



# Sustainable cities – from Masdar City to "Our City" of Carlsberg

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29. september 2009  
Lise-Lotte Pade, Pöyry

# Agenda

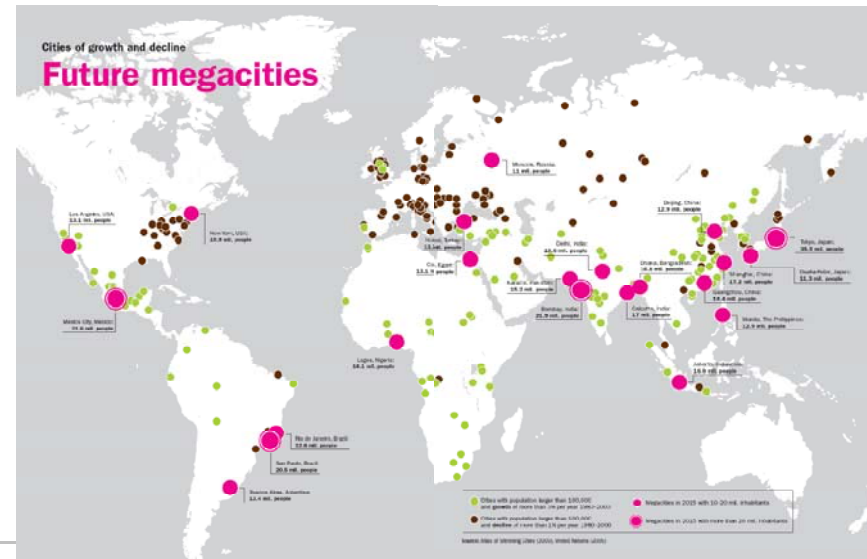
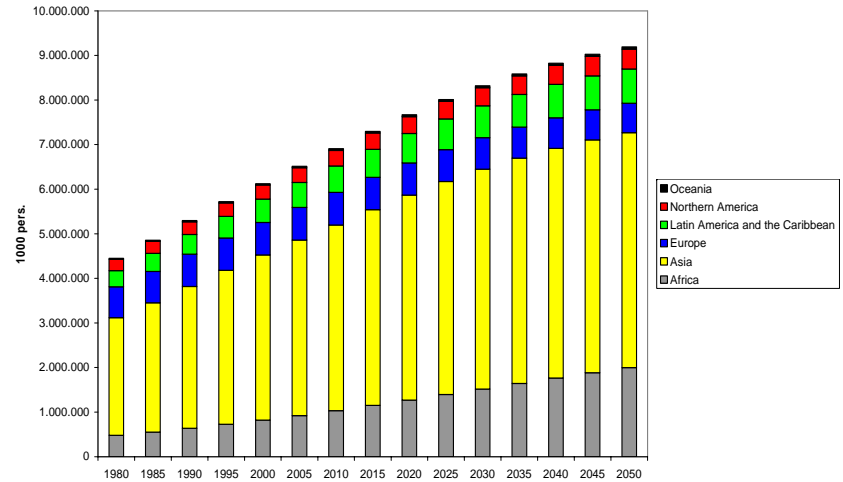
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- **Background and Challenges**
- Around the world
- Pöyry Projects
- Conclusions

# Population development and the cities

- World population today: 6,7 bill.
- World population in 2050: 9,2 bill.
- In 30 years, 80% of the world's urban population will live in developing countries
- In 30 years, 70% of the world's population will live in cities
- In 2015 there will be 22 megacities, each with more than 10 mill. inhabitants
- **Challenge: City planning will be decisive for the energy consumption and environmental impact in the future**

