responding to climate change

# training engineers to help rethink urban infrastructure

Peter .R. Head - OBE - FREng - FRSA
Director Arup
2nd May 2007 London

Meeting the Challenges-Sustainability in Design Teaching

ARUP

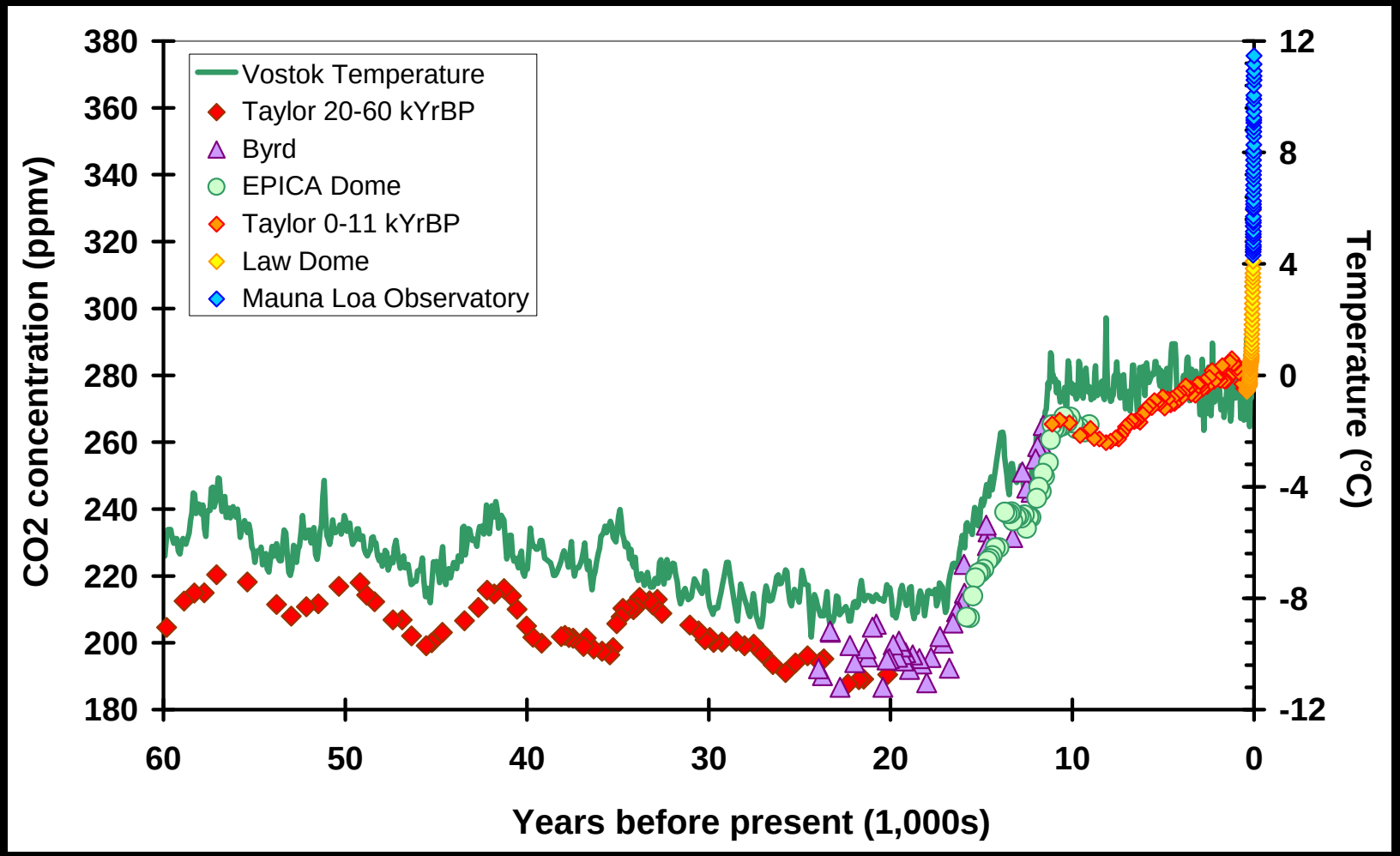
# science and society

“Scientific method” in technical research, accurate measurement and systematic reporting of materials and methods.

