Dongtan Eco-City, Shanghai

Roger Wood
Arup
23rd November 2007

ARUP

DONGTAN

“ Our biggest challenge in the new century is to take an idea that seems abstract

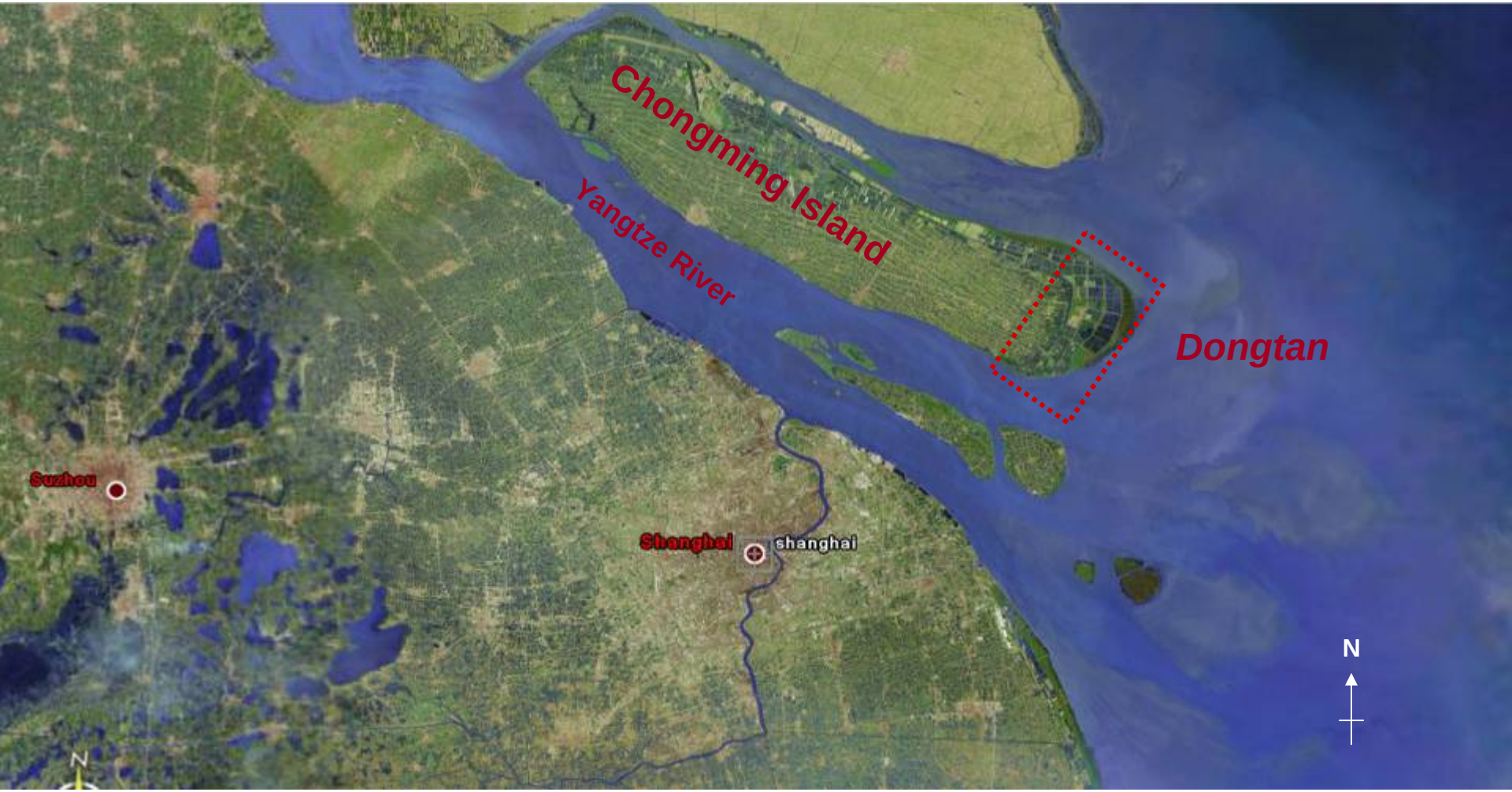
sustainable development

and turn it into a daily reality for all this worlds people”

