

# On the pathway to **LOW CARBON CITIES:** Contributions of urban planning

Kunming Urban Planning and Design Institute  
Technical University of Kunming  
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1st of June 2011

**CITY PARTNERSHIP KUNMING - ZURICH**

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# City partnership KUNMING - ZURICH

Learning from Europe?

Learning from China?

Learning together!

Thank you for invitation!

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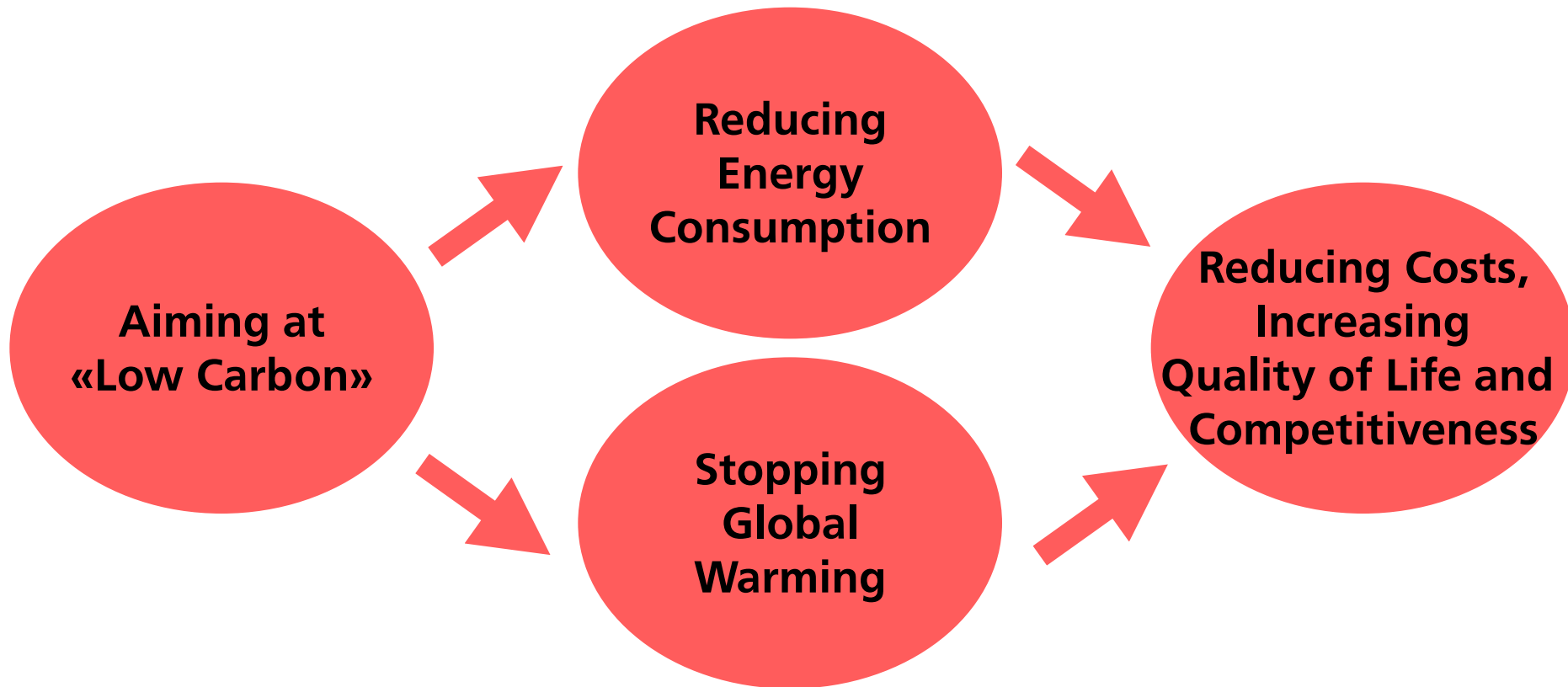
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# Content

- 1 Why is “low carbon” relevant to cities?
- 2 How to plan low carbon cities?
- 3 Conclusions for Kunming

# Why is "Low Carbon" relevant to cities?



**Why are cities relevant to  
«low carbon»?**

**We live in the Urban Age!**

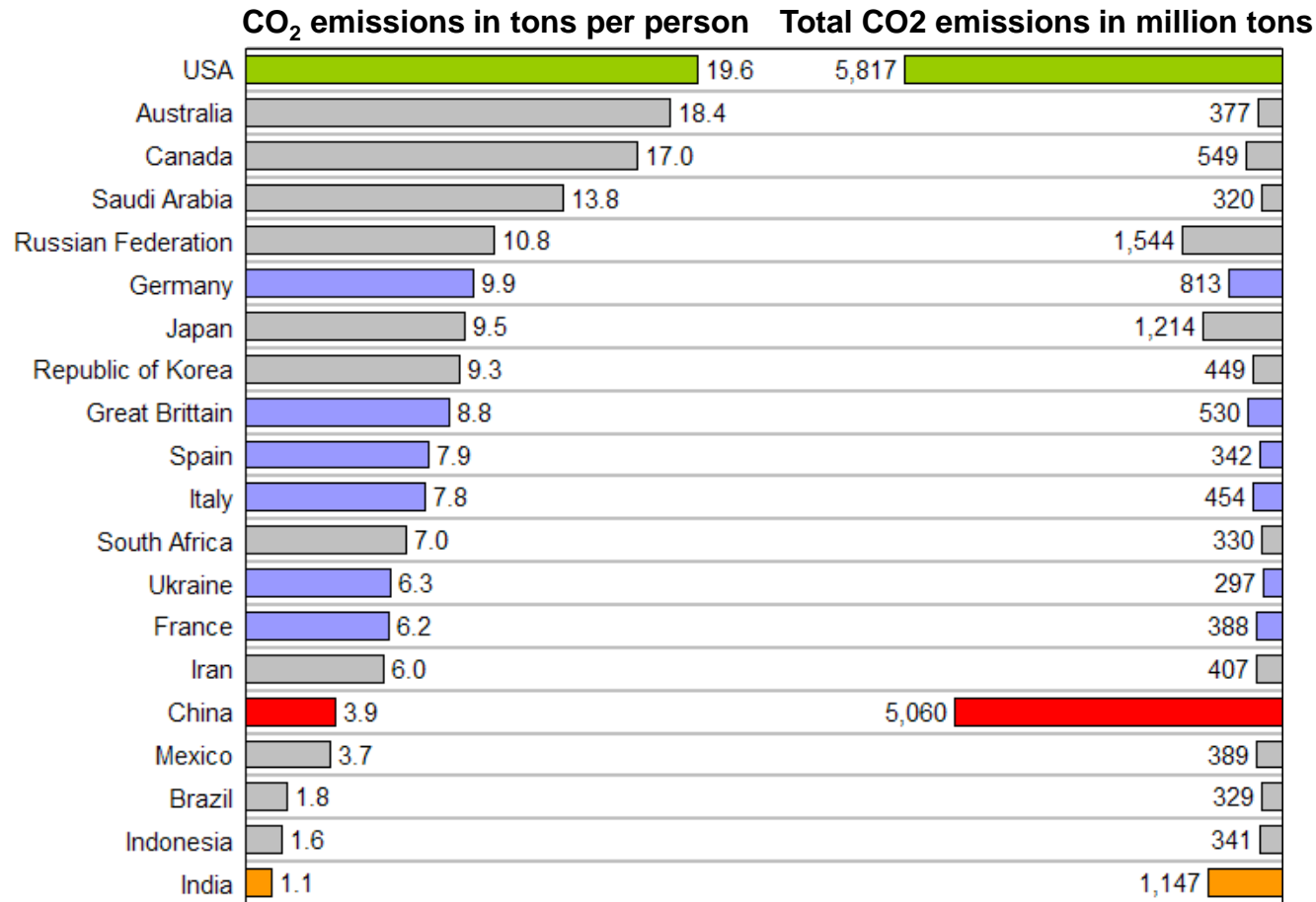
Percentage of the world's  
population living in cities