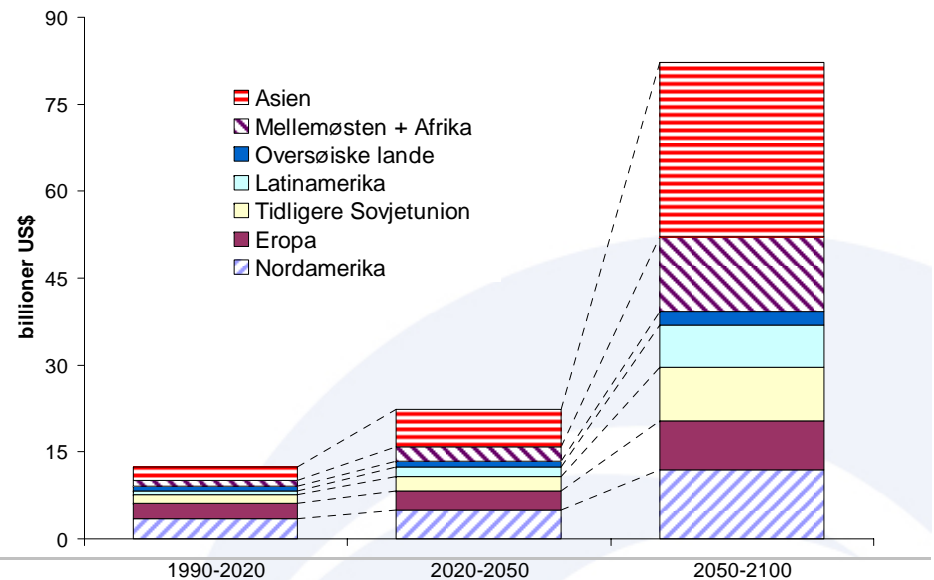
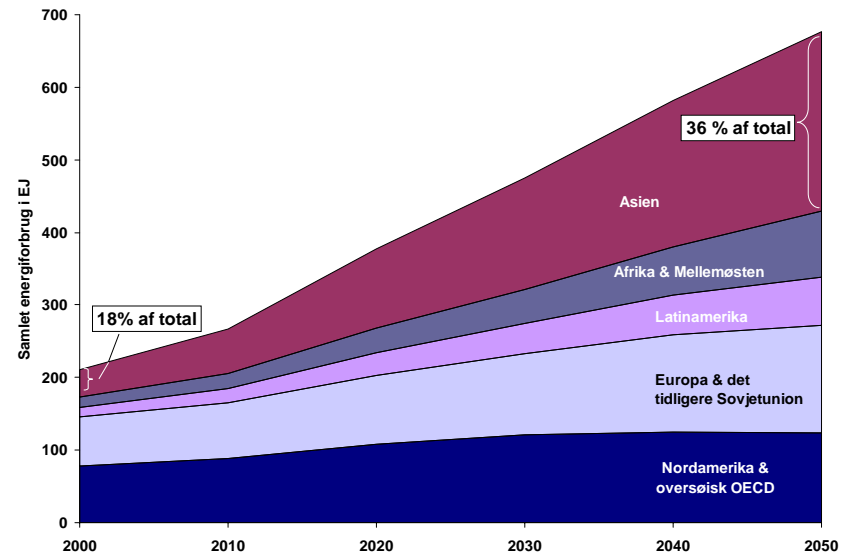
World population; 1980-2050



# Changes in energy consumption and investments in the energy sector

Source: WEC B scenario, IIASA 2002

- Industrial countries' share of the world's energy consumption is today 65%. In 2050 it will only be 40%
- In 2050, Asia is expected to be responsible for 36% of the world's primary energy consumption
- Fast growing economies demand very large investments
- Energy consumption in households, and business and public buildings is account for 35% of the world's energy consumption
- Need to get focus on energy saving potentials and development of new products
- **Challenge: Getting technologies on to the market**



