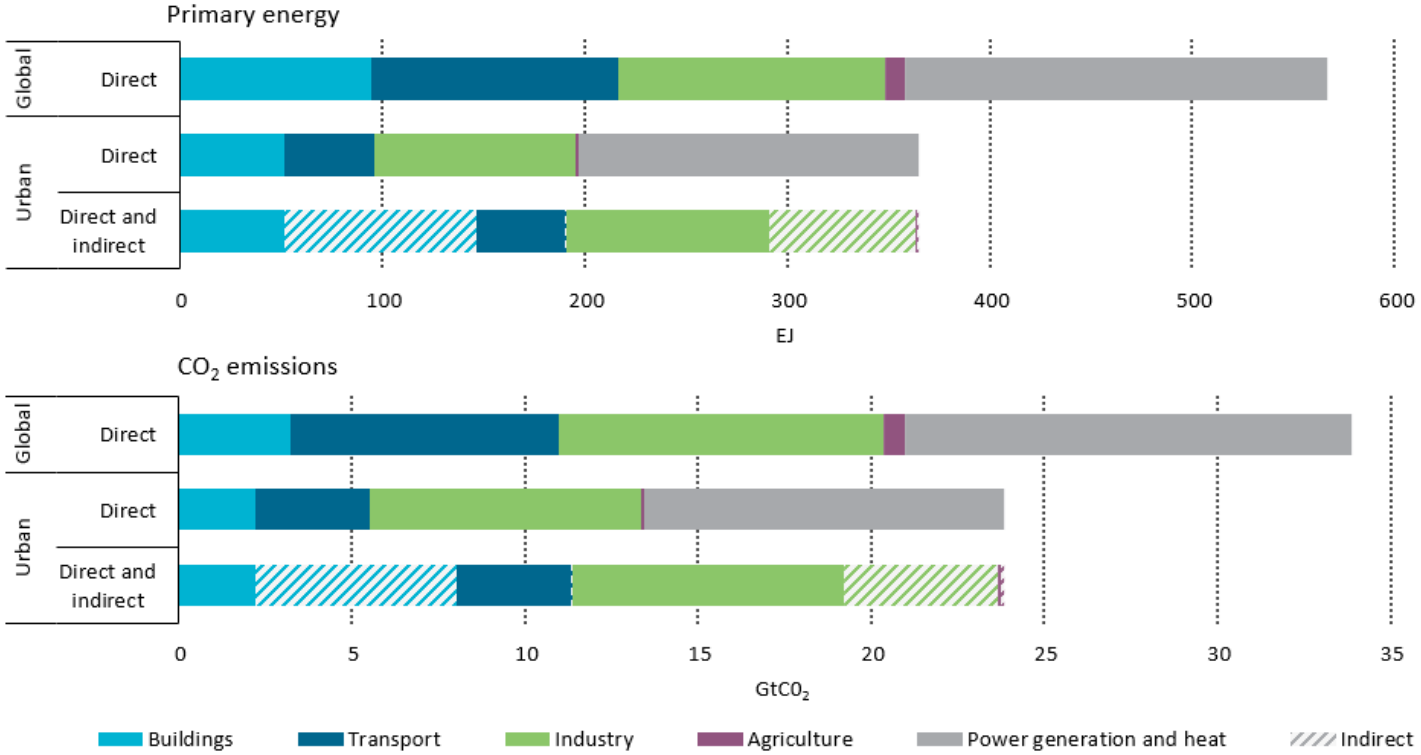
Utilities

Lighting, water supply and sewage, local energy networks

Waste

Landfilling, waste management

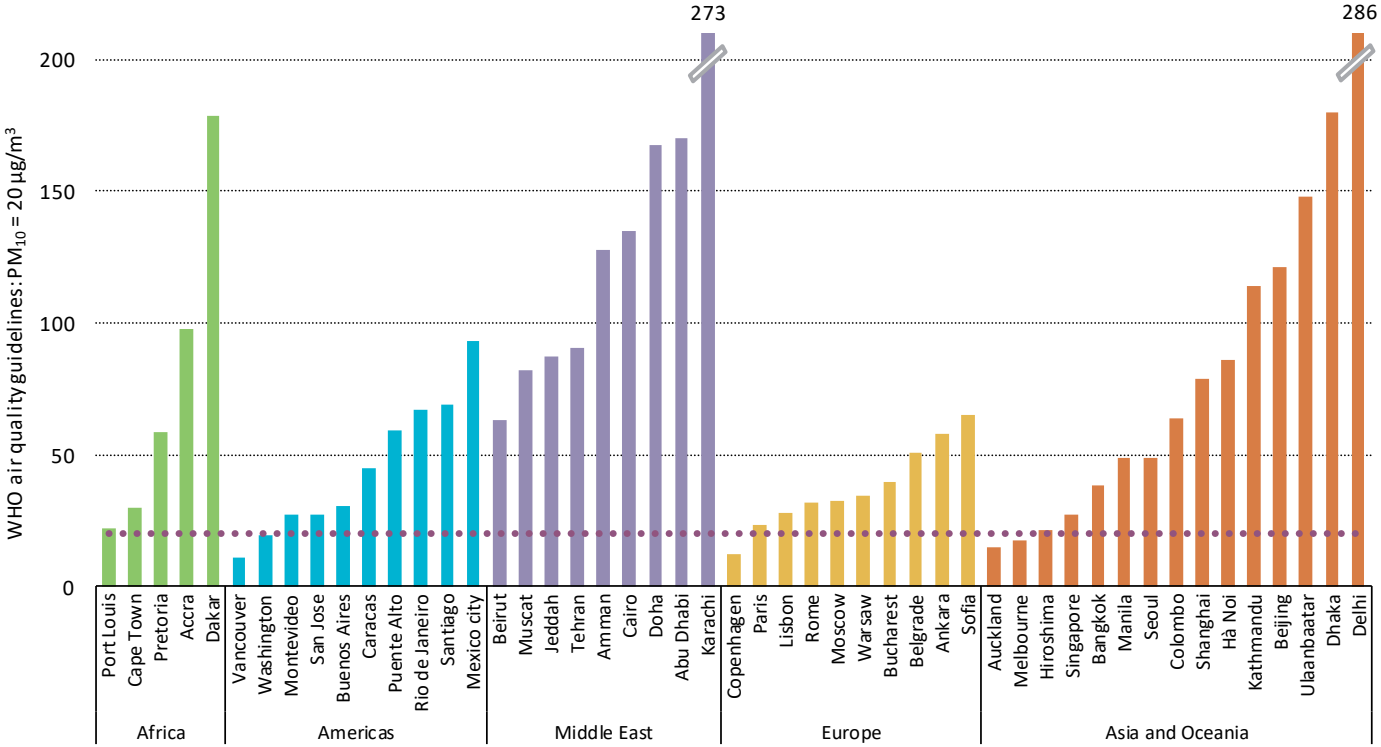
1. Why is municipal energy use important?