**10%** in 1900

**50%** today

**75%** in 2050

# CO<sub>2</sub> emissions in global comparison

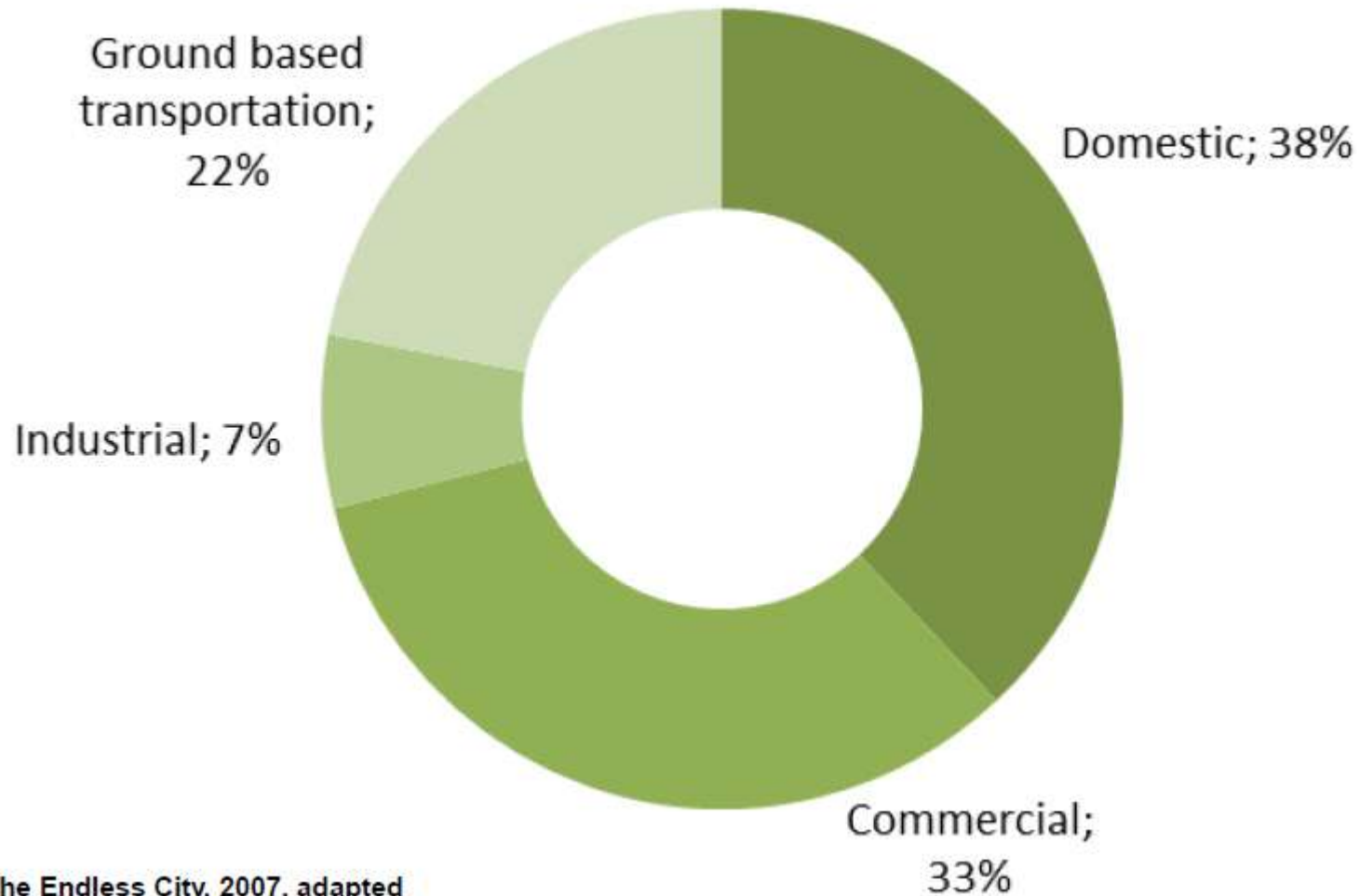


Source: U.S. Energy Information Administration (EIA)

## Figures from China

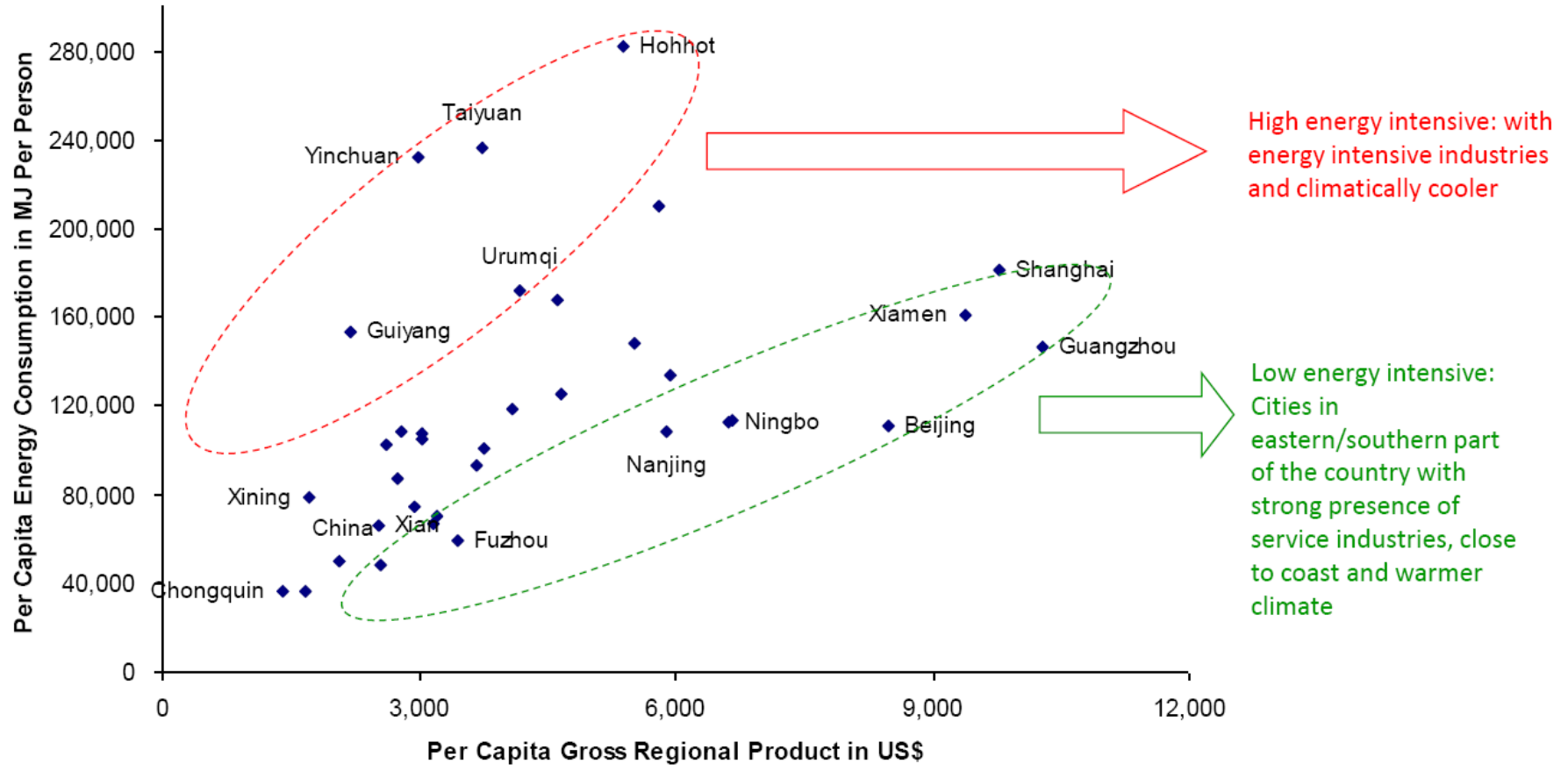
- China contributes 16 % of the global primary energy use in 2006
  - China contributes 20% to global energy-related CO<sub>2</sub> in 2006, in 2030 about half of global CO<sub>2</sub> from China
  - China contributes 16.8% of global urban population in 2006, Urbanization in China will increase further: from 41 % (545 m) in 2005 to 60% (880 m) by 2030
  - Density in Chinese cities is generally high, potential to introduce efficient public transport systems
- ⇒ An enormous share of global CO<sub>2</sub>-reduction potential can be found in Chinese Cities!