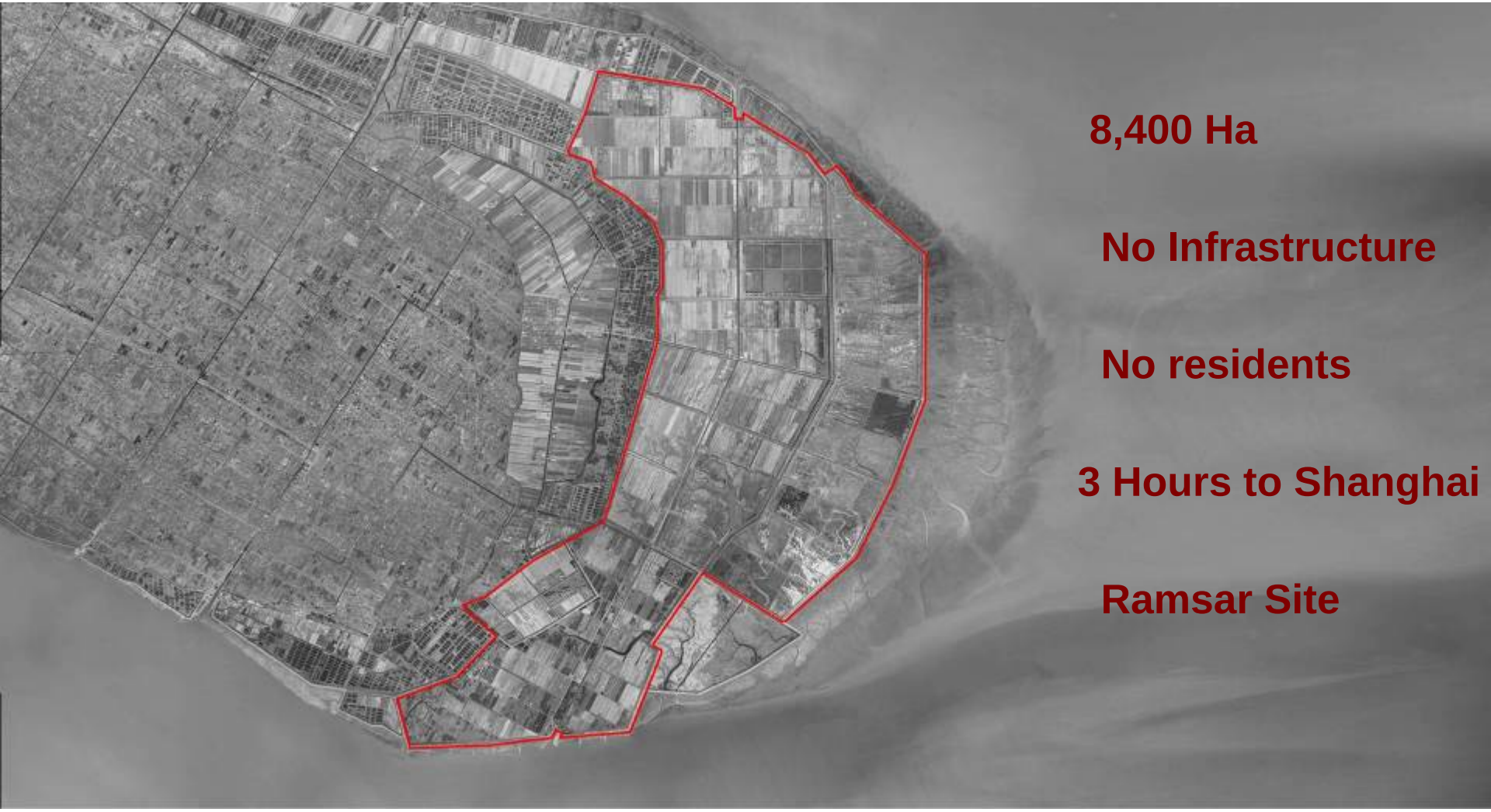
Kofi Annan

Sustainable Development
When done well, the approach can lead to:

Why Dongtan ?


Chongming Island
Yangtze River
Dongtan
Suzhou
Shanghai
shanghai
N
N

What Dongtan ?



8,400 Ha

No Infrastructure

No residents

3 Hours to Shanghai

Ramsar Site

How Dongtan ?

vision and leadership

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

Minister of State Environmental Protection Agency

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

November 2005


Yancheng
Nanjing
Nantong
Qidong
Dongtan
Shanghai
Hangzhou


August 2007

Linear City

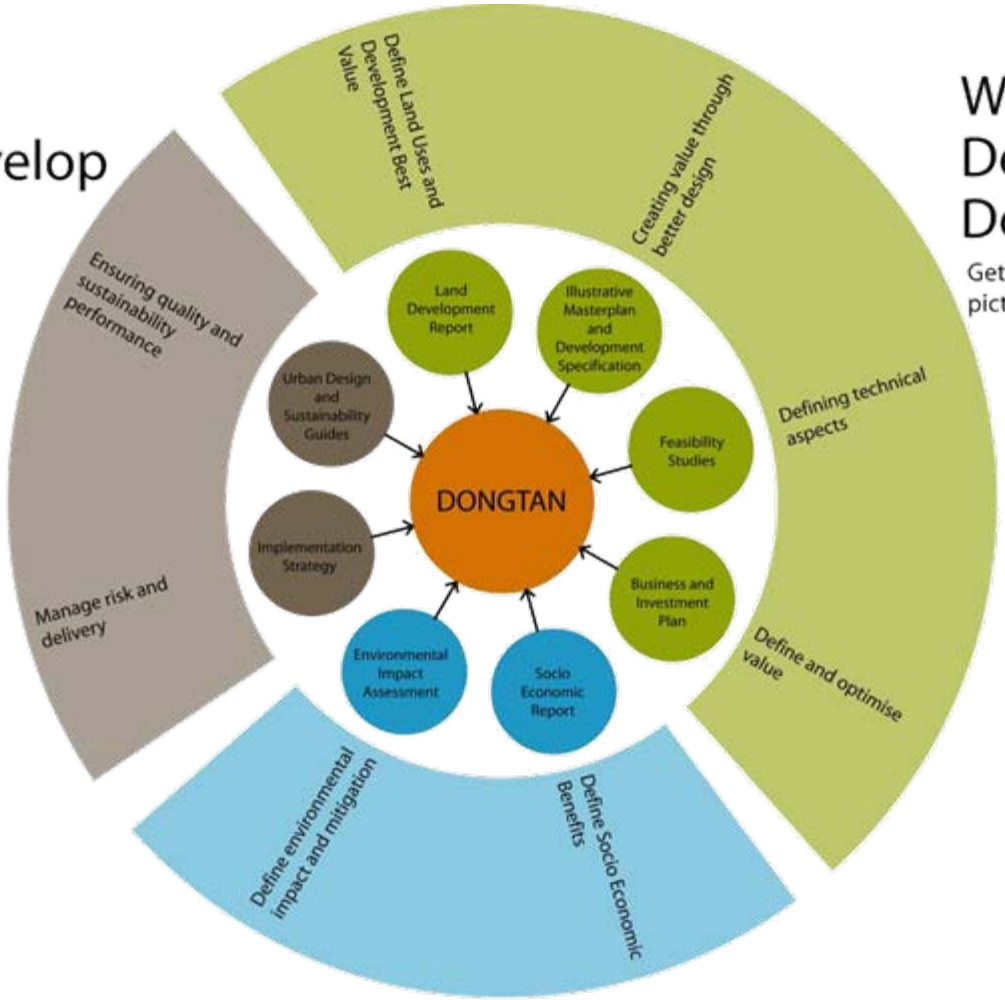

future dongtan phases
main nodes
将来东滩分期
主要节点
future dongtan phases
secondary nodes
将来东滩分期
次要节点
eco farms
eco farms
eco farms
eco farms
3.7 km
wetland park
ramsar
ramsar
eco park
eco park
2020

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.