The majority of global energy use and greenhouse emissions comes from urban areas.

Source Energy Technology Perspectives 2016

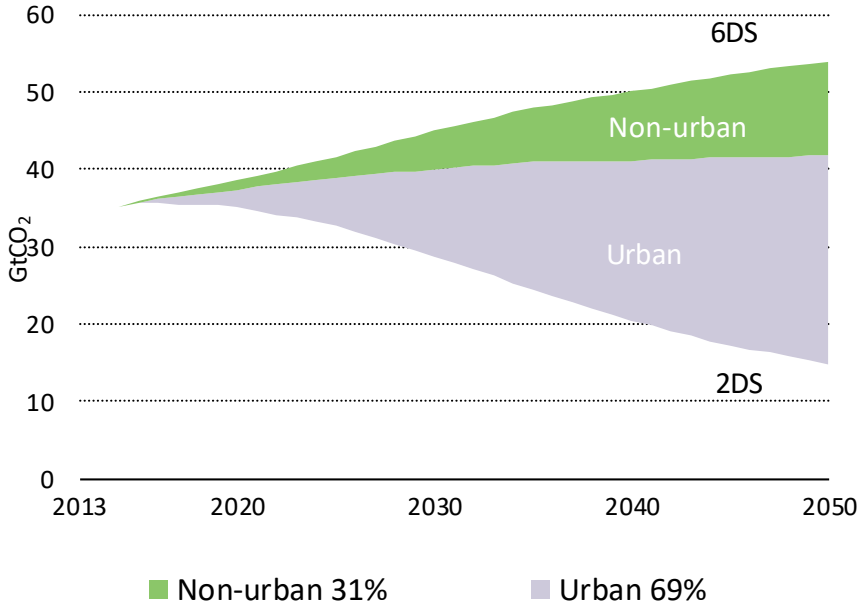
1. Why is municipal energy use important?

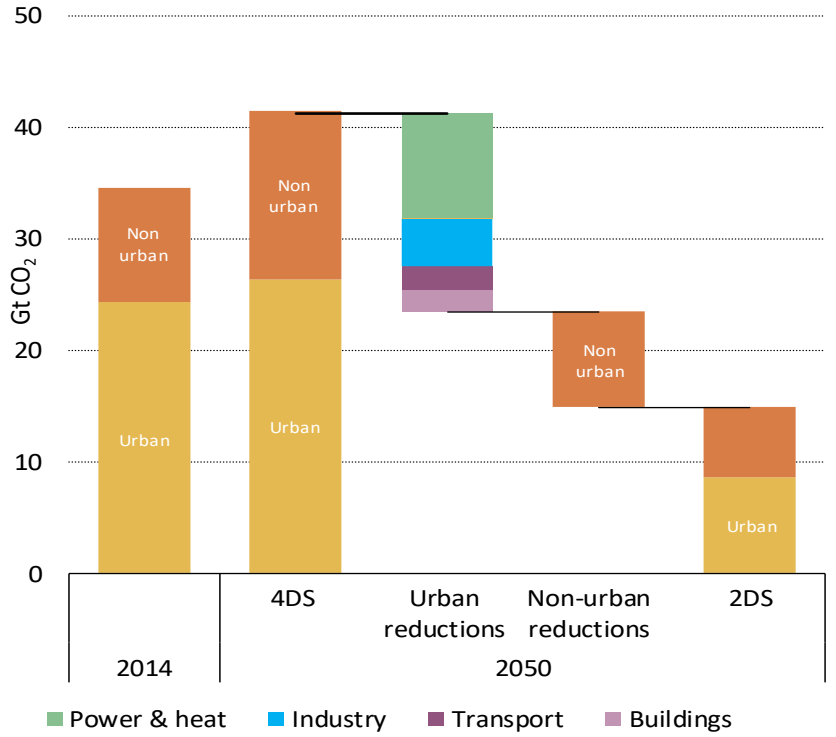


Local air quality is also worse in urban areas, often exceeding WHO guidelines of 20 µg/m³.

Source Energy Technology Perspectives 2016

1. Why is municipal energy use important?



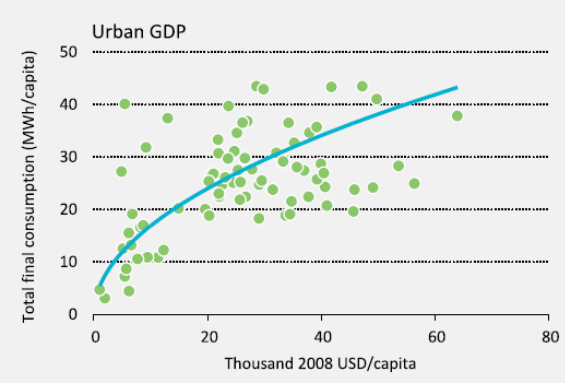


Major opportunities to reduce energy & related emissions are in urban areas.

Source Energy Technology Perspectives 2016

2. What are the typical drivers of energy use in municipalities?

2. Examples of drivers of energy use in municipalities



Factors like urban density, purchasing power and climate can be strong drivers of energy use.