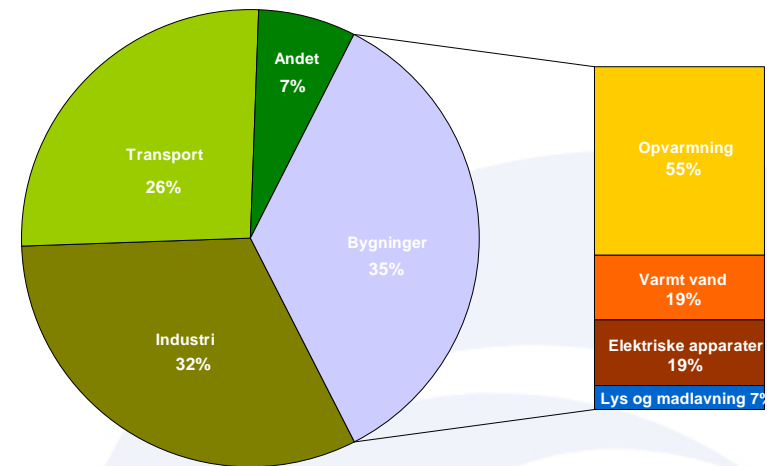
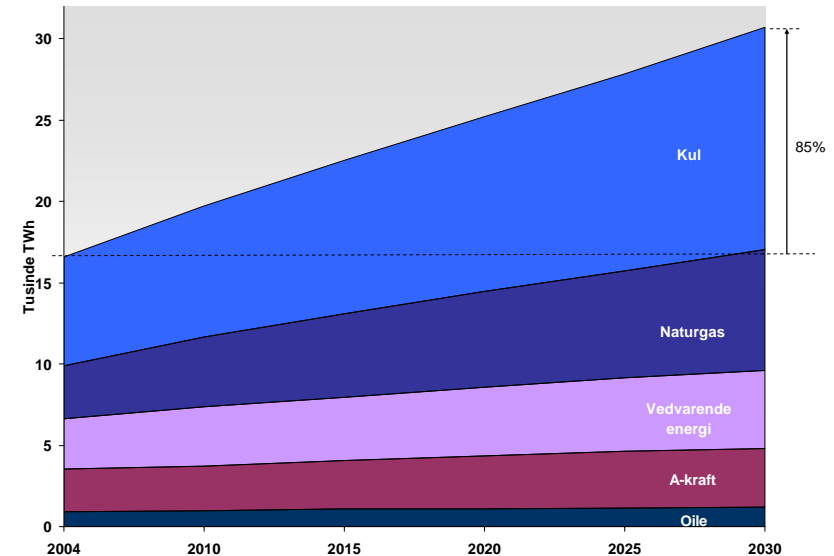
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# Changes in electricity production og fuel composition

Source: IEA International Energy Outlook 2007, reference case; IEA Energy Statistics 2005