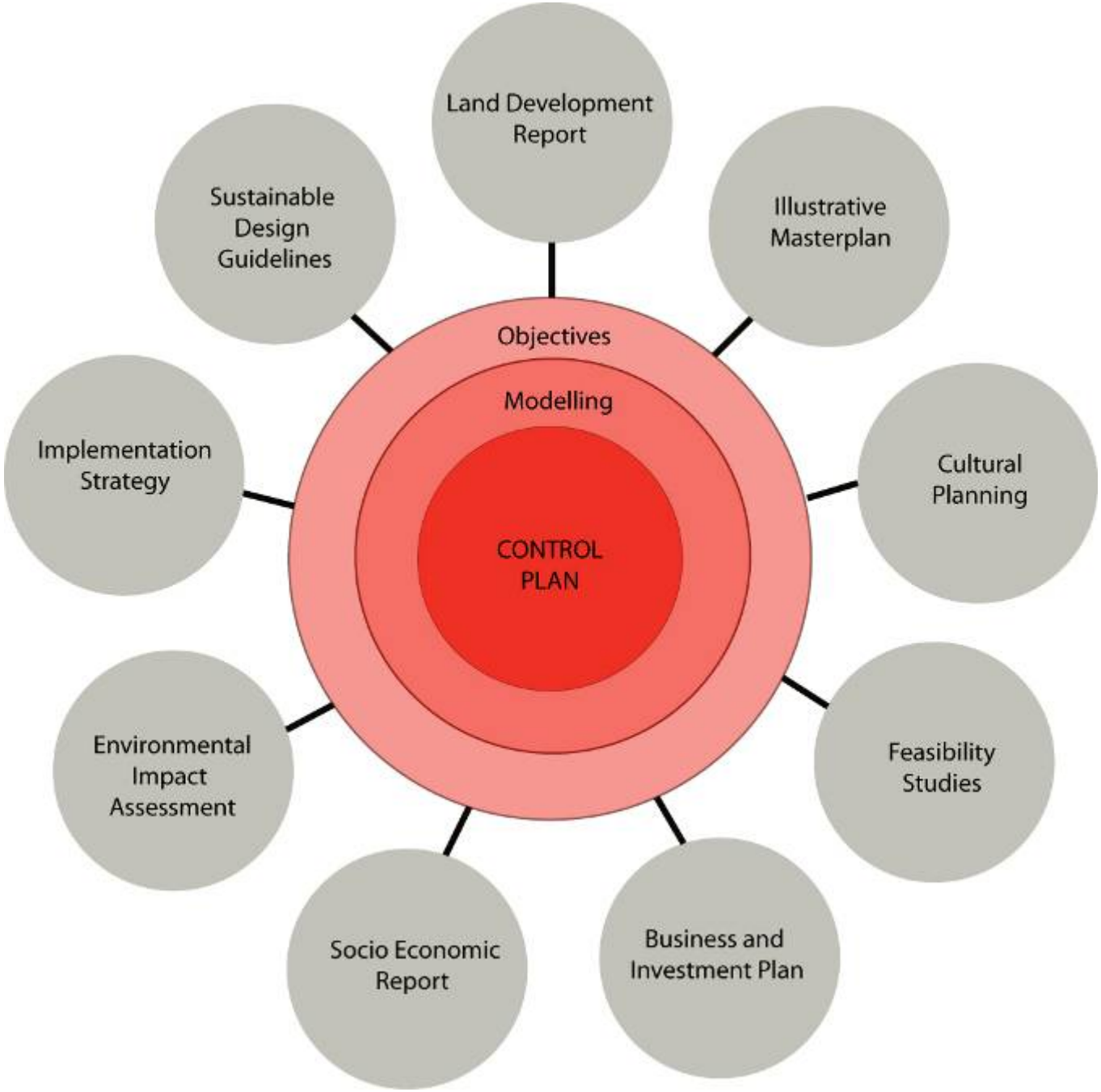
Arup

"… 'Total Architecture' implies that all relevant design decisions have been considered together and have been integrated into a whole by a well organized team empowered to fix priorities"

Ove Arup

integrated urbanism

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


Land Development Report
Illustrative Masterplan
Cultural Planning
Feasibility Studies
Business and Investment Plan
Socio Economic Report
Environmental Impact Assessment
Implementation Strategy
Sustainable Design Guidelines
Objectives
Modelling
CONTROL PLAN

The Sustainable Approach

Sustainability Principles

The key principles of the sustainability framework are:

- To preserve the wetland habitat
- To create an integrated, vibrant and evolving community
- To improve quality of life and create desirable lifestyles
- To create an accessible city
- To ingrain contemporary Chinese culture into the city fabric
- Managing the use of resources in an integrated manner
- Working towards carbon neutrality
- Utilizing governance to achieve long term economic, social and environmental sustainability

Using the framework

This framework has been developed by Arup to set out a vision for the Eco-City and a set of objectives to guide decision making
The framework should be used to:

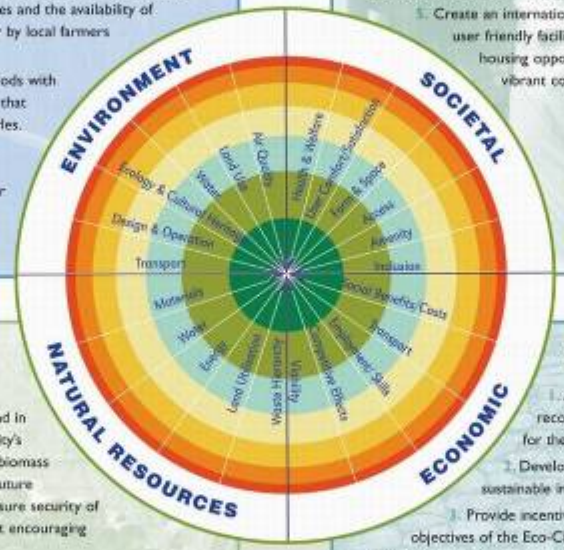
1. Undertake sustainability appraisals of designs, projects, plans and strategies
2. Monitor progress towards a more sustainable city
3. Provide the context for policy development and decision making