Source Energy Technology Perspectives 2016

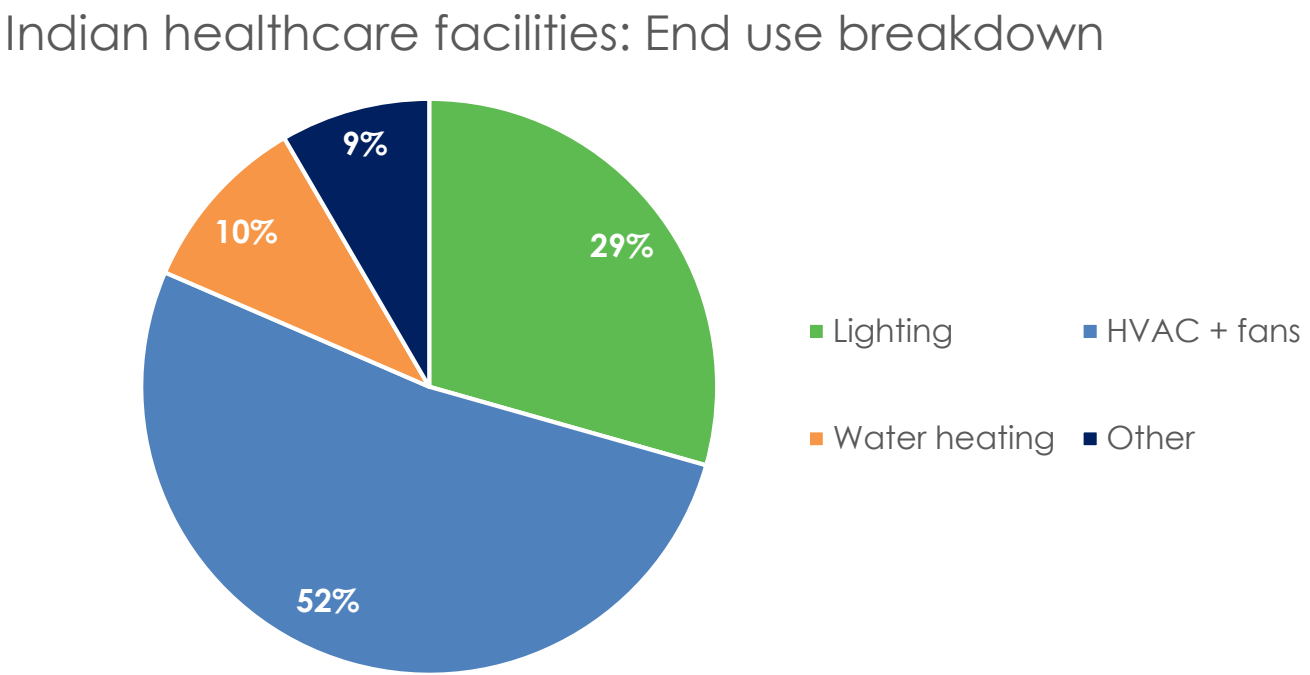
2. Examples of drivers of energy use in municipalities

A. Public Buildings

- **form :** shape, size, materials, window placement
- **function :** demand of energy services from a house is different for hospitals and schools
- **population density:** dense urban areas can influence building energy use (e.g. from urban heat island effect); building occupancy can influence needs (e.g. lighting and cooling services)
- **location of population and climate:** comfort and energy needs (e.g. for cooling) will be different between Lahore and Chennai, or Mumbai and Srinagar

2. Examples of drivers of energy use in municipalities

A. Public Buildings: example of hospital energy consumption in India



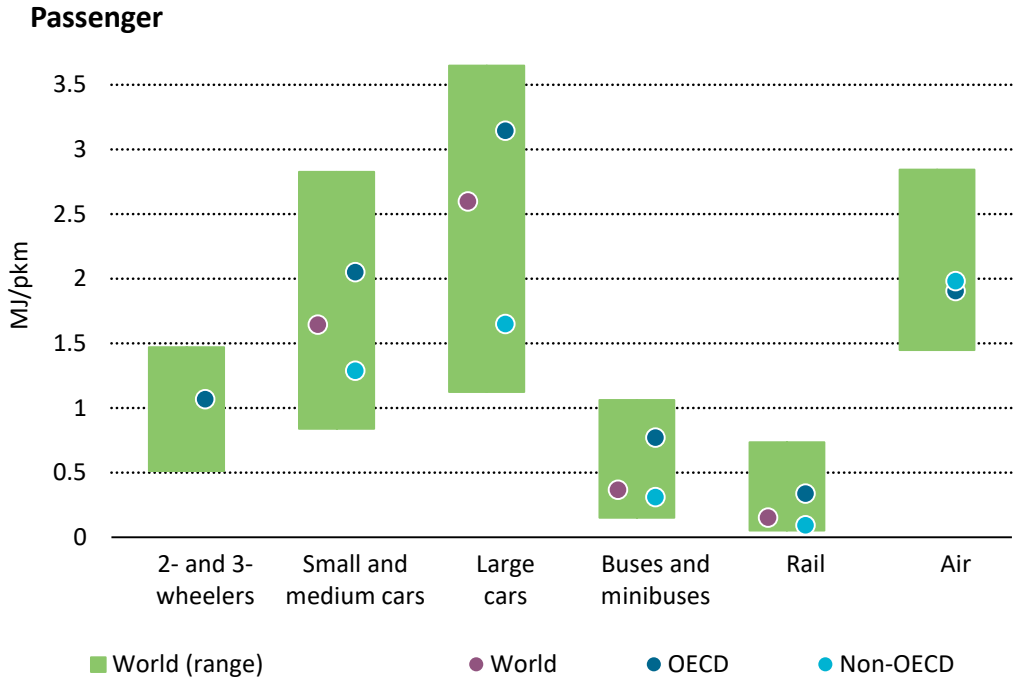
Source: Kapoor 2011 in https://betterbuildingssolutioncenter.energy.gov/sites/default/files/Hospitals_Use_Data_Analytics_Monitoring-Based_Commissioning.pdf