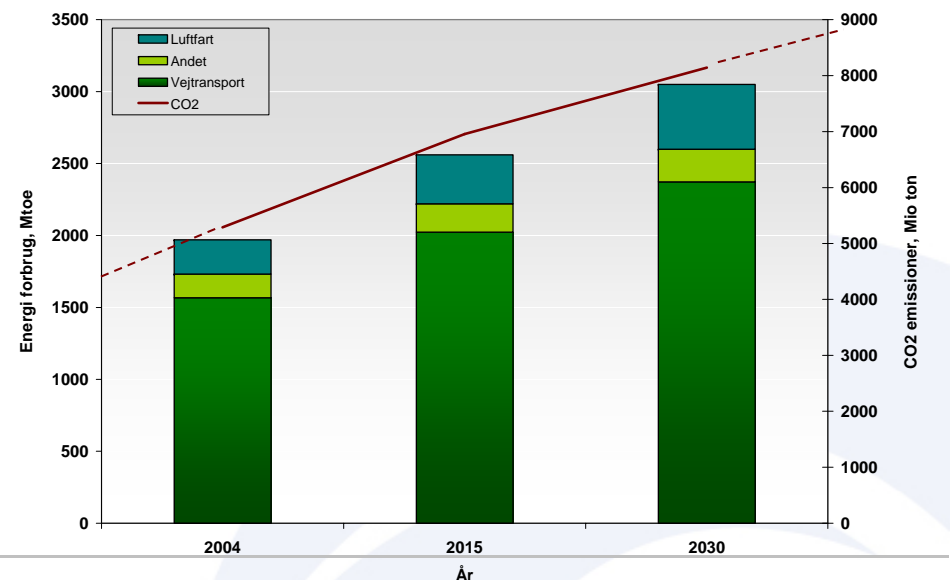
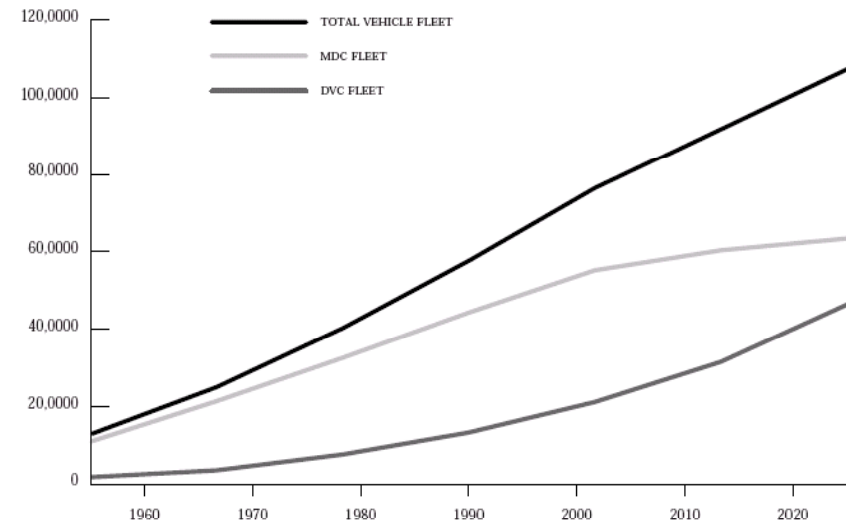
- Almost 40% of the world's CO<sub>2</sub>-emissions come from electricity and heat sectors
- Electricity demand is expected to increase with 85% until 2030
- Under BAU, energy related CO<sub>2</sub>-emissions are expected to rise with another 60% before 2030
- **Challenge: Focusing on energy efficiency (old and new buildings)**
- **Limit the use of fossil fuels, use more RE, and improve production efficiency**
- **New technologies: CCS, fuel cells, fusion energy, IV generation nuclear power, biomass, wind energy, solar**



# The transport of the future

Source: Resources For The Future, [www.rff.org](http://www.rff.org); IEA, World Energy Outlook, 2006

- The future growth in the world's vehicle stock will primary take place in developing countries
- Necessary to meet the rising transport needs without increasing emissions with the same amount
- Energy consumption and CO<sub>2</sub>-emissions in the transport sector are expected to rise with 50-60% until 2030
- **Challenges: Efficiency improvement in motors, alternative fuels, more flexible transport systems, more awareness about transportation in relation to society planning, re-thinking of the role of public transport, efficient traffic planning**



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# Masdar City

Sources: <http://www.fosterandpartners.com/Projects/1515/Default.aspx>,  
<http://www.masdaruae.com/index.aspx>