Environment

1. Physically and legally protect the Eco-City's internationally significant wetlands from any man-made intervention such as physical encroachment, poaching of wildlife and pollution to land, water and air. Impose the strongest possible penalties on organisations and individuals in breach of these measures.
2. Protect and enhance the biodiversity and quality of the wider Eco-City and its urban areas, including the ecological communities and habitat, canals and waterways.
3. Avoid any physical degradation of the island through the Eco-City's activities and monitor the impact of others on the rate of deposition and erosion of the eastern wetlands.
4. Enable sustainable lifestyles that minimise negative environmental impacts on resource use, waste and pollution through the provision of well connected, public transport links, cycling and walking routes and the availability of healthy food produced in a sustainable manner by local farmers and fishermen.
5. Create cleaner, safer, and greener neighbourhoods with ecologically sound, open spaces and landscape that encourage social interaction and healthy lifestyles. Build with people as the priority, not cars and encourage sustainable alternatives for the transport of freight, goods and food. Design for the likely effects of climate change for now and for the future, incorporating sustainable drainage and flood management techniques.

Societal

1. Create inclusive, cohesive and tolerant communities that recognise traditional and modern Chinese and other cultural values.
2. Ensure all citizens can engage with and are represented by governance systems that are accountable and that work towards the continued realisation of the fullest concepts of the Eco-City.
3. Develop a city that enables healthy and safe lifestyles through the provision of key services and facilities accessible to all and which promote health, provide suitable healthcare when required, avoid car dependence and reduce opportunities for crime.
4. Provide jobs and cultural, leisure, community, sporting and educational facilities for all, regardless of age or ethnicity, and make everyone aware of these opportunities through world class information and communication technology.
5. Create an internationally, regionally and locally accessible city with user friendly facilities and a sustainable mix of development and housing opportunities blended with green spaces to create vibrant communities and a real sense of place.



Natural Resources

1. Design for energy efficiency and the use of renewable energy at macro and micro scale and in all lifestyle energy uses to minimise the Eco-City's contribution to climate change. Produce local biomass for energy production. Maintain flexibility for future changes in energy supply and consumption. Ensure security of energy supply at a cost that is affordable whilst encouraging efficiency of use.
2. Design for the reduction, re-use and recycling of natural and man-made materials and develop polices that encourage resource management, sustainable production and consumption and the extraction of maximum benefit from residual wastes at the Eco-City, through energy production and use in agriculture.
3. Design for water efficiency in all domestic, commercial, industrial, leisure and agricultural applications and develop infrastructure and policies that allow for the application of potable water to only those applications that require it. Identify and protect reliable sources of fresh water for now and for the future and ensure security of water supply at a cost that is affordable whilst encouraging efficiency of use.

Economic

1. Aim for consistent economic progress, which recognises China's old and new economies and allows for the sustainability objectives of the Eco-City to be met.
2. Develop an equitable balance and mix of uses to support sustainable investment and prosperity.
3. Provide incentives for businesses that meet the sustainability objectives of the Eco-City and, conversely, ensure that environmental and social costs are met by organisations that are responsible for them.
4. Provide jobs diverse enough for all and maintain a culture of innovation and business creation, together with relevant life-long training and educational opportunities. Ensure economic benefits are realised within the local community.
5. Design and maintain suitable and flexible infrastructure, homes, buildings, transport links and information and communications technology to sustain the economic objectives of the Eco-City. Ensure the city is suitably protected from flooding and extreme events.

Overall objective

The Eco-City aims to achieve environmental, social and economic development simultaneously; the improvement of one will not be to the detriment of another.
Where trade offs between competing objectives are unavoidable, these will be transparent and minimised.

SPeAR®

The Sustainable Project Appraisal Routine (SPeAR®) developed by Arup, will be used as a sustainability monitoring and reporting tool for the Eco-City. It will be used at key stages of the design to assess the Eco-City masterplan against the sustainability objectives. It will also be used as a management information tool in the development and decision making process.
It is based on a four-quadrant model, that structures the issues of sustainability into a robust framework.

Sustainable Appraisal / Management Process

OBJECTIVES (MASTERPLAN & SUSTAINABILITY)