# The urban level: London's CO<sub>2</sub>-emissions



Source: The Endless City, 2007, adapted

# The urban level: Varying energy-economy pathways within China's cities

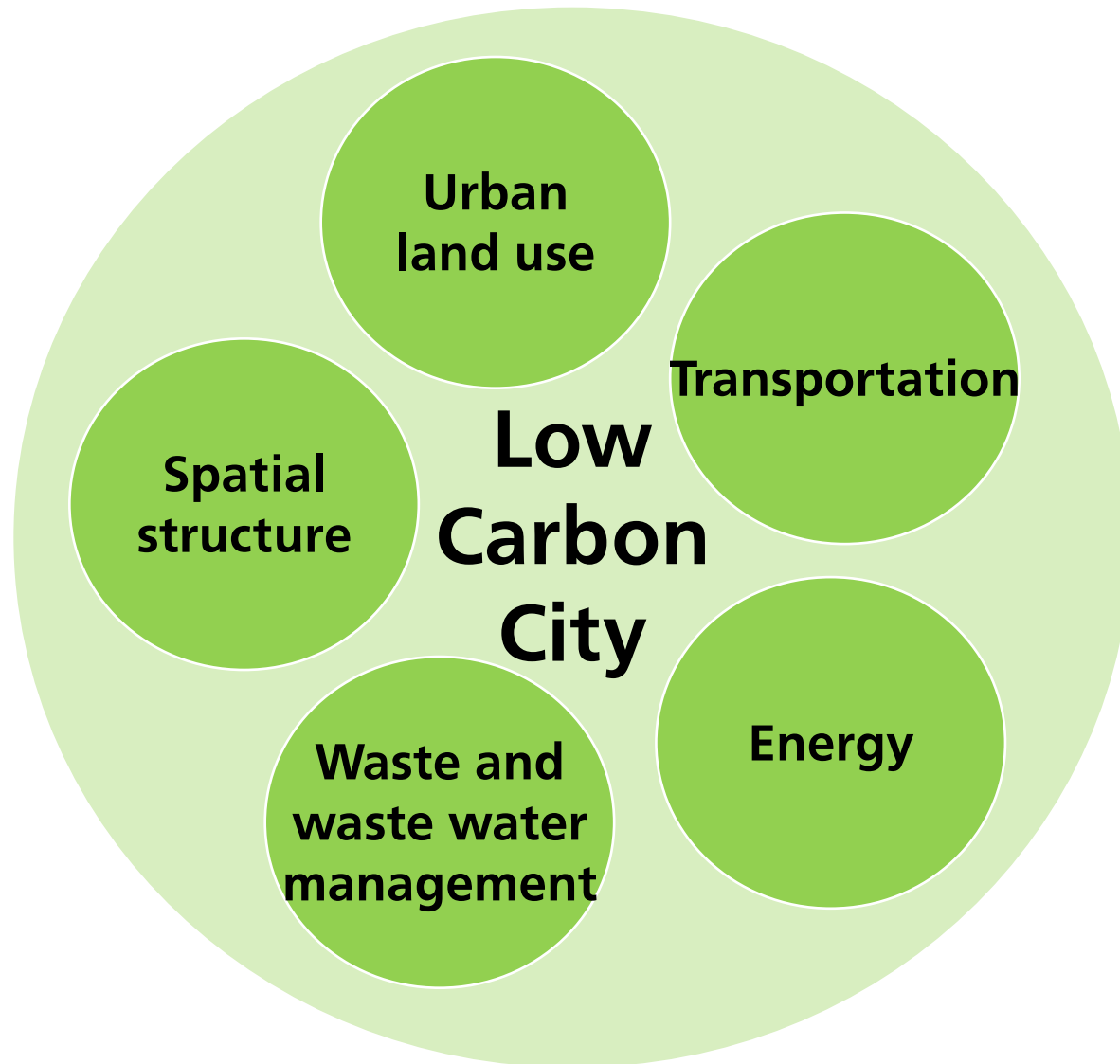


Source: Dhakal 2009

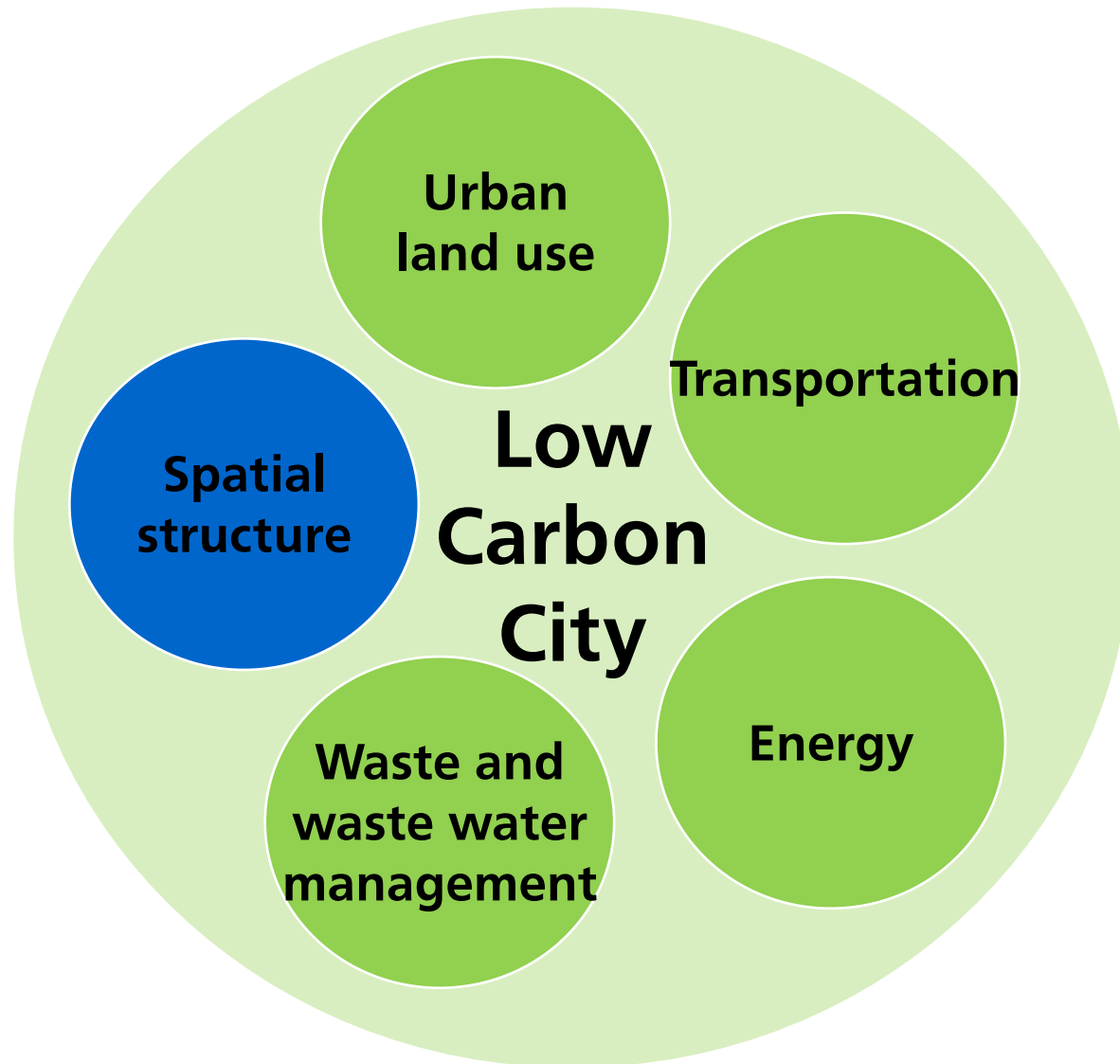
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# How to plan low carbon cities? 5 basic pillars for planners at the urban level



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# Spatial structure of Tokyo and New York

## Central Business District (CBD)



# Spatial structure of Tokyo and New York

5km from CBD

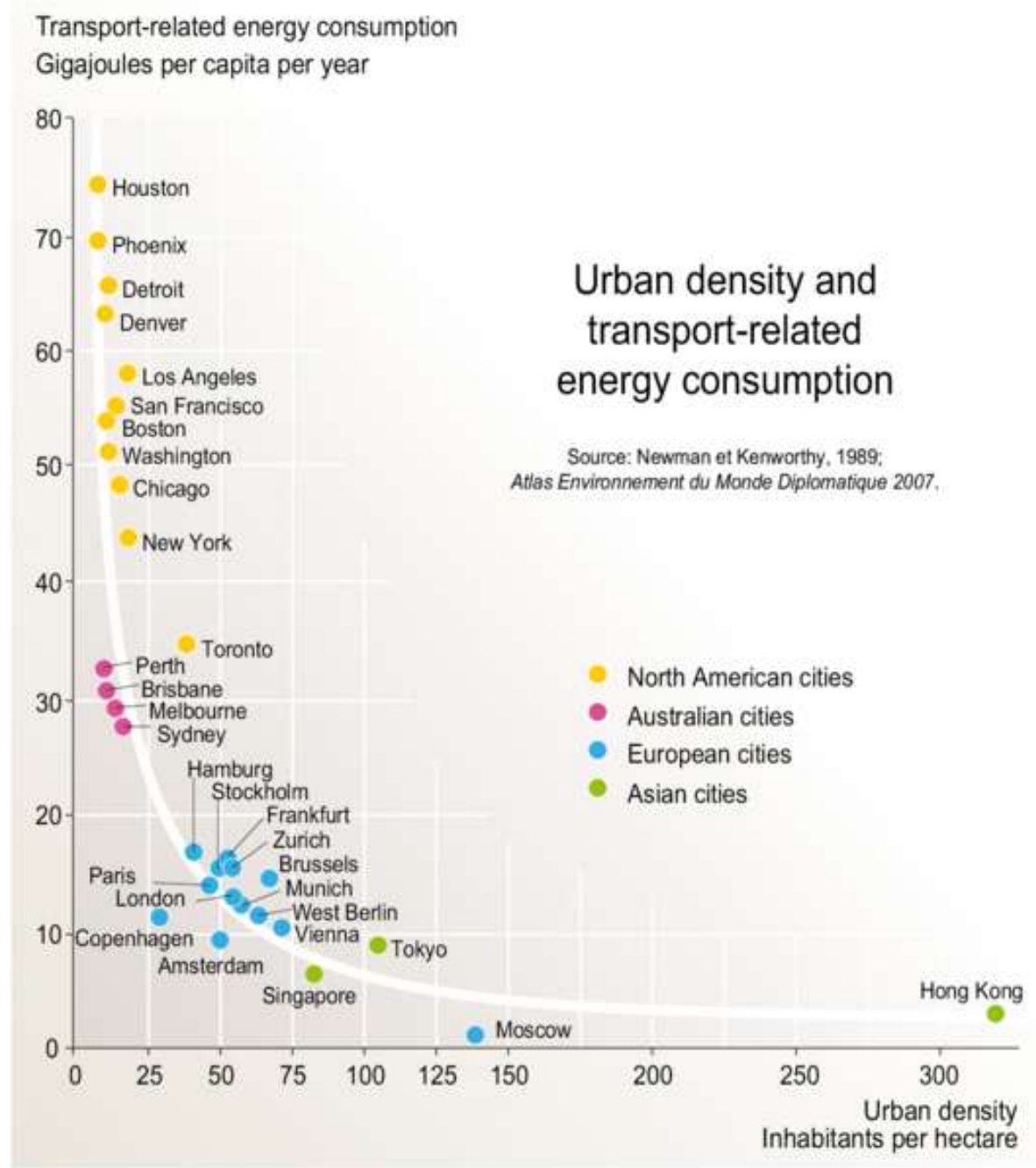


# Spatial structure of Tokyo and New York

10km from CBD



# Density and transport system matter



# Urban Sprawl

-Los Angeles-



## Drawbacks

- Long transport distances and dependance on private transport → **high carbon emissions**, «living on the road», congestion, high individual costs (rising energy prices)
- Inefficient Infrastructure → high investment and maintenance costs
- Extensive land use → loss of landscape
- Mono-functional housing areas → «sleeping residential housing areas», «sleeping city centres»

**Low carbon policies are in line with other strategic urban planning approaches, which lead to a competitive and liveable cities!**



Image: The Endless City, 2007

# Changing Urban Form – Shanghai

**121**

Buildings over eight storeys in 1980

**3'529**

Buildings over eight storeys in 2000

**10'045**

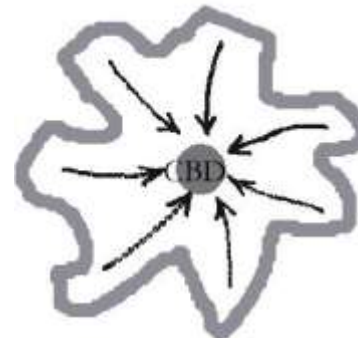
Buildings over eight storeys in 2005

# Spatial structures: Which model supports low carbon the most?

Schematic representation of trip patterns in metropolitan areas

Little evidence.