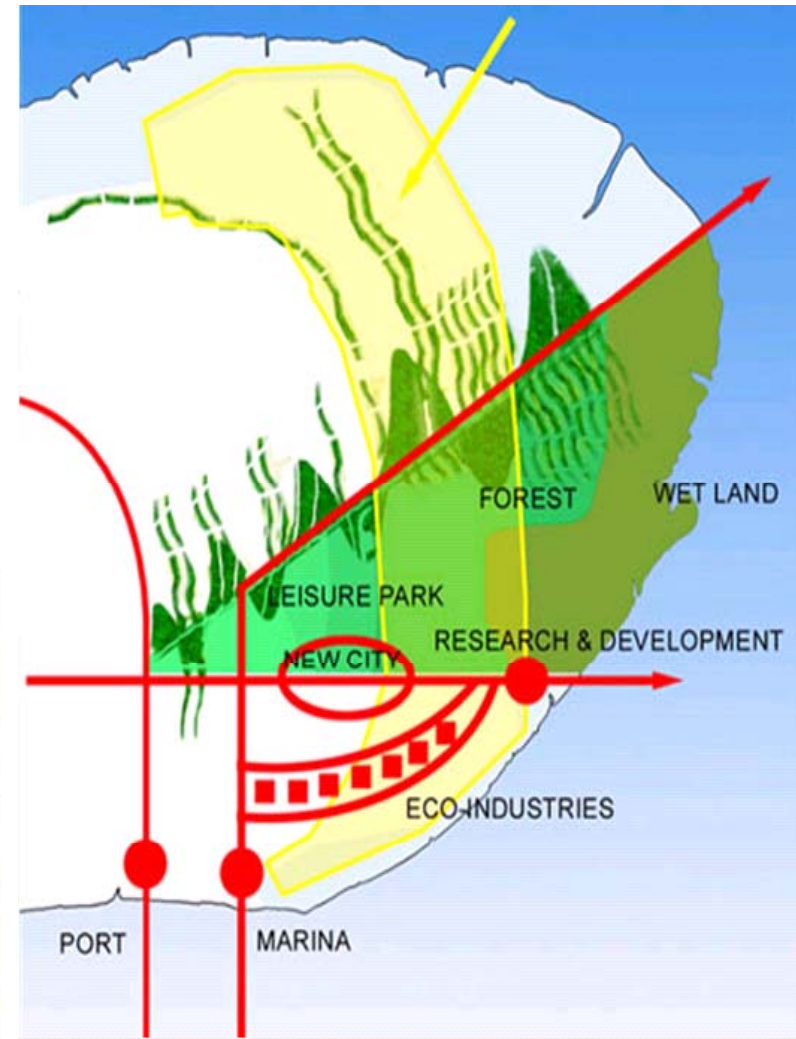
- Carbon- and waste-neutral city
- Located in the desert, uses solar power and wind energy
- First phase: Solar power station generating electricity for the rest of the construction
- No cars
- Easily accessible public transport



# Dongtan eco-city

Sources: <http://www.dongtan.biz/english/zhd/plan06.php>, <http://www.dongtan.biz/english/zhd/plan05.php>, <http://www.popsci.com/environment/gallery/2007-07/dongtan-city>.

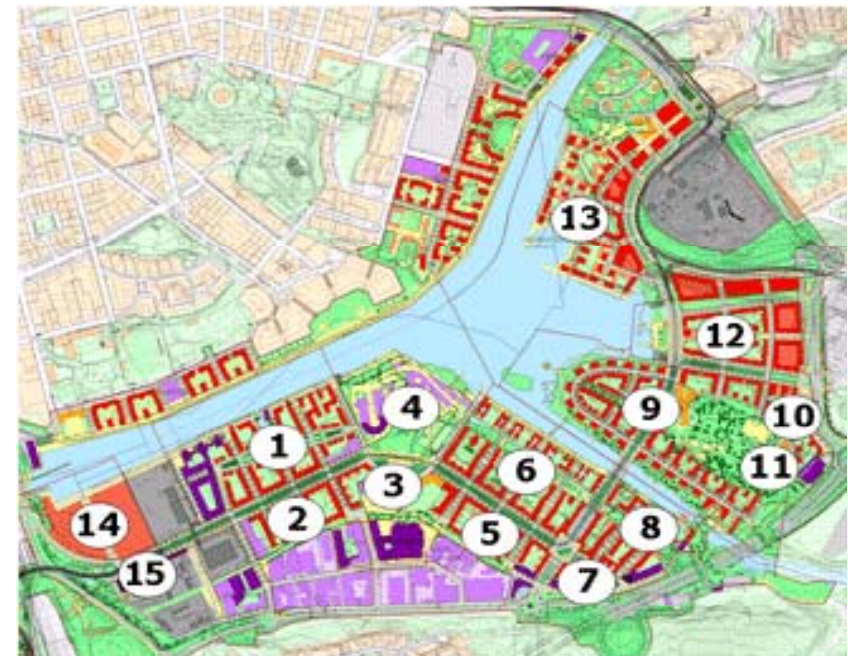
- First purpose-built eco-city
- Designed for sustainability
- 64% lower energy use
- Environmentally friendly transport and infrastructure, green buildings, recycling of waste to energy, wind energy, protection against flooding
- Phase I complete in 2010