OPPORTUNITIES

CONSTRAINTS

e.g. cost

DESIGN & PERFORMANCE CRITERIA

ALTERNATIVES

CONCEPTS

e.g. wind energy

PREFERENCES

FEASIBILITY

e.g. space

DESIGN OPTIONS

DESIGN ITERATIONS

CHANGE DESIGN

INTEGRATED RESOURCE MANAGEMENT (IRM) MODEL INPUT

ANALYSE & EVALUATE

PREFERRED SOLUTIONS

Task 1: Sustainability Appraisal Framework

Task 2: Development of design options

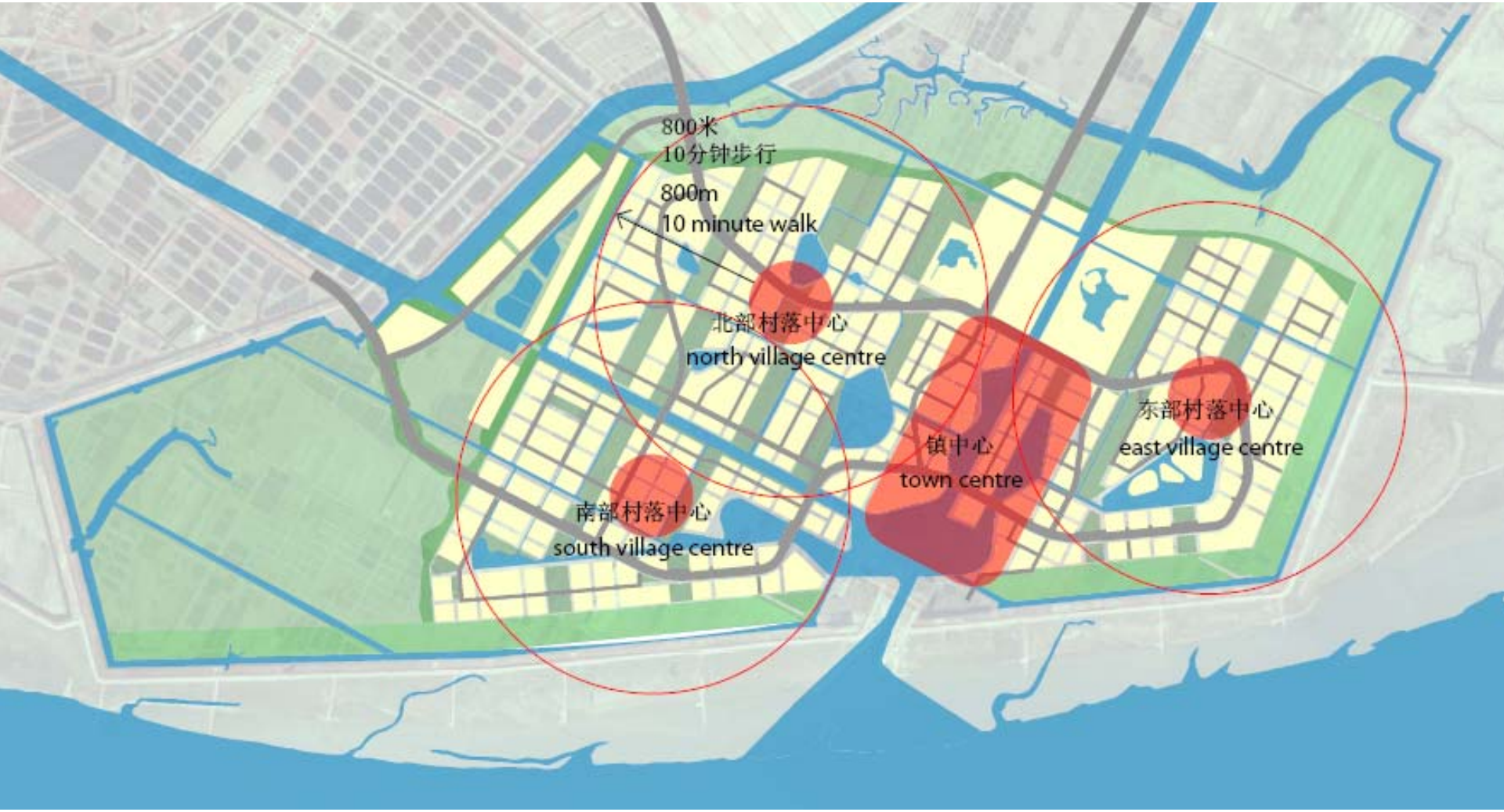
Task 3: Populate IRM model and evaluate design options

Task 4: Reporting on output of IRM model


Town of three villages
clusters and centres

Town of three villages

walking and cycling



Town of three villages

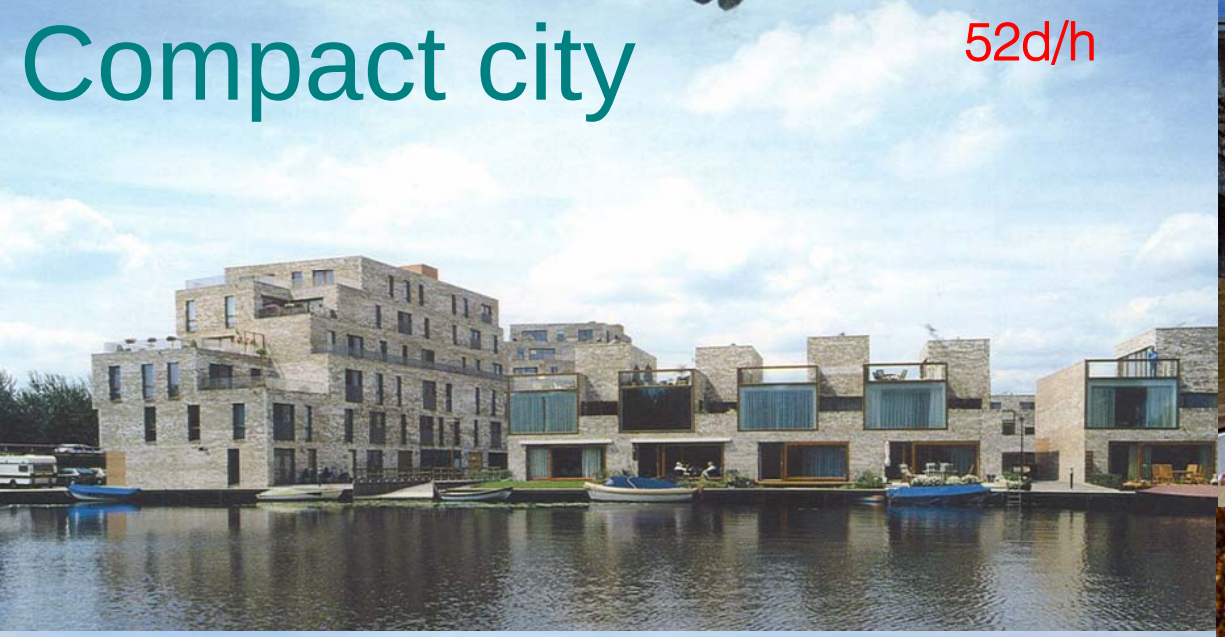
road network

Compact city

low rise & high density – 3 to 6 storeys / 1.2 average plot ratio
75 dwelling per hectares / 80,000 people