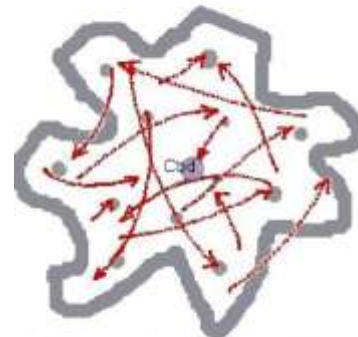
But: high density and polycentricity with an efficient public transportation system better than random urban sprawl



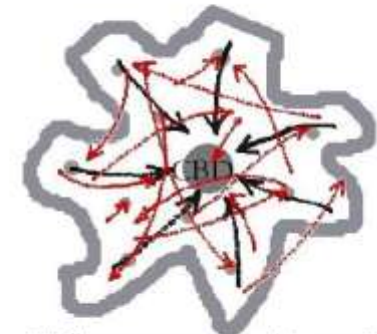
(a) The monocentric model



(b) The polycentric model:  
The urban village version



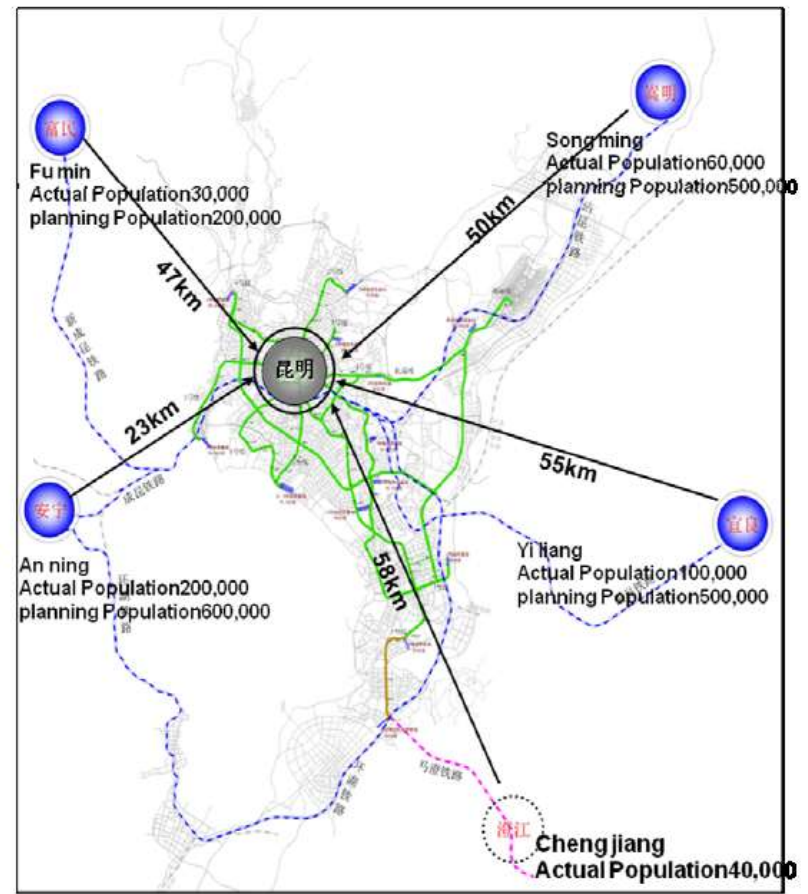
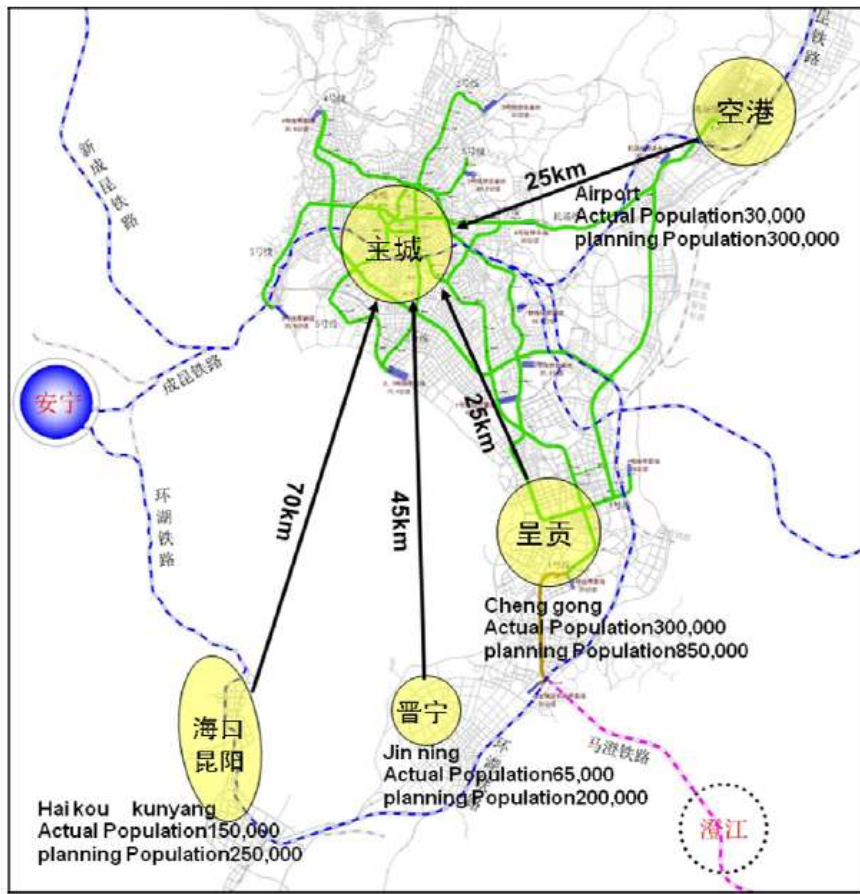
(c) The polycentric model:  
The random movement version