2. Examples of drivers of energy use in municipalities

B. Transport

p-km: passenger kilometre,

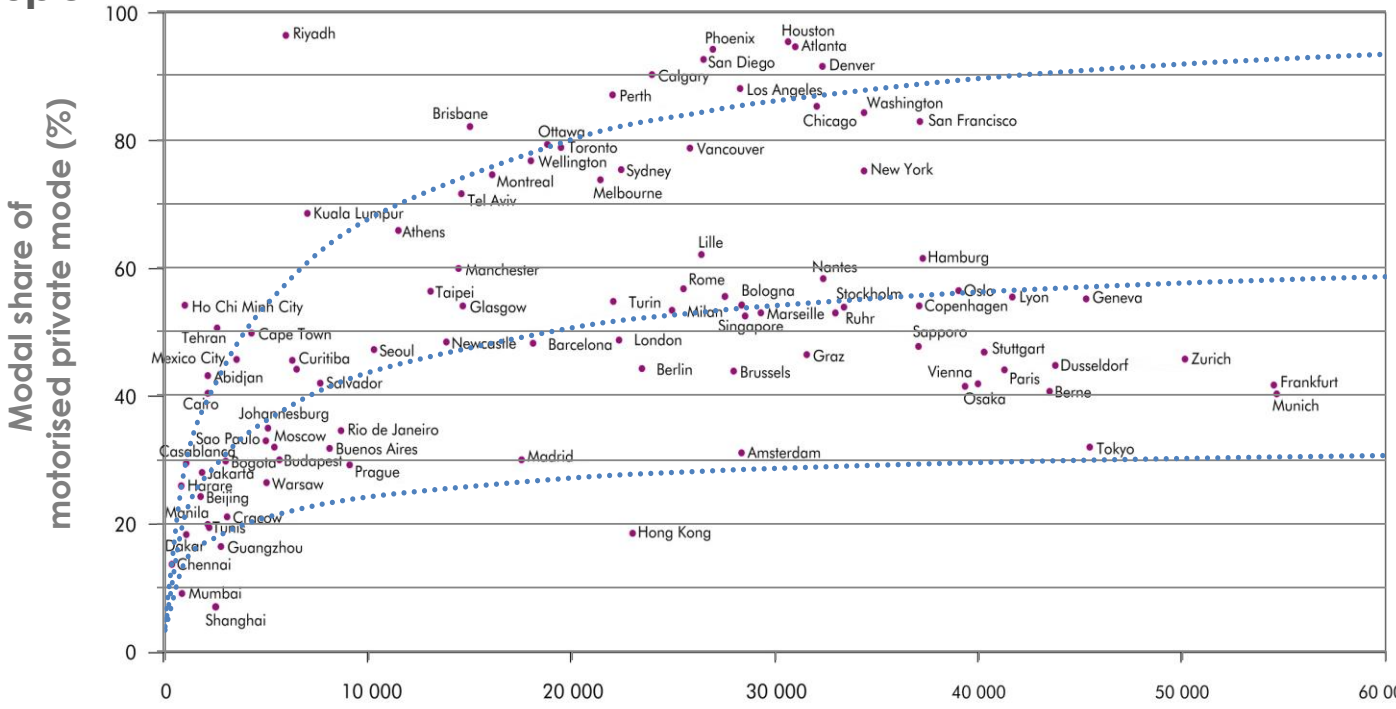
p-km: vehicle-km **x** passengers/vehicle
v-km: stock **x** mileage



Energy use is a function of a vehicle type/technology, as well as mode.

2. Examples of drivers of energy use in municipalities

B. Transport



Modal choice is a function of purchasing power and municipal structure (i.e. urban sprawl).

Source: elaboration of UITP, quoted by IEA, 2008

2. Examples of drivers of energy use in municipalities

C. Utilities: Lighting

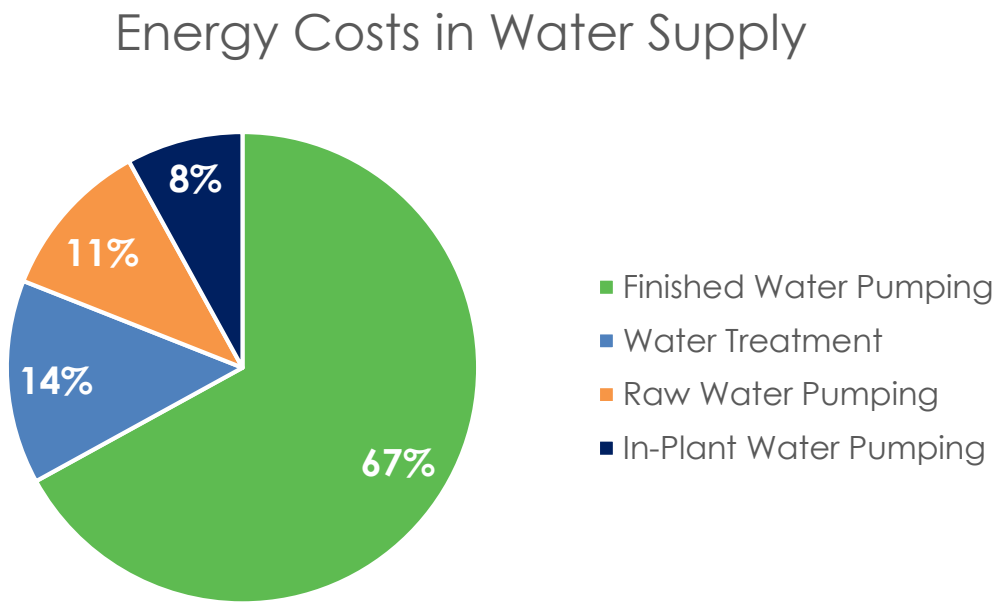
- As more countries, especially India, increase urbanisation, demand for public lighting will increase.