Francis Bacon :-

> The purpose of science is to raise comforts and living standards and to ‘torture nature for her secrets’.

# $CO_2$ levels in atmosphere and global temperatures

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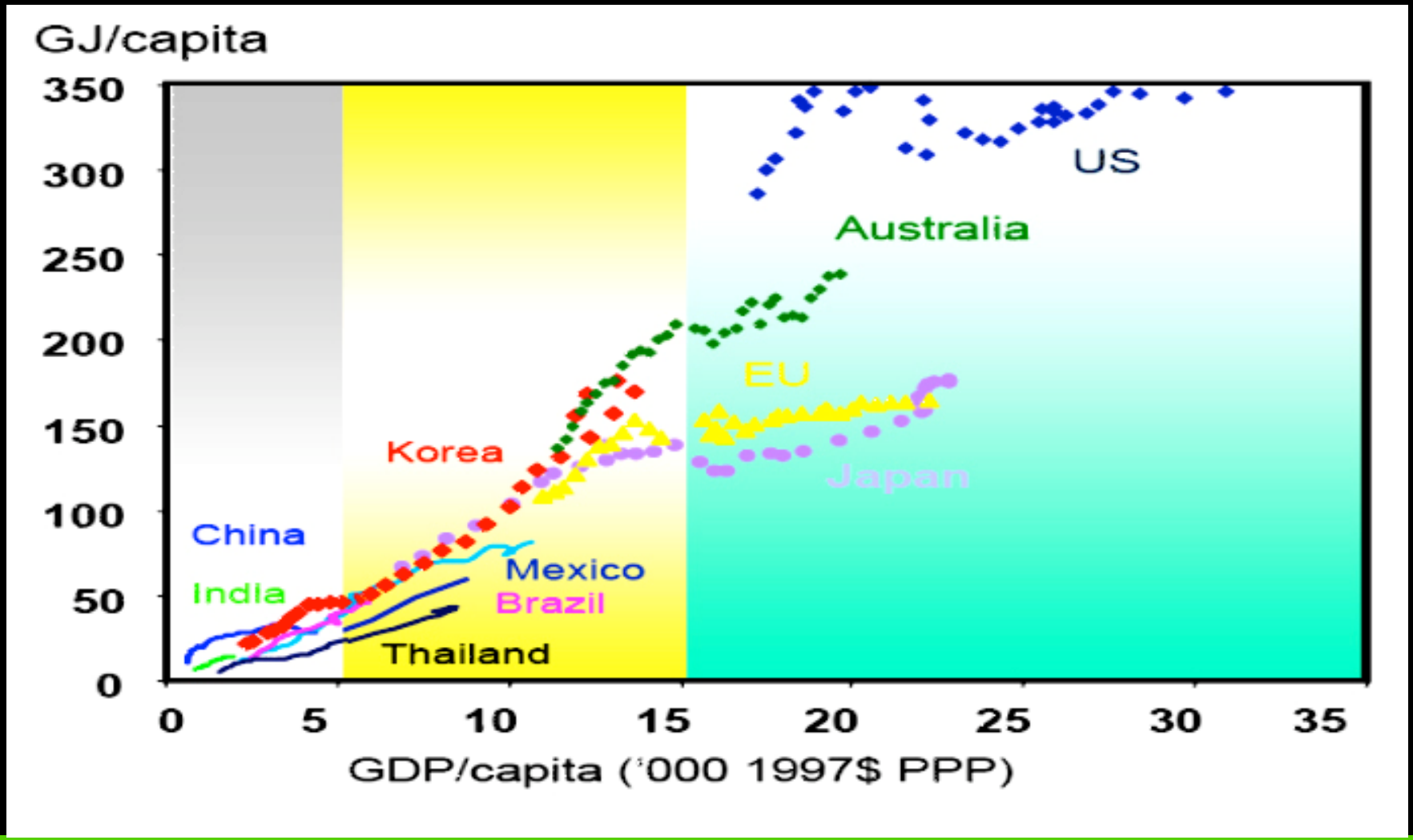
the mitigation challenge:

# global ‘energy hunger’

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# like much of the world, China is becoming more urban

**“Urban population is to reach 1.12 billion by 2050 – this is a shift of more than 600 million people from rural to urban.”**

- ***Guangming Daily***

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# vision and leadership

**‘China’s current development is ecologically unsustainable, and the damage will not be reversible once higher GDP has been achieved’**

**‘A new Ecological phase of development’**

***Zhenhua Xie, Minister of State Environmental Protection Agency***

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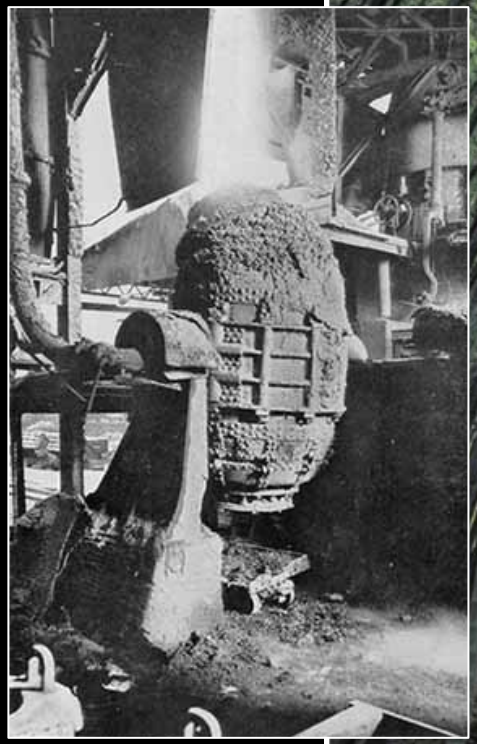

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# biomimicry winning strategies

1. Use waste as a resource
2. Diversify and co-operate
3. Gather and use energy efficiently
4. Optimise not maximise
5. Use materials sparingly
6. Clean up, not pollute
7. Do not draw down resources
8. Remain in balance with the biosphere
9. Run on information
10. Shop locally

Janine Benyus
Biomimicry

# integrated urbanism

- Human and Environmental Health
- Economic Vitality and Individual Prosperity
- Energy
- Housing
- Nutrition and Urban Rural Linkages
- Mobility and Access
- Education and Culture
- Governance and Civic Engagement
- Water
- Materials and Waste
- Ecological Footprint

the world's first eco-city:

# Dongtan

ARUP

# Dongtan will be an 8,400 hectare city situated on Shanghai's Chongming Island


- **Commissioned by SIIC**
- **Designed by Arup**
- **First phase delivery by 2010**
- **A unique planning methodology**
- **Major social, environmental and economic benefits**
- **Connected by a new road/rail link to be completed in 2009**