Compact city

52d/h



73d/h

100d/h

120d/h

Compact city

planned development by 2020

634 Ha	**Land Developed**
57%	**Development Area**
43%	**Open Space, Water and Major Roads**
27,000	**Dwellings**
5.1 M sqm	**Gross floor area**
55%	**Residential as proportion of GFA**
24%	**Commercial, retail and light industrial**
16%	**Culture, tourism, leisure and hotel**
5%	**Education and Social Infrastructure**

1 Environmental Protection

Improving air quality

Reducing noise levels

Enhance the ecology

Introduce biodiversity in the landscape

Reduced light pollution

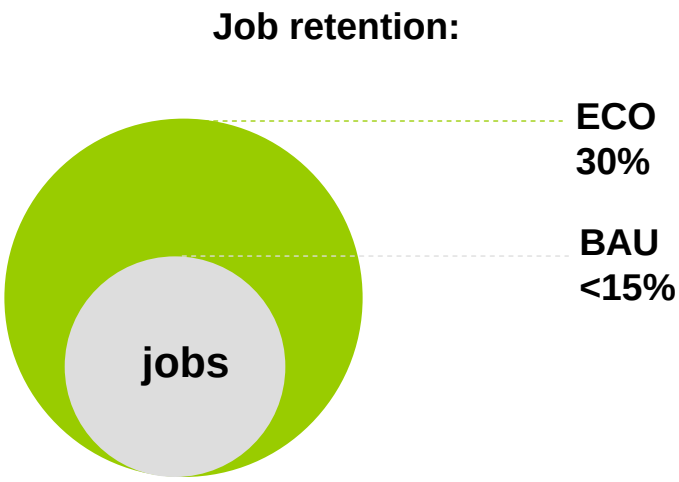
2 Socio – Economic Benefits

Job retention : people living and working on site

Accessible green space

Sense of place / community

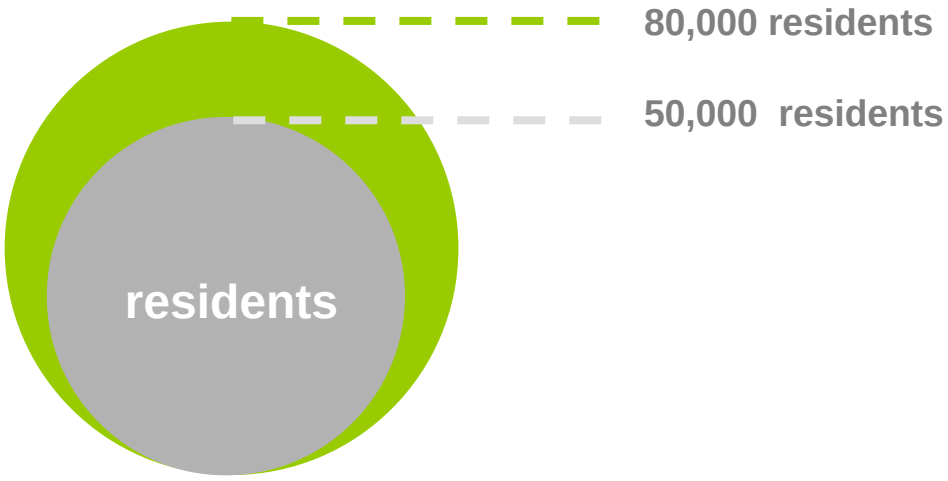
Support more residents, deliver more jobs, and attract more visitors