- In India, energy costs on municipal budget due to running of public lighting can be **5-10% for large cities, and up to 20% for smaller cities.**

Source http://blogs.worldbank.org/energy/led-street-lighting-unburdening-our-cities

2. Examples of drivers of energy use in municipalities

C. Utilities: Water Supply and Sewage

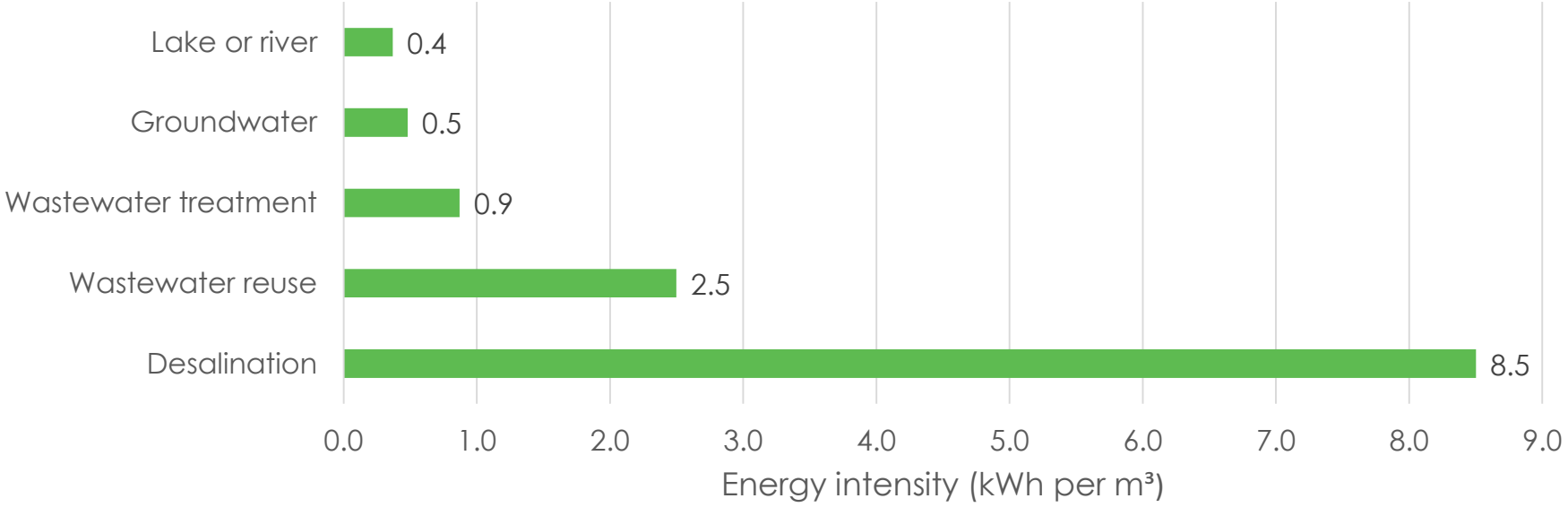


Energy can represent 25-30% of total operation costs for water supply, mainly due to pumps.

Source EPRI Solutions (2005). Bringing Energy Efficiency to the Water & Wastewater Industry: How Do We Get There? WEFTEC

2. Examples of drivers of energy use in municipalities

C. Utilities: Water Supply and Sewage



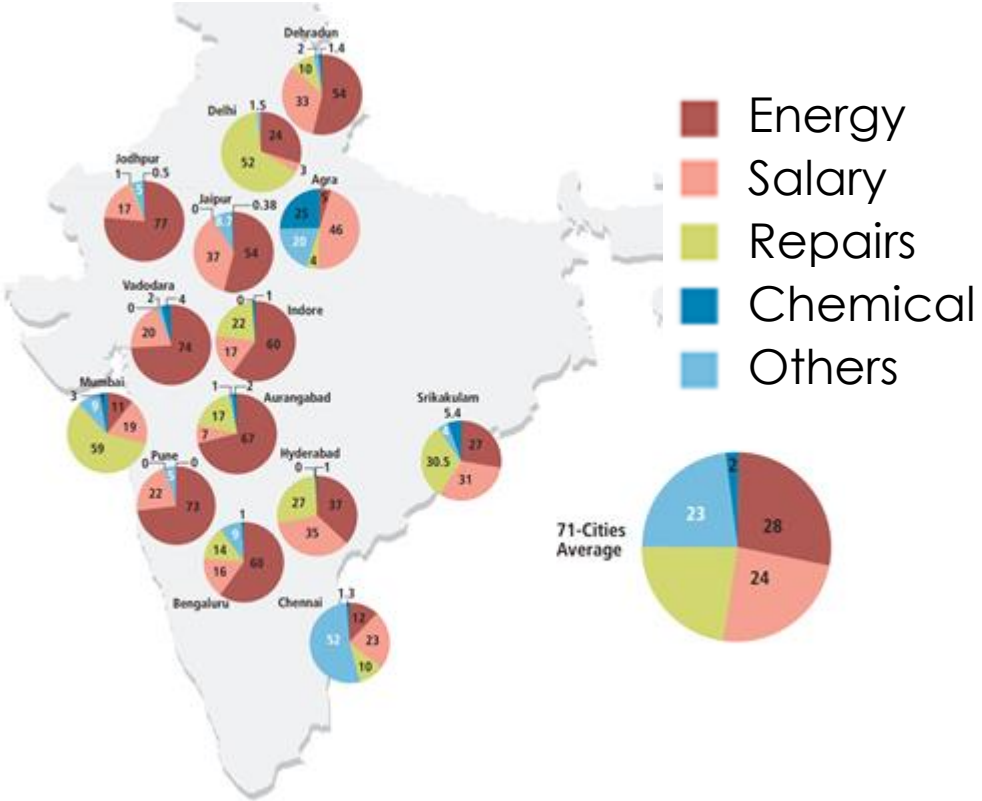
The more water-strained the location is, the more energy intensive the process has to be.