(d) The mono-polycentric model:  
Simultaneous radial  
and random movements

— weak links  
— strong links

# Kunming: Polycentricity supports low carbon, but needs a public transportation system!

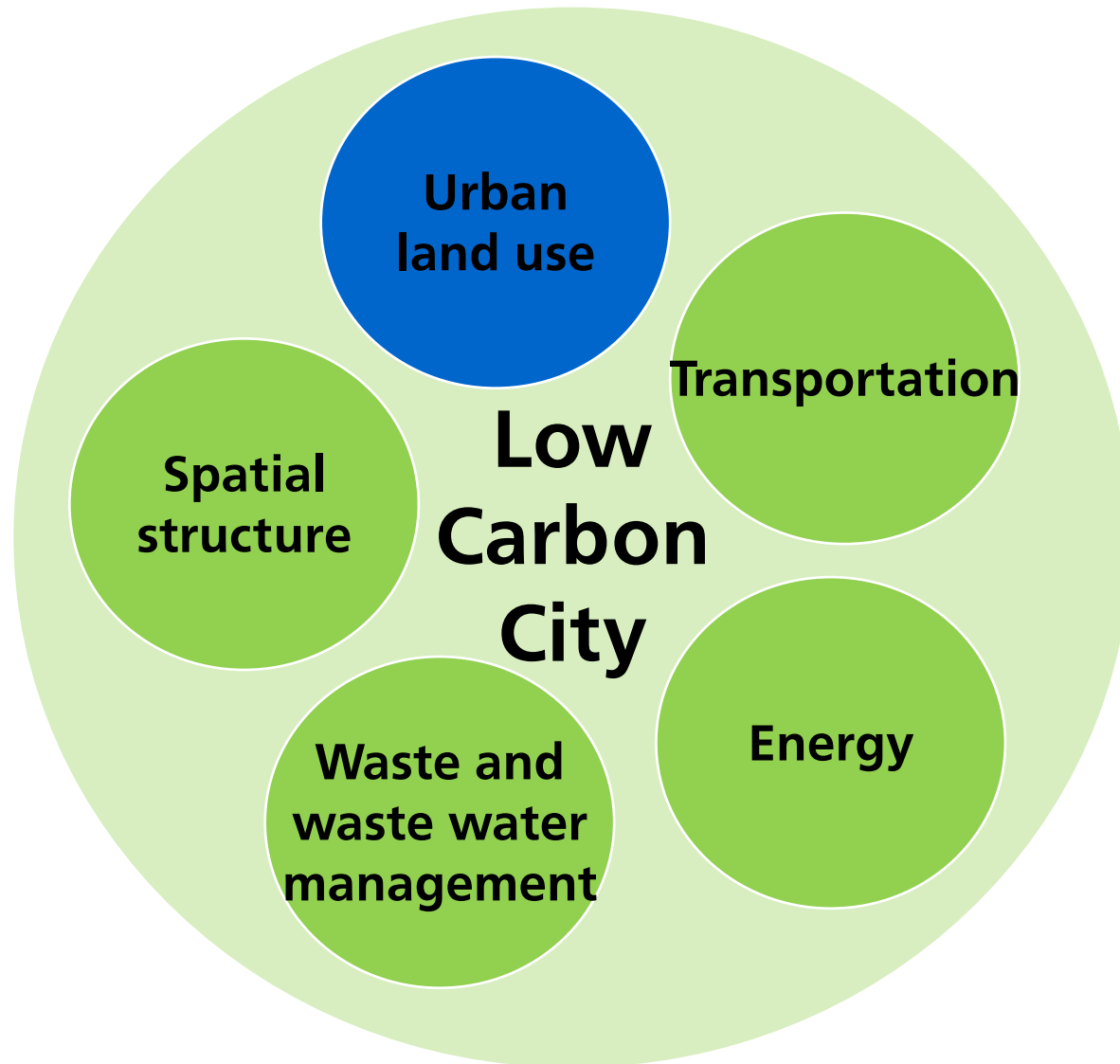


# How to plan Low Carbon cities?

## **Spatial structure**

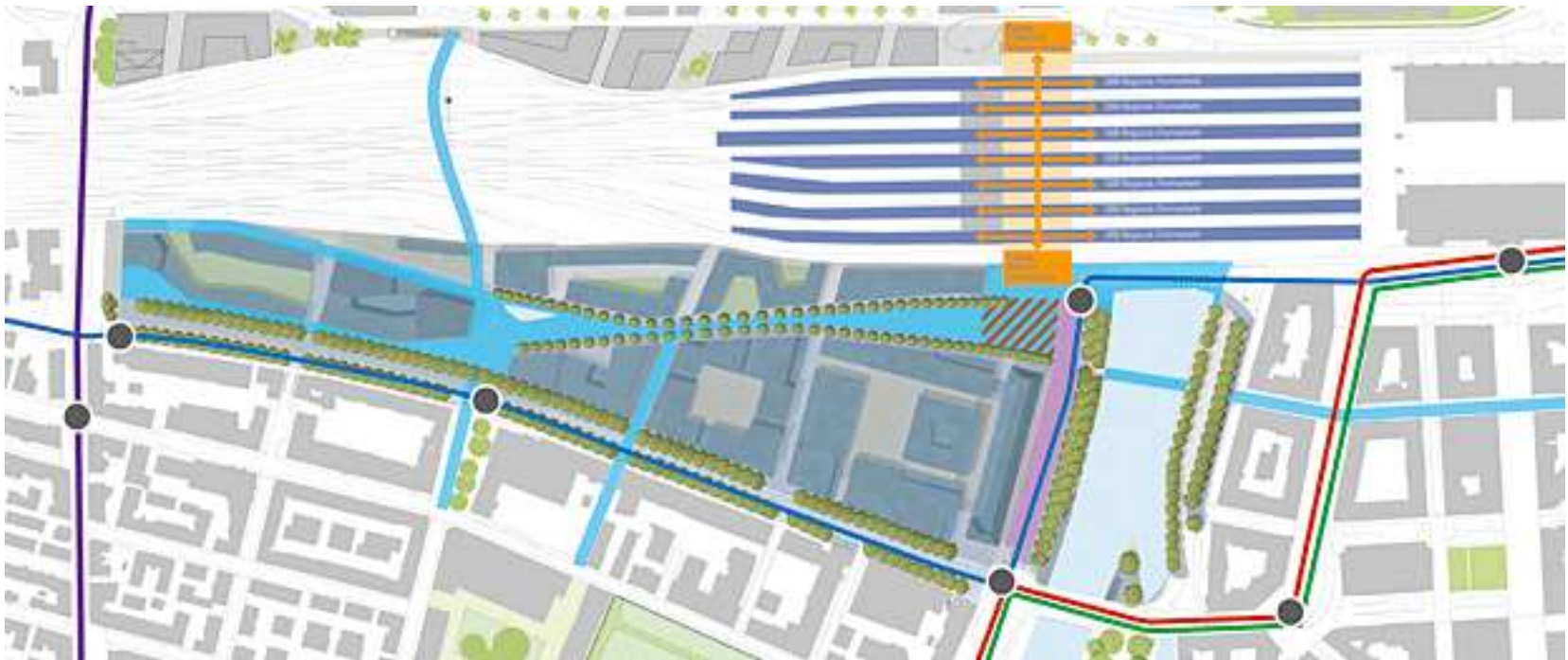
- High density and compact settlements, especially at nodes of public transport (transit oriented development, TOD)
  - intelligent orientation and volume design of buildings (facilitating use of solar energy and providing shadow for windows)
  - Urban ecosystem: reduction of soil sealing, provision of green spaces / trees
- ⇒ Urban planners: key tasks in strategic planning, zoning plans, public space design, housing design

# How to plan low carbon cities? 5 basic pillars for planners at the urban level



## «Europaallee» Zurich: a low carbon area

former railtracks / maintenance buildings redeveloped  
high density and high accessibility with public transportation  
mixed-used  
restricted parking spaces  
high energy standards