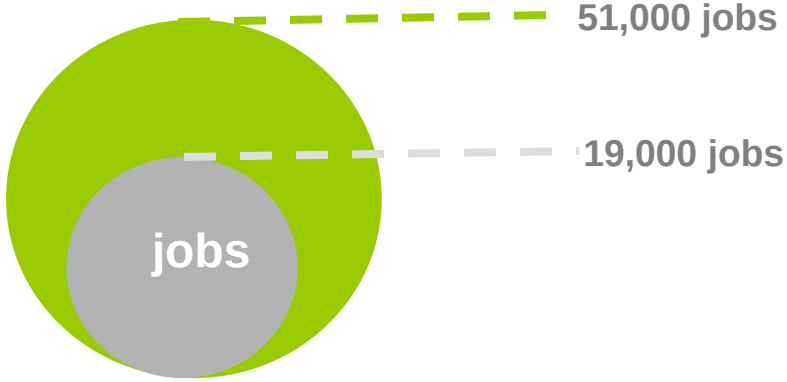


2 Social and Economic Benefit

It supports more residents,
delivers more jobs,

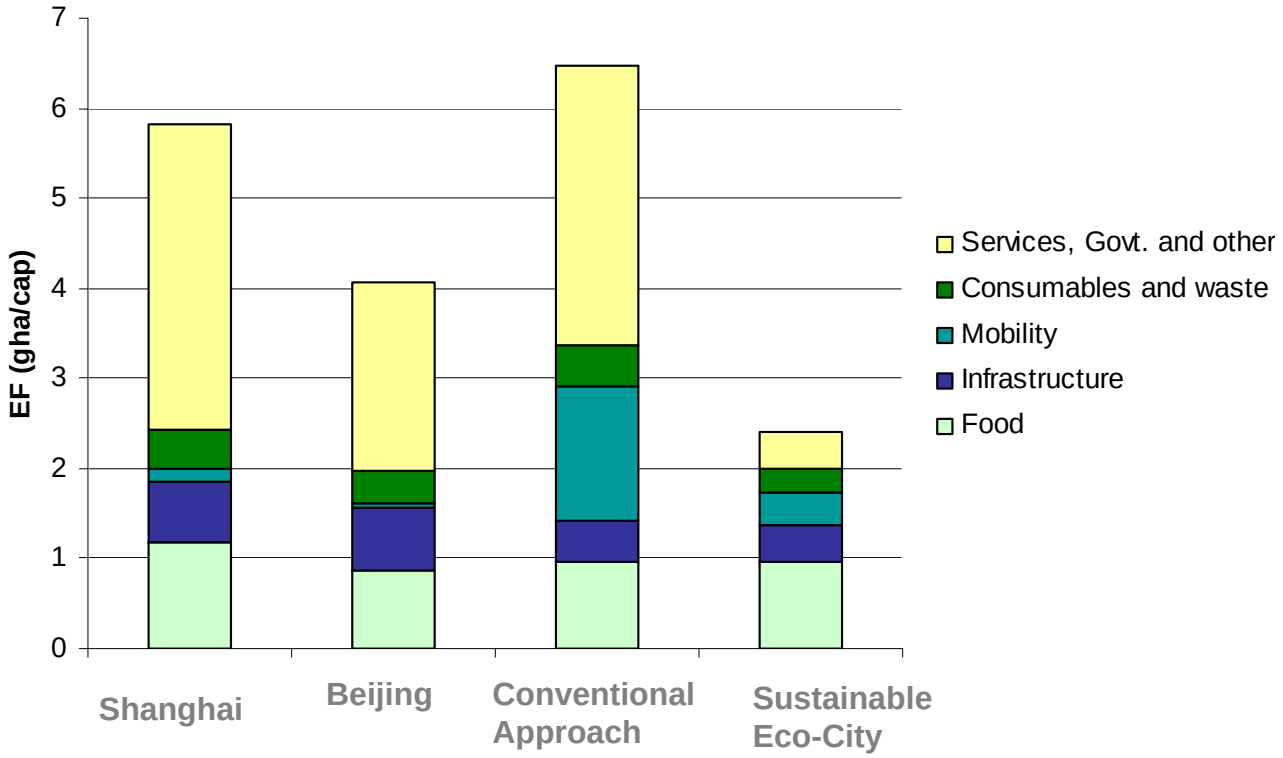
and will attract more visitors





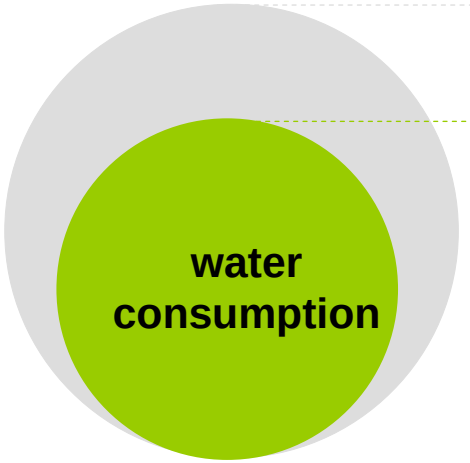
3 Low Ecological Footprint

World Average	Footprint	2.1 gh/person
Eco-City	Footprint	2.3 gh/person
Conventional Approach City	Footprint	5.8 gh/person



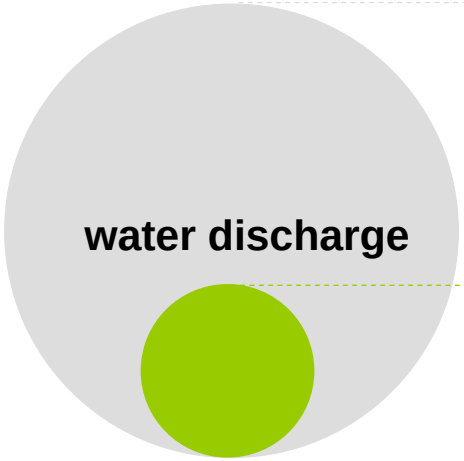
4 Water and Flood Management

- Increase water efficiency
- Grey water recycling
- Dual pipe system
- Reduce mains sewage output
- Incorporating flood management