# a global partnership

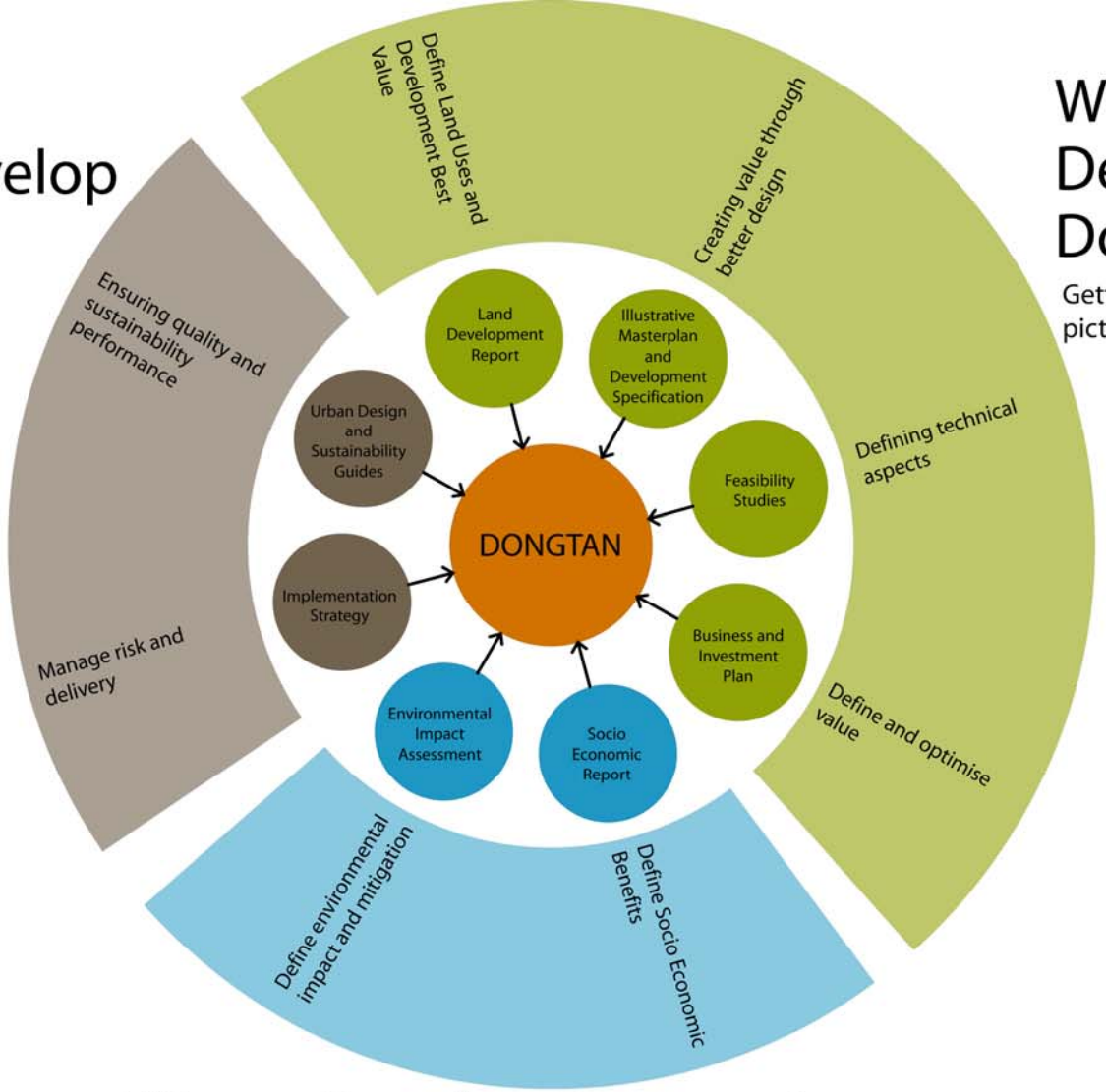
Arup Director, Mr Peter Head and SIIC Executive Director, Mr Ma Chengliang, committing to the future of sustainable development at 10 Downing Street

# How to Develop Dongtan?

Attracting investors and managing risk

# What to Develop in Dongtan?

Getting a clear picture of Dongtan




# Why to Develop Dongtan?

Strengthening the case for development to the Local Government, and defining the economic impact of Dongtan.

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# eco-city the sustainable approach