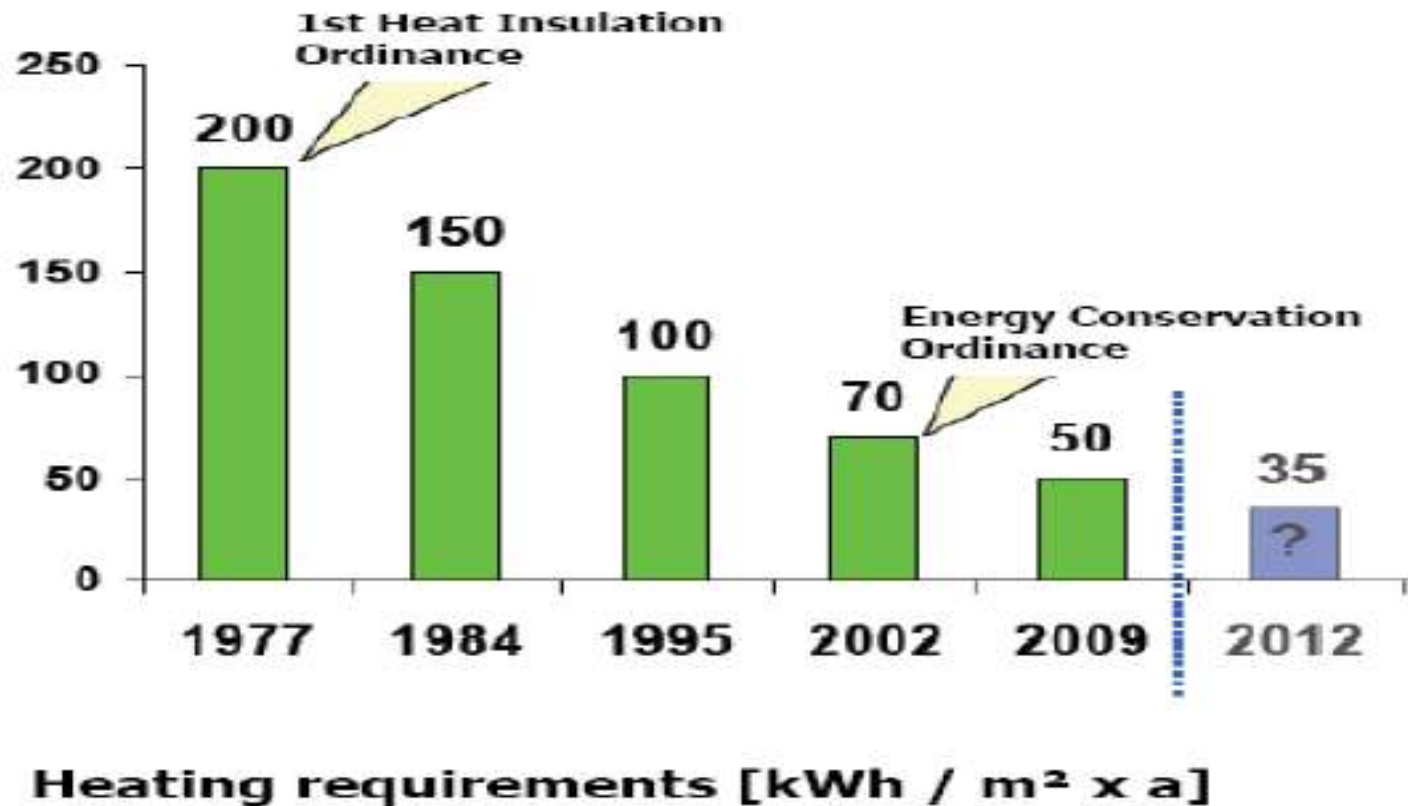


## Facts and Figures

**mixed land use:** retail, university, housing, offices, entertainment, hotel

**quantities:** 6000 work places, 1200 inhabitants, 1800 students and 700 parking spaces

# Development of the heat requirements of new buildings in Germany



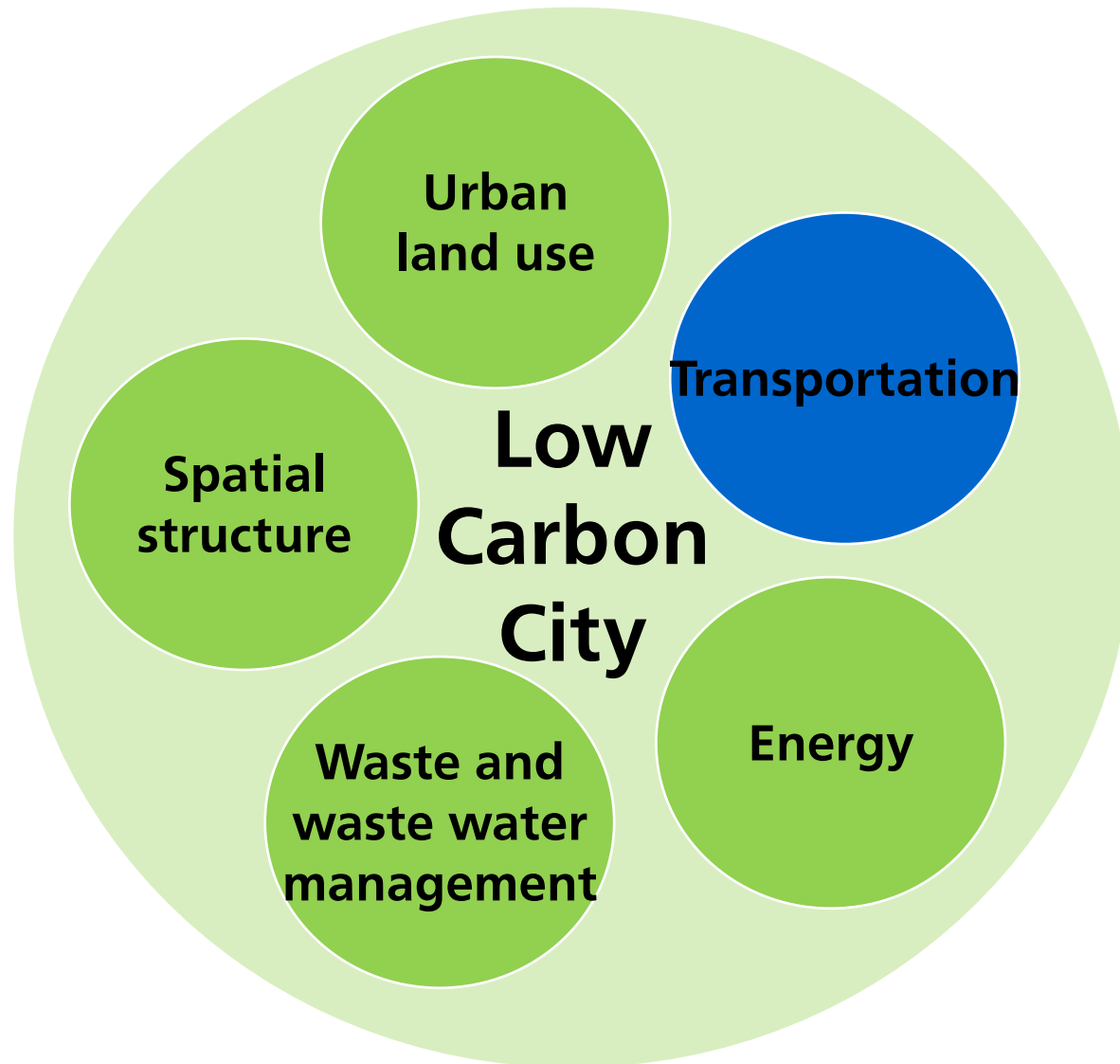
Source: Wolfgang Ornth, German Federal Ministry of Transport, Building and Urban Development

# How to plan Low Carbon cities?

## Urban land use

- proximity of work and live
  - Transformation of inner city non-used-areas (e.g. former industrial to housing)
  - Ecologically meaningful selection of land use area (e.g. availability of renewable energy)
  - Definition of building standards in planning regulations (e.g. energy efficient buildings, renewable energy use on rooftops)
- ⇒ Urban planners: key tasks in strategic planning, zoning plans

# How to plan low carbon cities? 5 basic pillars for planners at the urban level

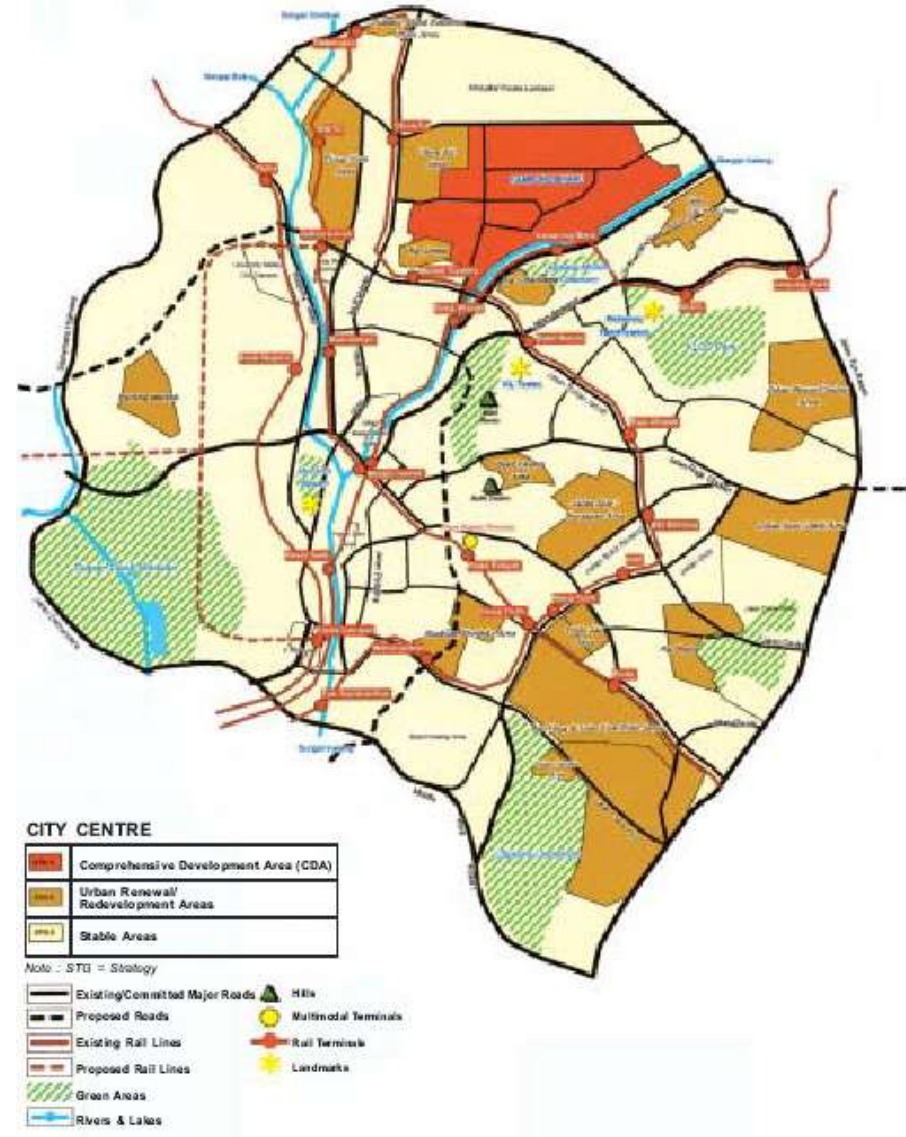


# Transportation



# Kuala Lumpur City Plan 2020

Hierarchy of urban density with high density residential areas near rail stations



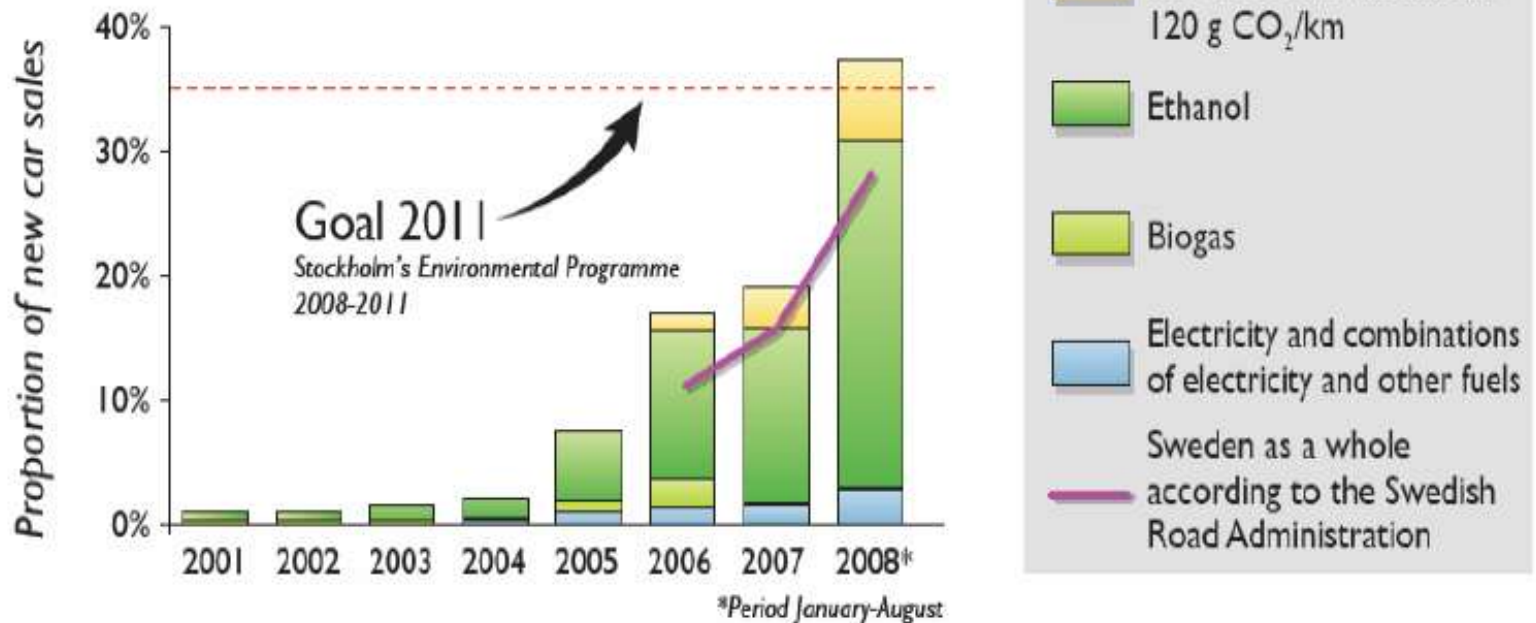
# Best practice in Bern Area (Switzerland)



New office buildings around an existing S-Bahn station with 3 rail lines merging

# Low consumption vehicles in Stockholm County

Proportion of clean vehicles in sales of new cars  
During the period 2001-2008 in Stockholm County