# Hammarby Sjöstad

Sources: <http://www.stockholm.se/Extern/Templates/PageWide.aspx?id=191251>,  
<http://www.hammarbysjostad.se/>

- Old industrial area
- Sustainable city
- Fast and efficient public transport, shared cars, bicycle tracks
- Environmentally adjusted building materials
- Renewable energy, recycling of waste heat, biogas
- 90% of household waste will be recycled for energy generation
- Water saving and purification of waste water



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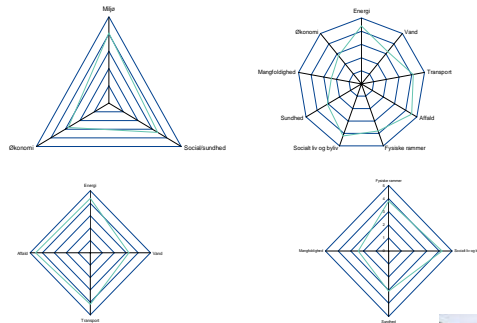
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# Pöyry projects

## Fredericia C



### Rating tool



### Carlsberg's "Our City"



### Køge Kyst

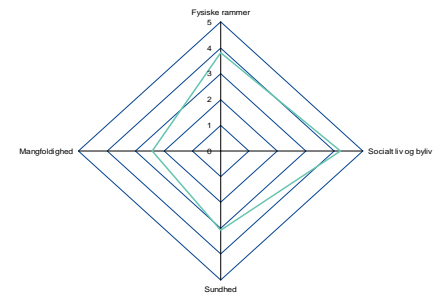
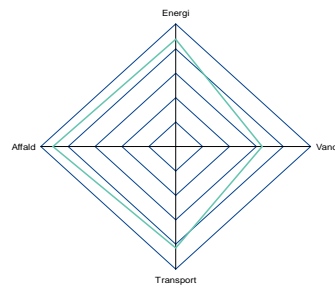
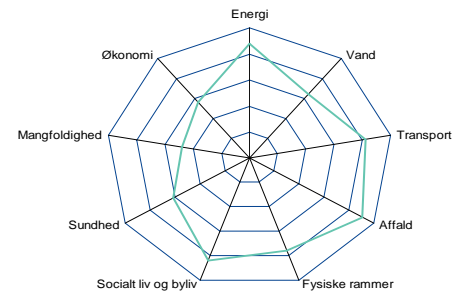
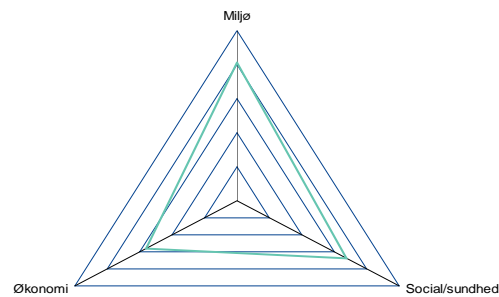