Source EPRI Water and Sustainability Volume 4 https://www.epri.com/#/pages/product/1006787/

2. Examples of drivers of energy use in municipalities

C. Utilities: Water Supply and Sewage

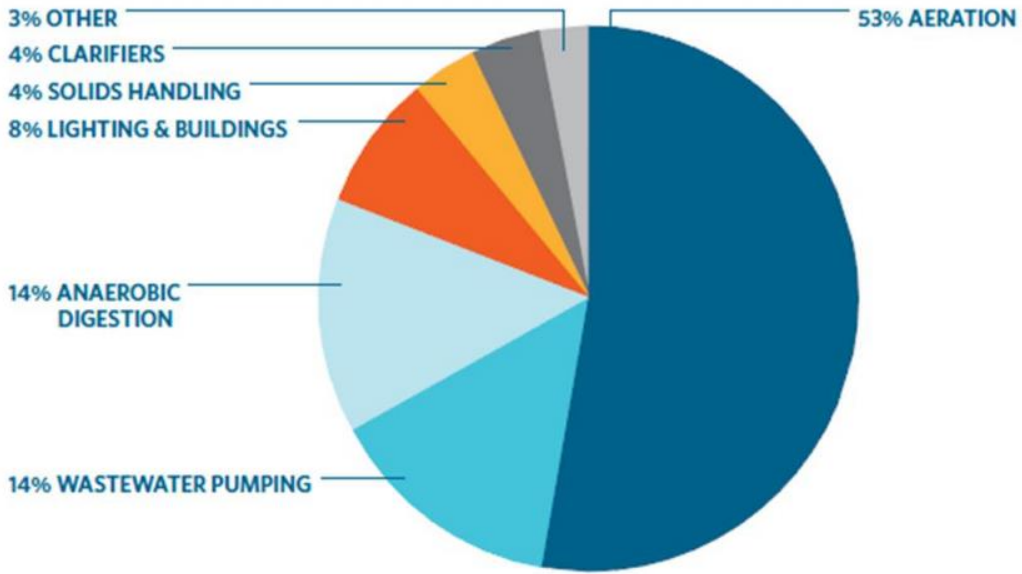
- India, average is 28% but energy ranges from **5% to 77%** of total operational costs.
- **Leakage** in distribution is estimated to contribute to additional **11% losses.**



Source *Mainstreaming Energy Efficiency in Urban Water and Waste Water, Centre for Science and Environment India 2017, Excreta Matters 2012 CSEI*

2. Examples of drivers of energy use in municipalities

C. Utilities: Water Supply and Sewage

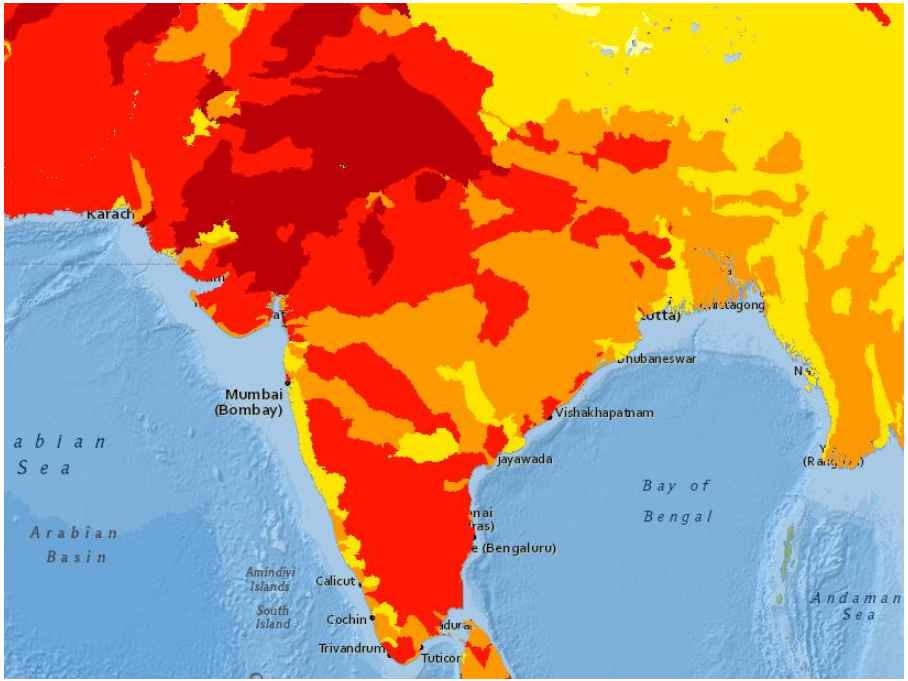


Energy cost in sewage treatment is dominated by aeration (53%) to remove biological and chemical oxygen demands (BODs and CODs).

Source: *Wastewater Treatment Energy Savings Guide: Energy Trust of Oregon*

2. Examples of drivers of energy use in municipalities

C. Utilities: Water Supply and Sewage – Water-Energy Nexus



Overall Water Risk

- Low risk (0-1)
- Low to medium risk (1-2)
- Medium to high risk (2-3)
- High risk (3-4)
- Extremely high risk (4-5)
- No Data

Definition

Overall water risk identifies areas with higher exposure to water-related risks and is an aggregated measure of all selected indicators from the Physical Quantity, Quality and Regulatory & Reputational Risk categories.