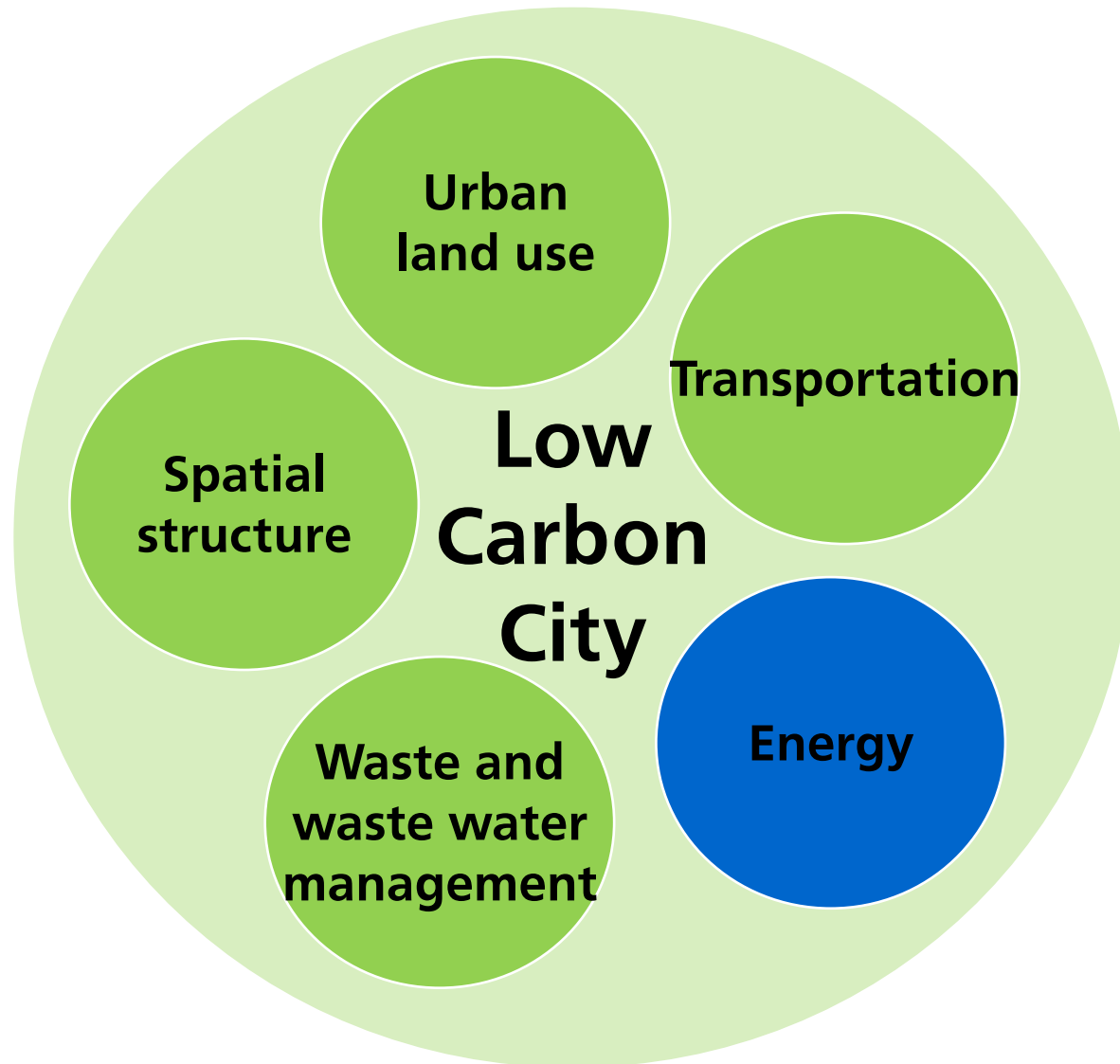
Source: The City of Stockholm (2009) "The City of Stockholm Climate Initiatives"

# How to plan Low Carbon cities?

## Transportation

- Traffic-reducing urban planning (high density at nodes of urban transport, proximity of work and live)
  - Improvement of public transportation system
  - Attractive pedestrian paths and bike lanes
  - Mobility Pricing
  - Control measures for individual motor car traffic (e.g. control of traffic lights)
  - Buses and vehicles with low energy consumption / low CO<sub>2</sub> emissions
- ⇒ Urban planners: Urban/regional development strategy, public space design

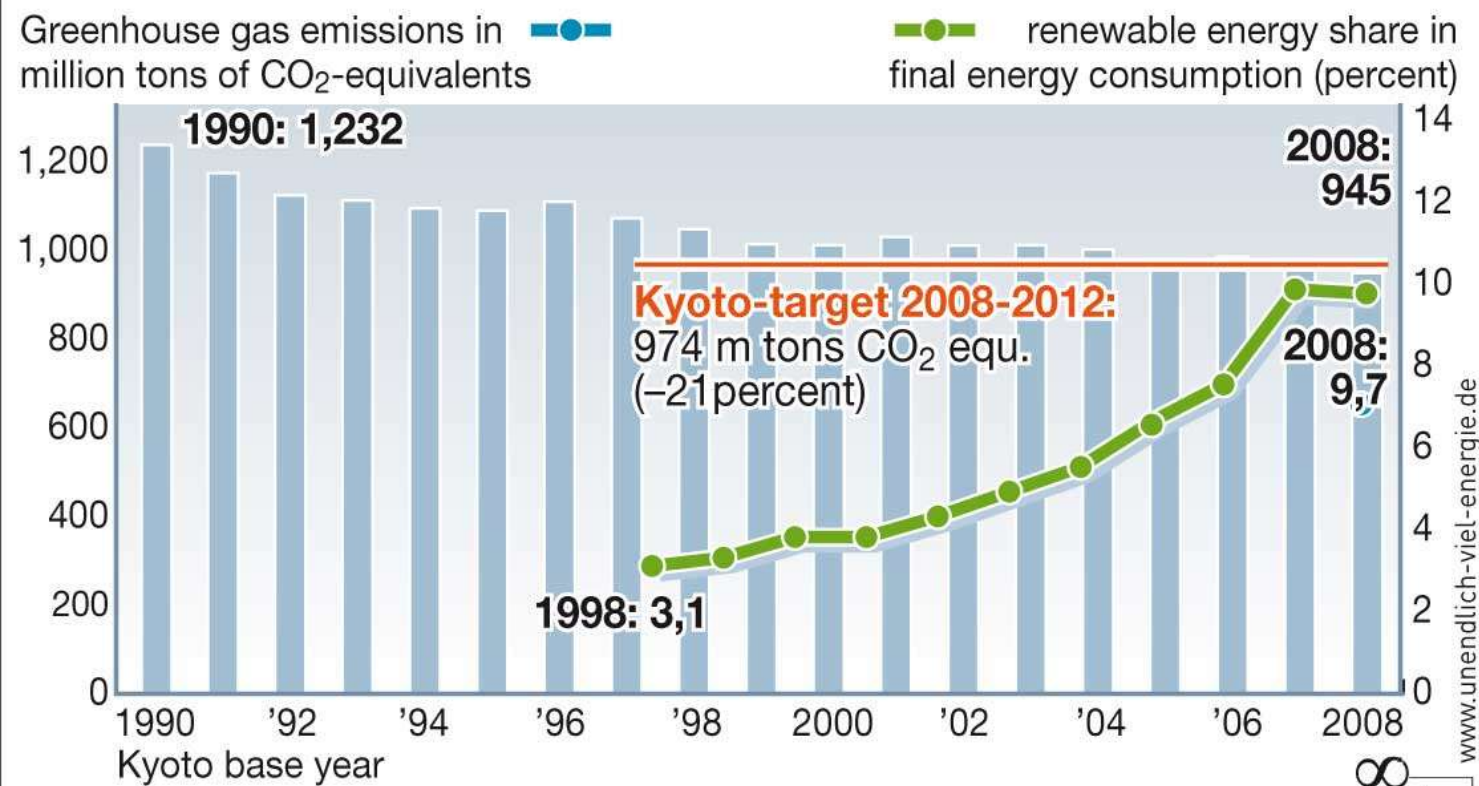
# How to plan low carbon cities? 5 basic pillars for planners at the urban level



# Production of renewable energy in Germany

## Greenhouse gas emissions and renewable energy in Germany

*Renewable energy is a key to climate protection.  
Already in 2007 Germany exceeded its Kyoto-target.*