### Amager Fælled Neighbourhood



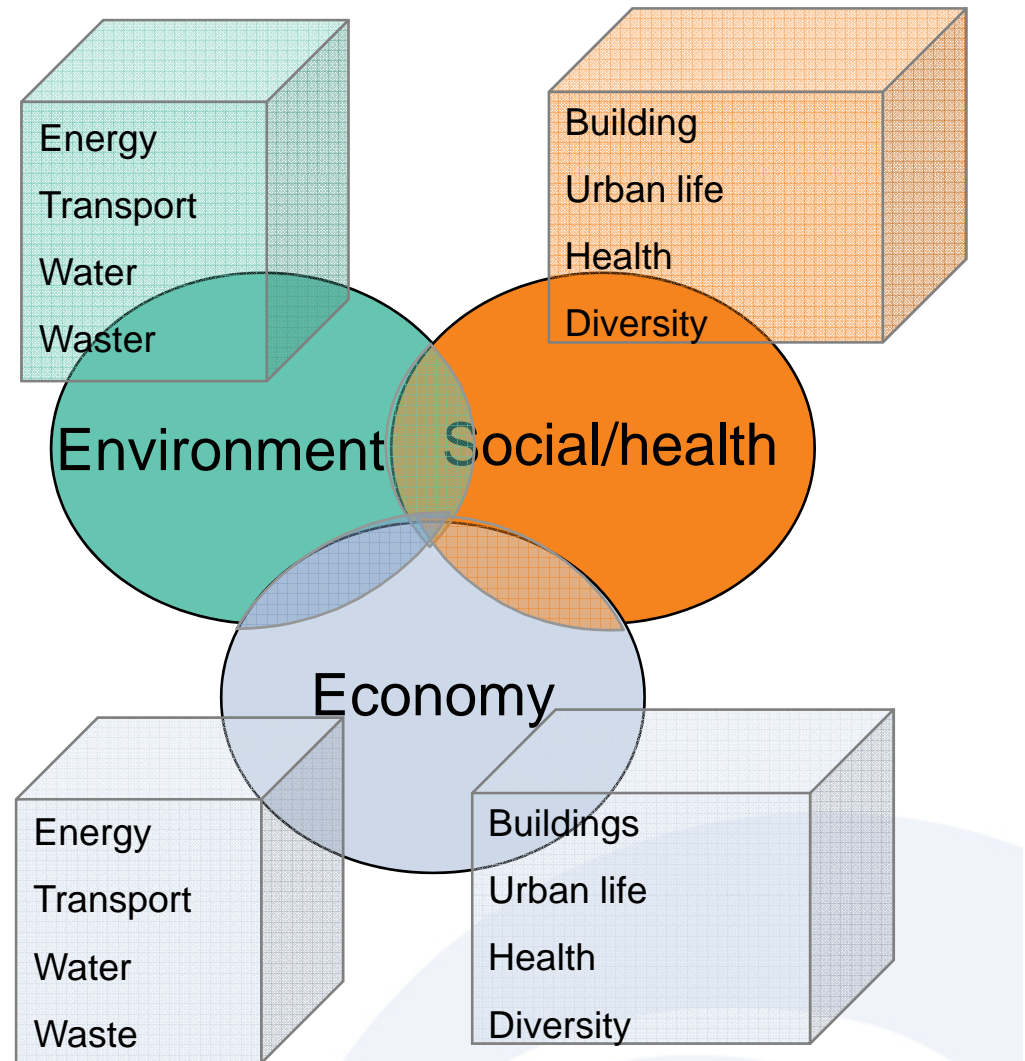
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# Rating tool



# Pöyry projects – rating tool

- **Proces tool**
  - evaluating and adjusting sustainability in urban development projects
  - identify where and how to focus on sustainability
- **Three sustainability *dimensions***
  - Eight *elements* representing the dimensions
    - For each element a number of *indicators* describe sust.
- **Review/grade each element with point of departure in the indicators**
  - sustainability profile