Sources: WRI Aqueduct 2014

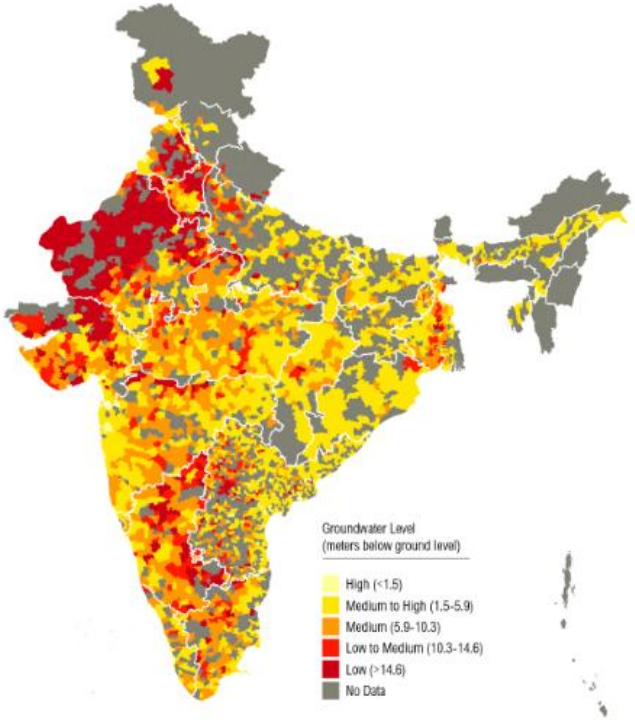
High water risk in India means supplying water will be harder and sewage treatment will be more important.

Source http://www.wri.org/applications/maps/aqueduct-atlas/

2. Examples of drivers of energy use in municipalities

C. Utilities: Water Supply and Sewage – Water-Energy Nexus

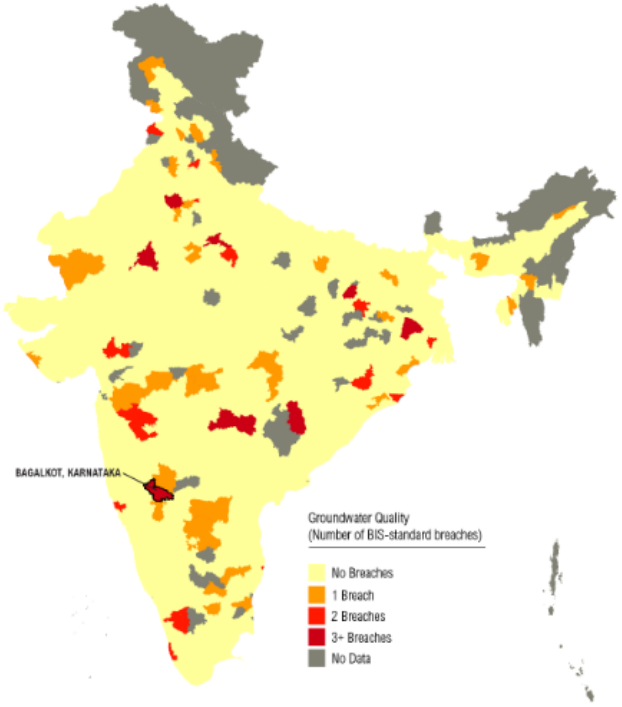
54%
of India's Ground-water Wells Are Decreasing



www.indiawatertool.in

WORLD RESOURCES INSTITUTE

More than
100
MILLION
People Live in Areas of Poor Water Quality



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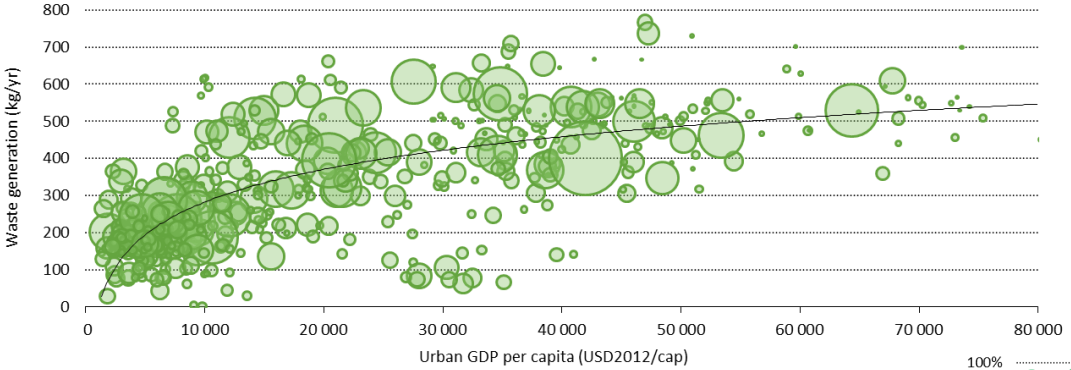
WORLD RESOURCES INSTITUTE

https://www.wri.org/blog/2015/02/3-maps-explain-india-s-growing-water-risks

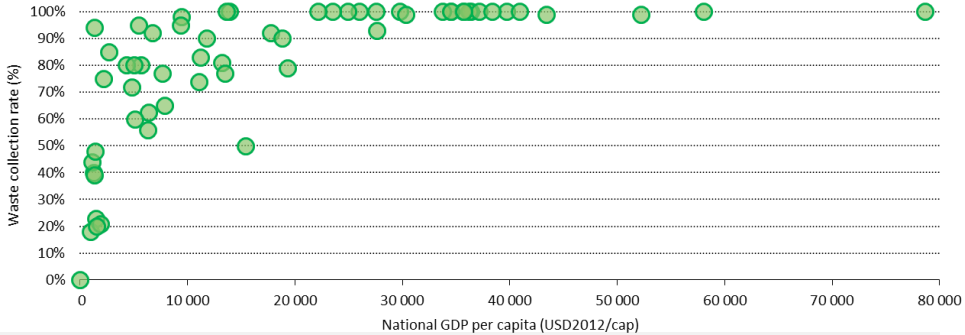
2. Examples of drivers of energy use in municipalities

D. Solid Waste



Waste generation per capita

Waste collection rate



Solid waste generation is often driven by purchasing power.
Collection could be crucial for energy recovery.