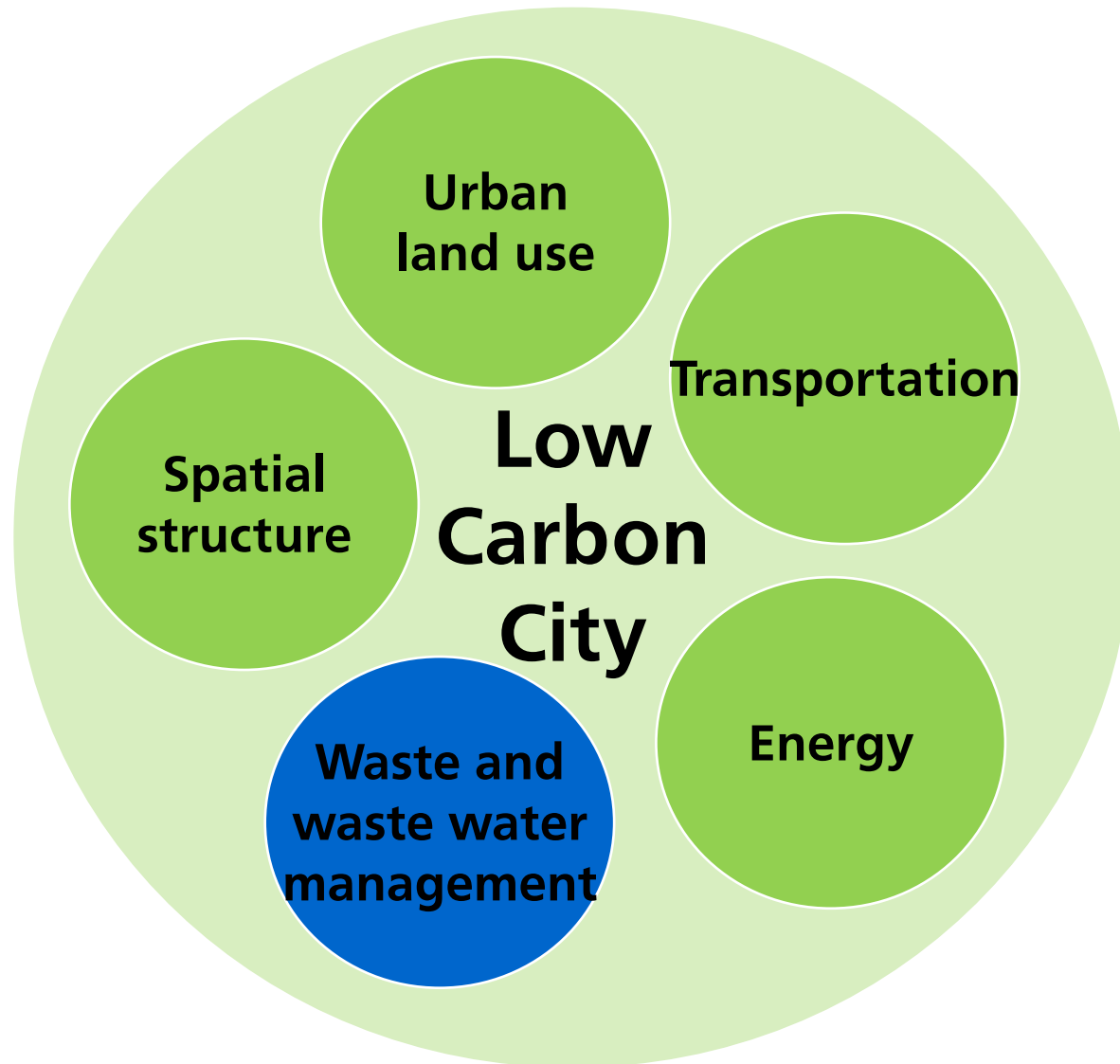


# How to plan Low Carbon cities?

## Energy

- Use of renewables for the production of electricity and heating
  - Energy-efficient retrofitting of buildings
  - Financial incentives for energy-saving investments
- ⇒ Urban planners: Definition of production opportunities and energy standards in land use plans (e.g. zoning plans)

# How to plan low carbon cities? 5 basic pillars for planners at the urban level



## WASTE RECYCLING

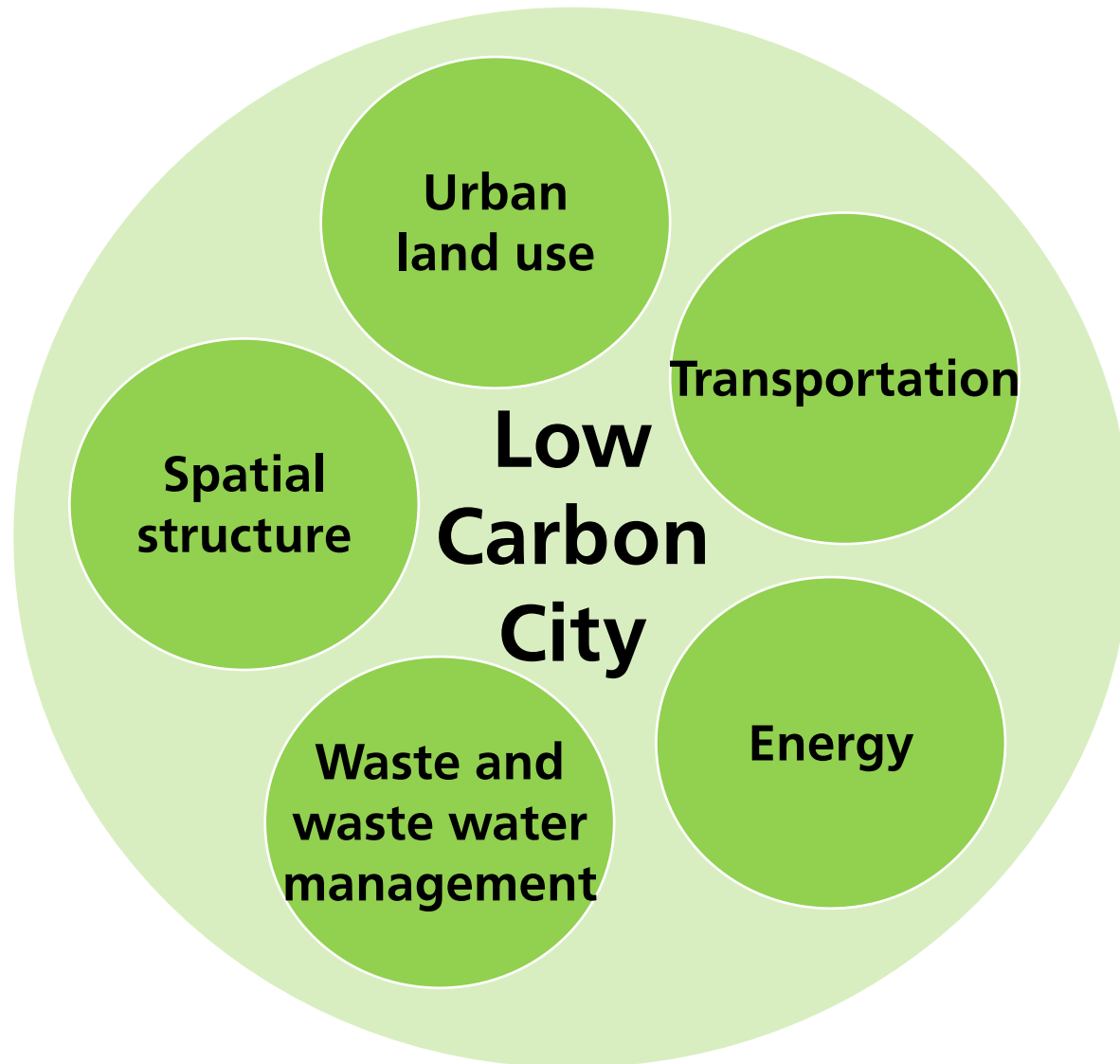


# How to plan Low Carbon cities?

## **Waste and waste water management**

- Waste collection and disposal fee in dependence of quantity
  - Provision of a waste separation system, composting and recycling systems
  - Usage of landfill gas for electricity production
- ⇒ Urban planners: Definition of standards and opportunities in land use plans (e.g. zoning plan)!

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## Conclusions: A low carbon city is a competitive and liveable city!

1. A low carbon city is competitive and has a high quality of life – in Kunming and elsewhere
2. Urban planners can contribute a lot to reduction of carbon emissions, need to consider the shown principles
3. Low carbon is relevant to cities and cities are relevant to low carbon, especially Chinese cities
4. Chinese cities have a high potential to become low carbon cities due to high density
5. The key to low carbon urban development in Kunming is the spatial structure of the metropolitan area and its coordination with efficient public transport

# What to do next in Kunming? 2 ideas

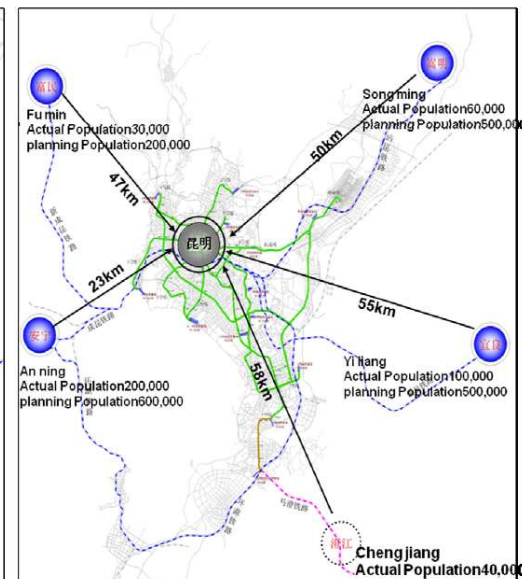
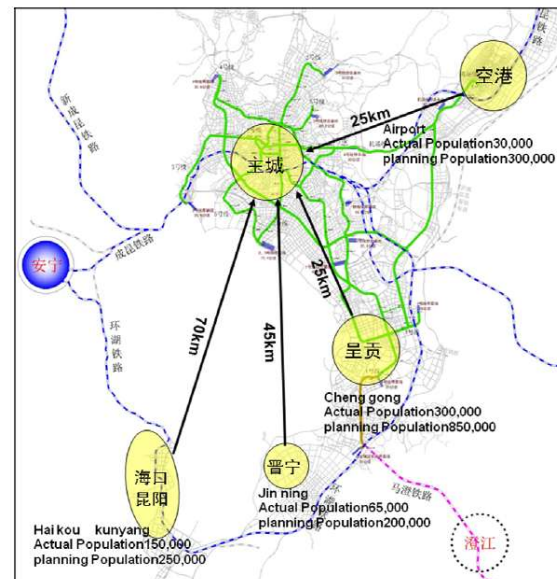
## 1. masterplan / spatial development strategy at regional scale:

Integrate principles of low carbon regarding spatial structure + transport!

for inner city and beyond: new airport city, lake cities, metropolitan subcenters

## 2. Shining example at local scale:

pilot area  
as a low carbon  
shining example!  
goal: nr. 1  
Chinese low  
carbon area!



Thank you for your attention!