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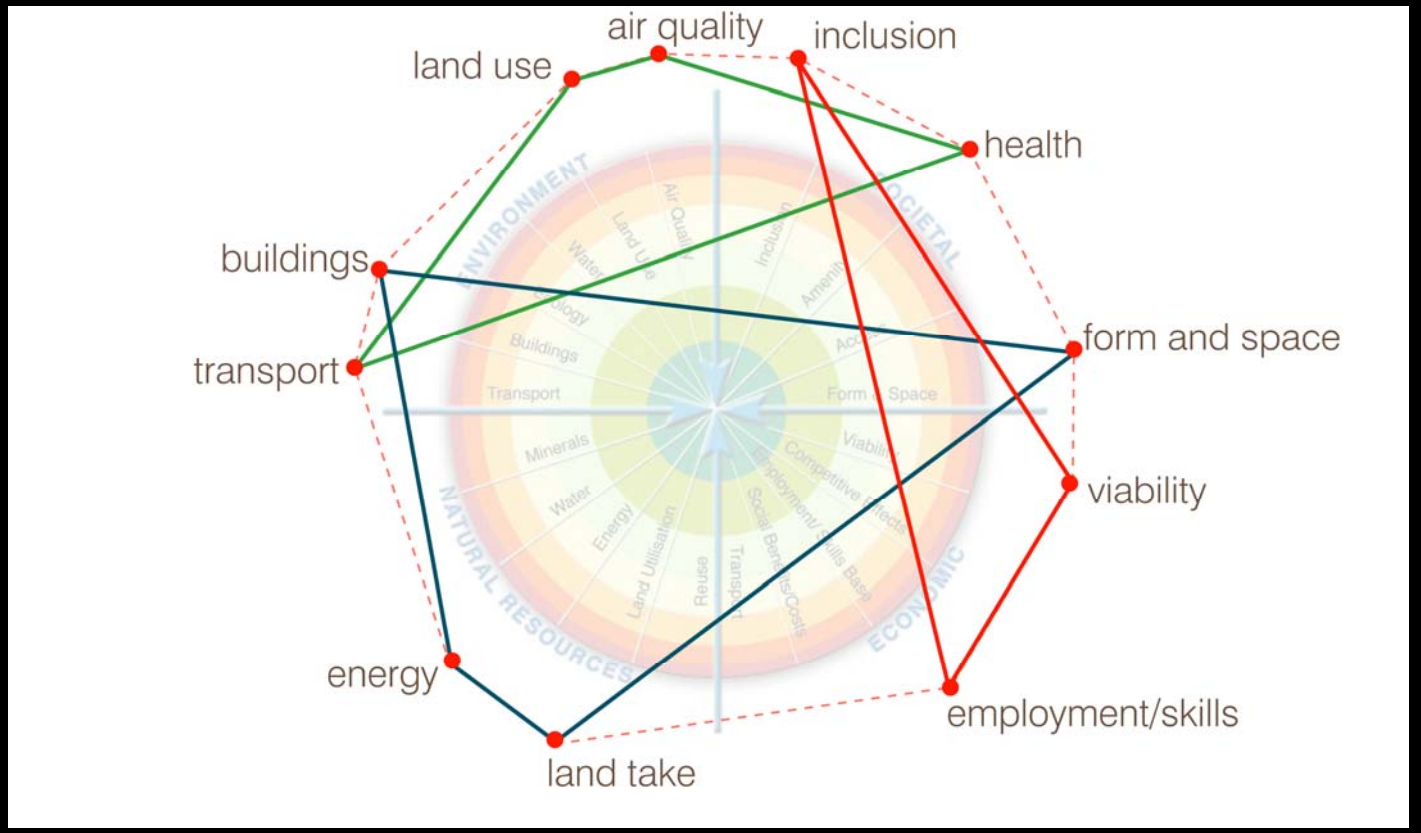