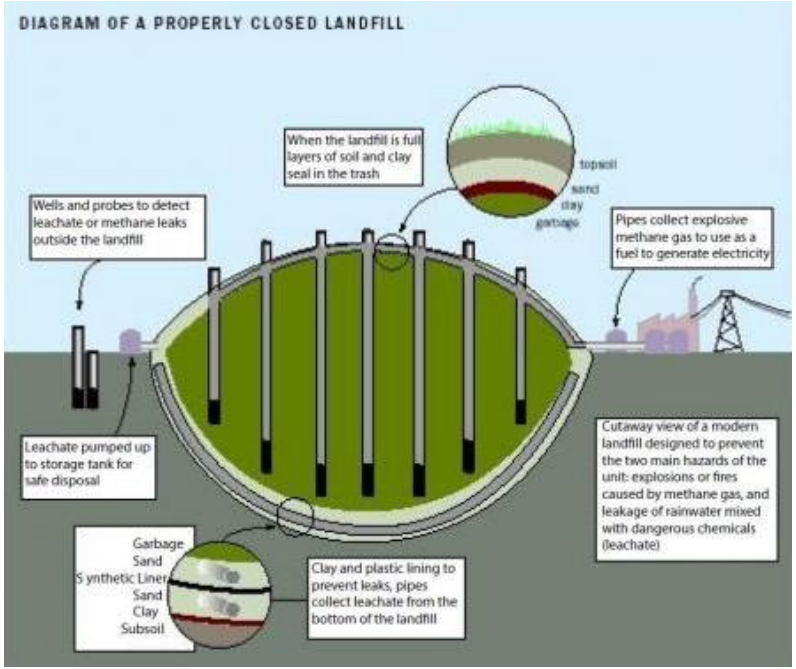
Source Energy Technology Perspectives 2016

2. Examples of drivers of energy use in municipalities

D. Waste

- Issue in solid waste is more of **excess energy** not utilised

Source https://indianexpress.com/article/explained/how-burning-rubbish-at-garbage-landfills-are-injurious-to-health/



Source https://www.epa.gov/landfills/municipal-solid-waste-landfills

3. Activity: Drivers influencing energy consumption in municipalities

Activity: Drivers influencing energy consumption in municipalities

Break into groups of 6

Scenario: Your mayor/commissioner is under pressure to reduce energy consumption to meet national targets.

Question: How do you help the commissioner understand the drivers of energy consumption in the municipality?

What level of influence do you have on the energy consuming aspects of a municipality?

Activity: Drivers influencing energy consumption in municipalities

What level of influence do you have on the energy consuming aspects of a municipality?

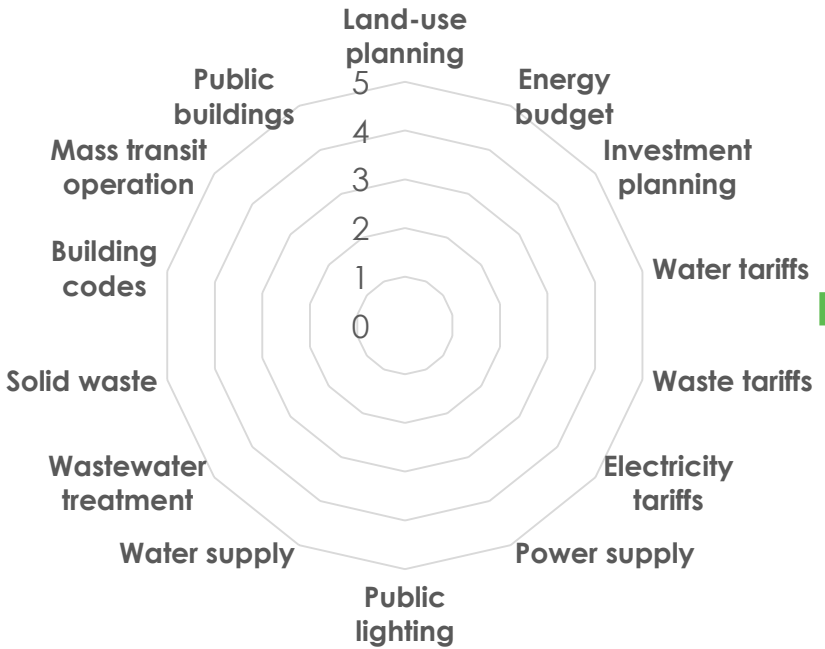
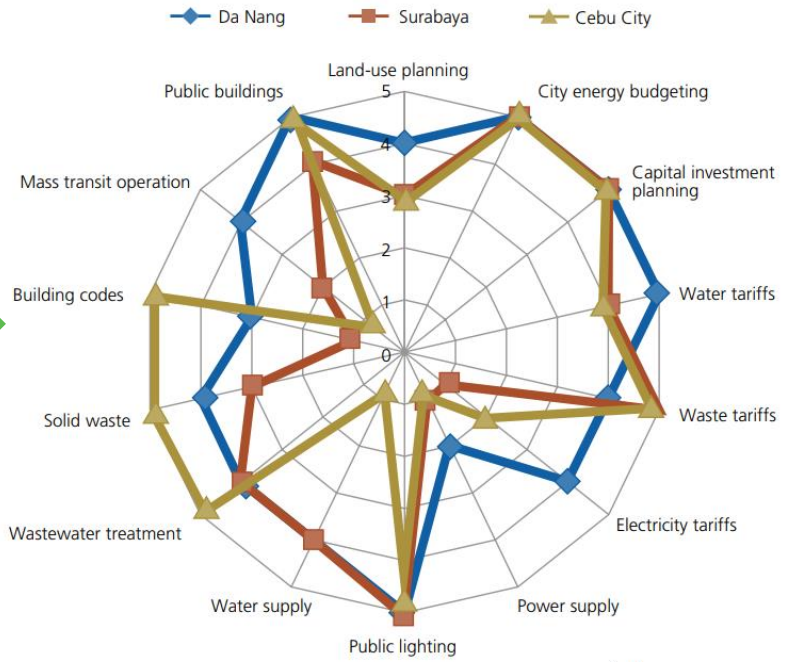


FIGURE 1.8. LEVEL OF INFLUENCE OF CITY GOVERNMENTS IN VARIOUS SECTORS



Source: Authors.

Source ESMAP 2012 Energizing Green Cities in Southeast Asia

www.iea.org

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