# Fredericia C



# Køge Kyst



## Pöyry projects – Fredericia C and Køge Kyst

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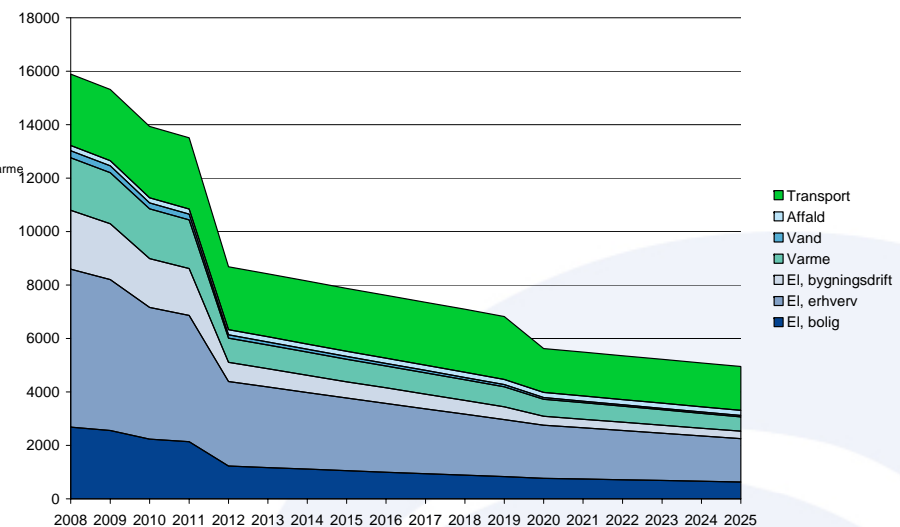
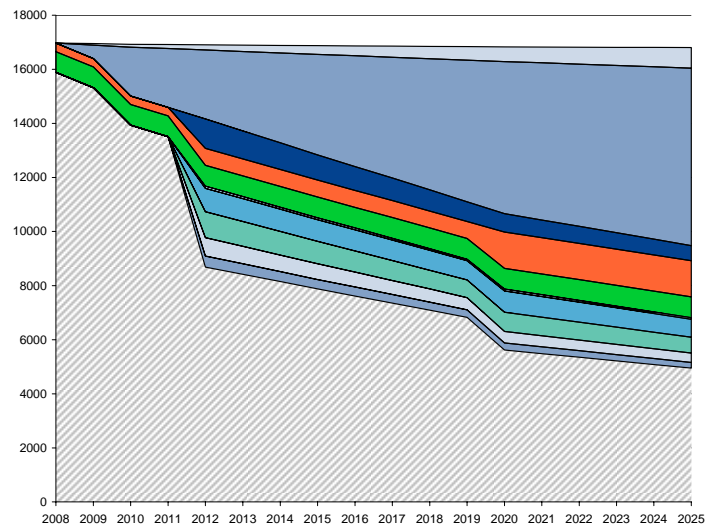
- Sustainability experts
- Competition Brief
  - specify sustainability in urban development
    - three dimensions
      - environment, social/health, economy
    - eight elements
      - energy, transport, water, waste, buildings, urban life, health, diversity
  - define targets – eg.
    - energy consumption, CO2-neutrality, water consumption, sports facilities, cultural facilities
- Review proposals

# Amager Fælled Neighbourhood



# Pöyry projects – Amager Fælled Neighbourhood

- CO2-neutral and sustainable neighbourhood
  - means to reduce CO2-emissions
    - energy (electricity and heat), transport, water consumption, waste management, planning, behaviour
  - reduce CO2-emissions by 65 percent compared to business as usual



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# Carlsberg's "Our City"



# Pöyry projects – Our City – CO<sub>2</sub>-neutral City

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- Optimisation of CO<sub>2</sub>-neutrality
  - energy standard
  - energy production
  - off shore wind mill farms
  - green electricity



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# Conclusions

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- Lots of things going on
  - In Denmark as well as abroad
    - more is needed
- Based on known technologies
  - No man on Mars
    - but is it still too expensive?
- Need for further specification of sustainable urban development
  - Open discussion of definitions
    - Is it possible to make clear definitions?
    - Dynamic process

# Copenhagen

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