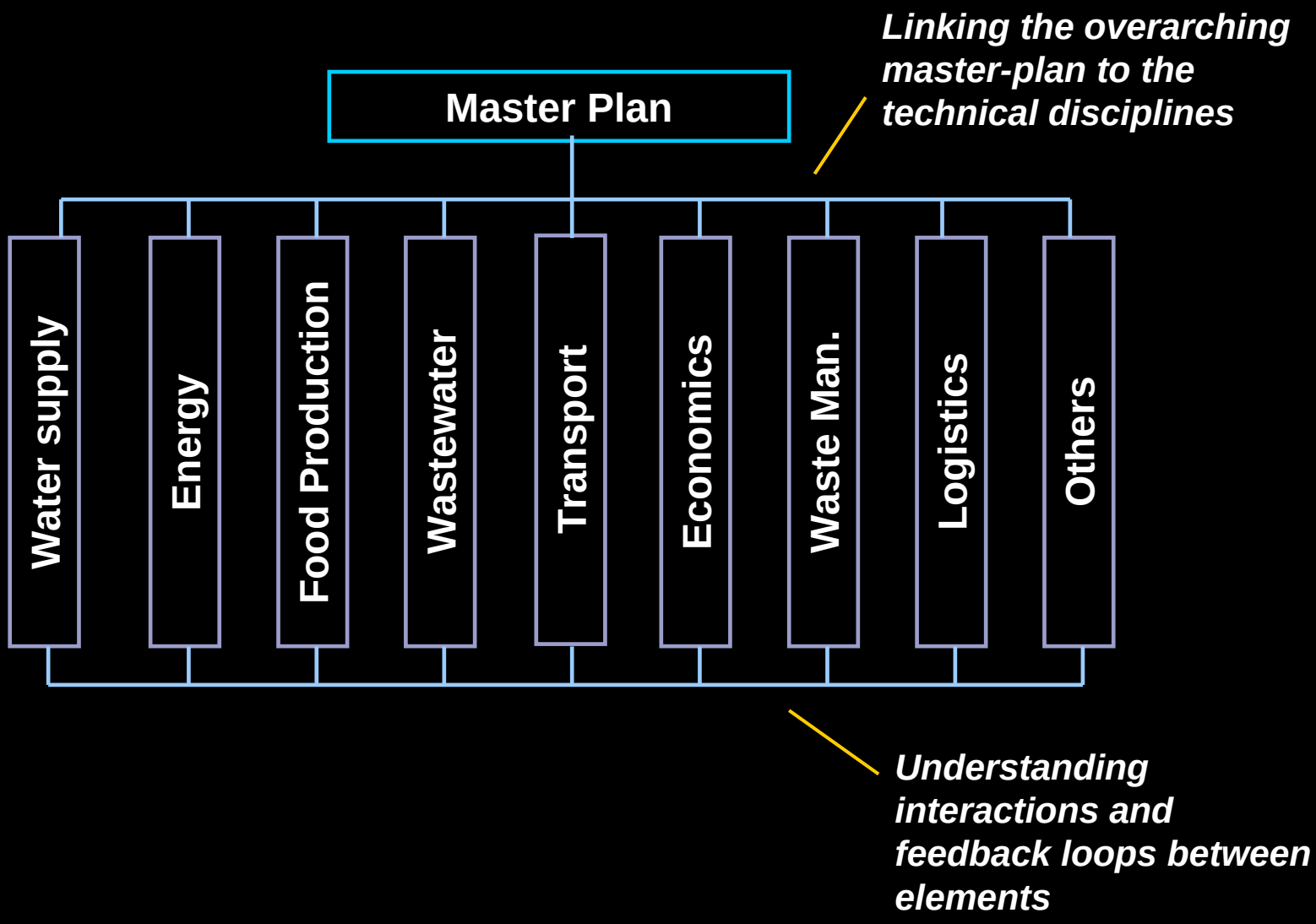
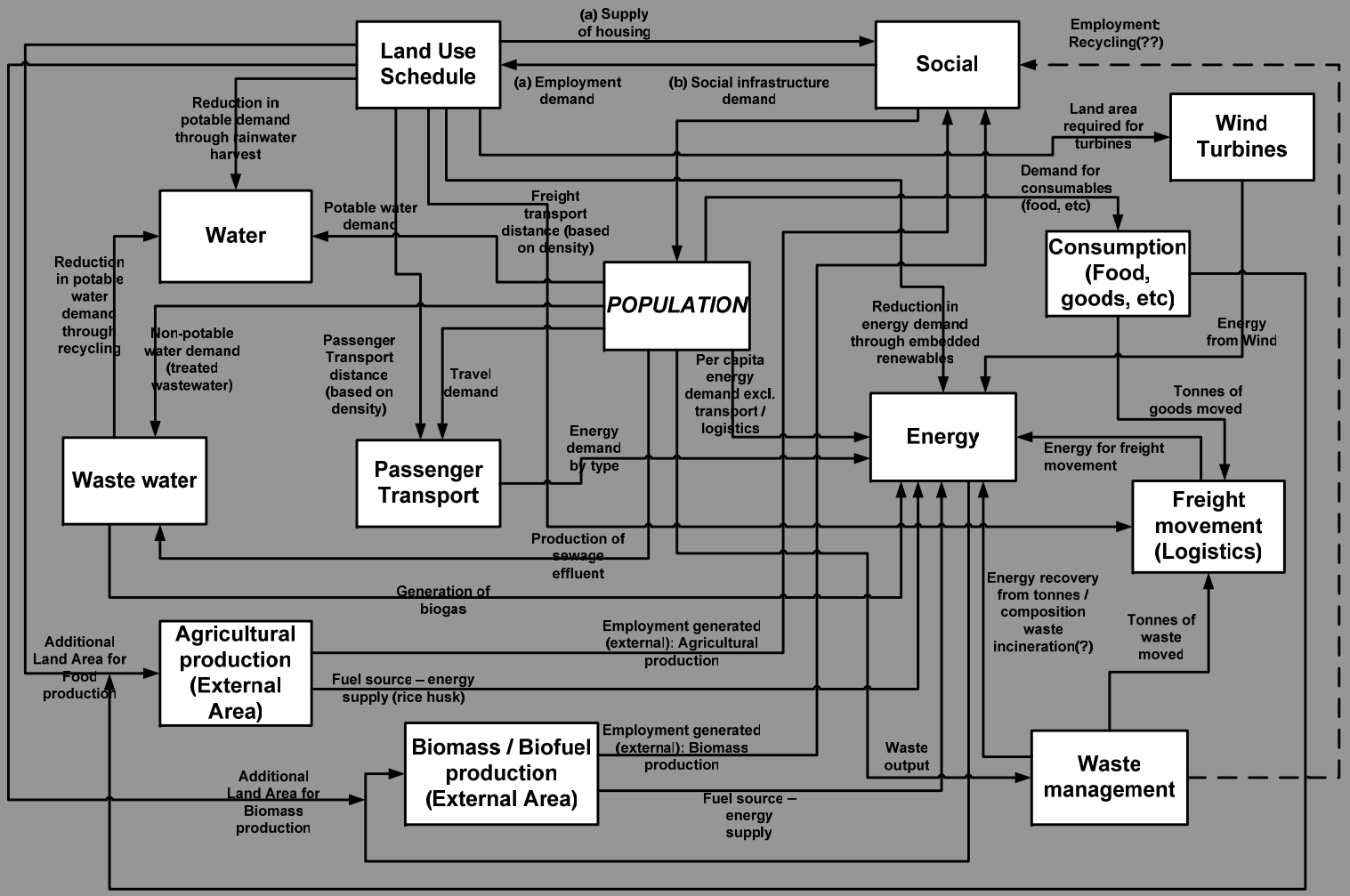
# virtuous cycles of value in masterplanning



# integrated resource management



# the system of city life

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# control plan

630 ha start-up area

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water consumption down by 43%

water discharge down by 88%

## Conventional approach city

- **Water consumption 29,000 tonnes/day**
- **Water discharge 29,000 tonnes/day**

## Sustainable eco-city

- **Water consumption 16,500 tonnes/day**
- **Water discharge 3,500 tonnes/day**

64% reduction in energy demand with no emissions from energy for power / heat, saves

# 350,000 tonnes of $CO_2$ per year

## Sustainable eco-city

- **Energy demand 600 GWh/year**
- **No $CO_2$ emission from energy for power and heat**

## Conventional approach city

- **Energy demand 1650 GWh/year**
- **350,000 tonnes of $CO_2$ emission**

improved accessibility reduces travel distances by 1.8M km. With zero emission transportation this reduces $CO_2$ emissions by

# 400,000 tonnes per year

## Sustainable eco-city

- **Daily travel: 4.2 million km**
- **Zero $CO_2$ emissions**
- **Average trip length 24 km**

## Conventional approach city

- **Daily travel: 6.0 million km**
- **400,000 tonnes $CO_2$ emissions/year**
- **Average trip length 56 km**

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# better city, sustainable city

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‘The purpose of technology in 2007 is to raise comforts and living standards in a sustainable way and to uncover the secrets of the natural world to accelerate better use of resources before it is too late.’

*Peter Head*

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