BAU
150 lt. water/ person / day

ECO
80 lt. water/ person / day



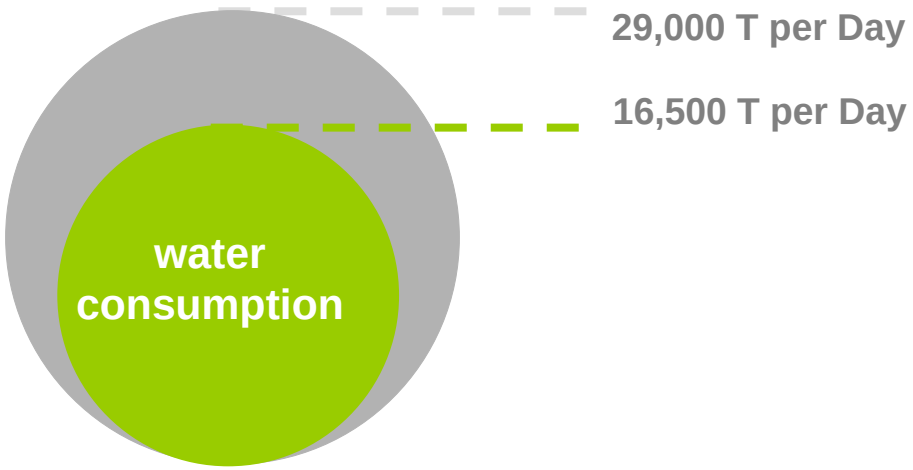
BAU
29,000 T per Day

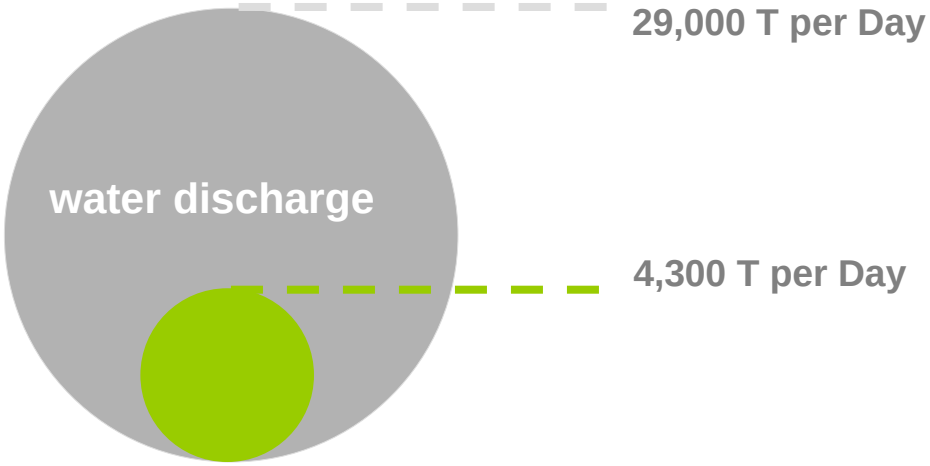
ECO
4,300 T per Day

Source: Code for Sustainable Homes Level 6

4 Water and Flood Management

water consumption down by 43%
water discharge down by 88%



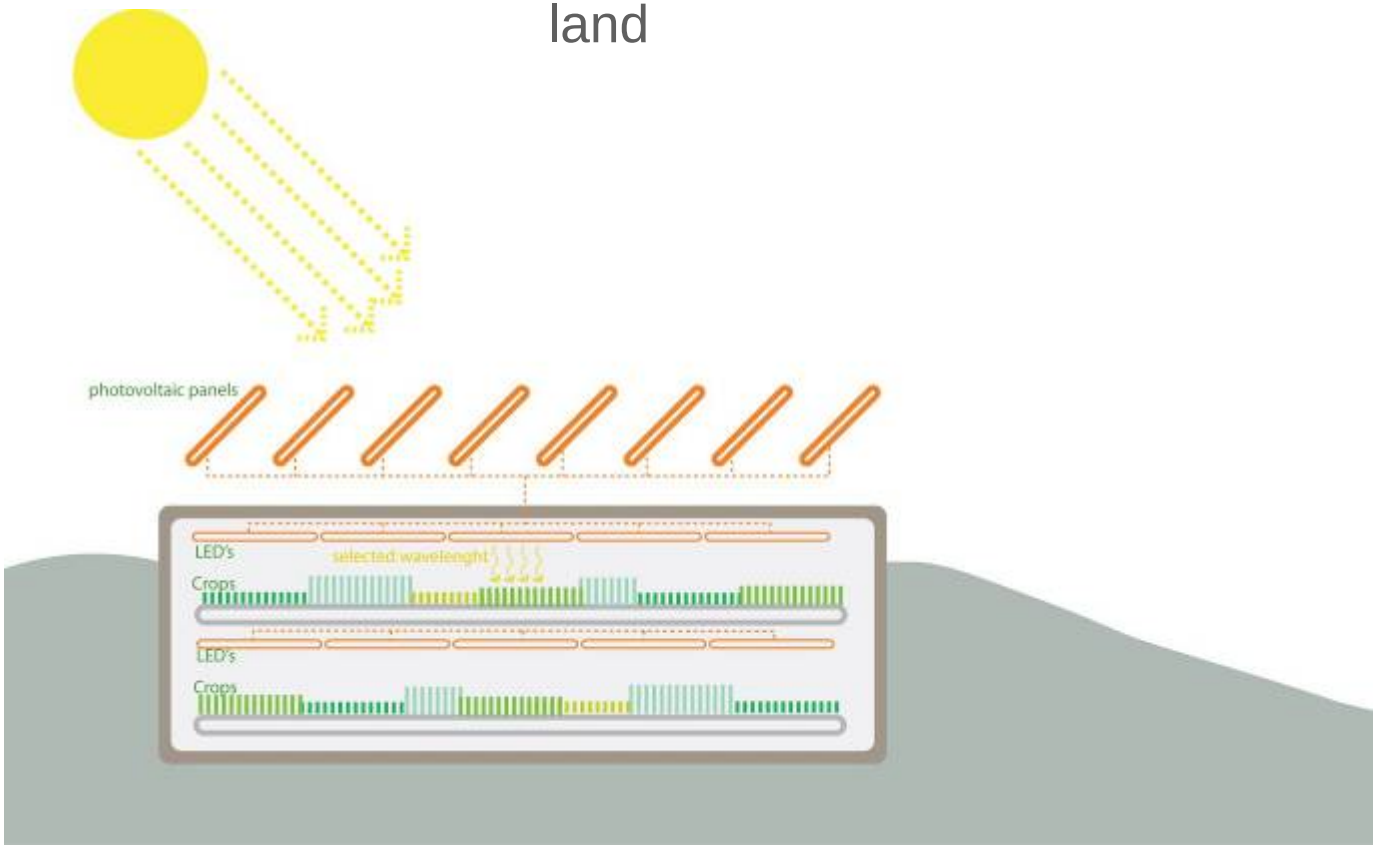


4 Flooding Strategy

5 Agricultural Production

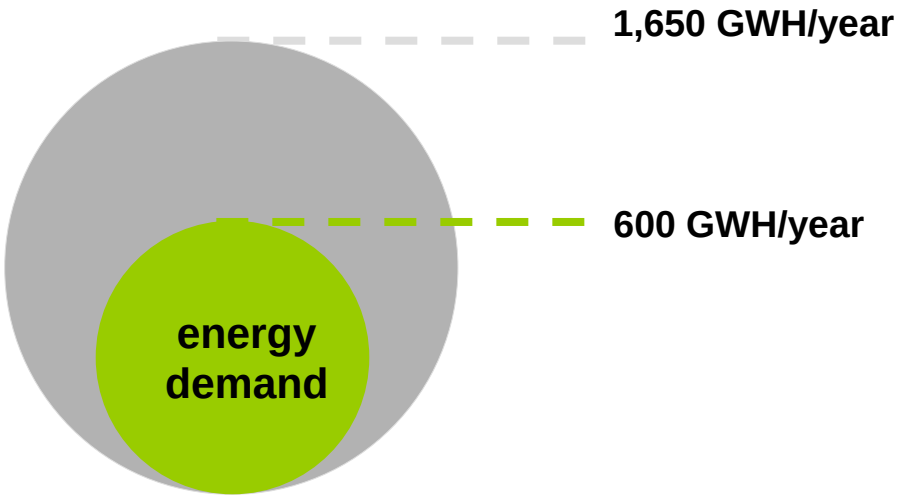
Research into no loss of productive land,

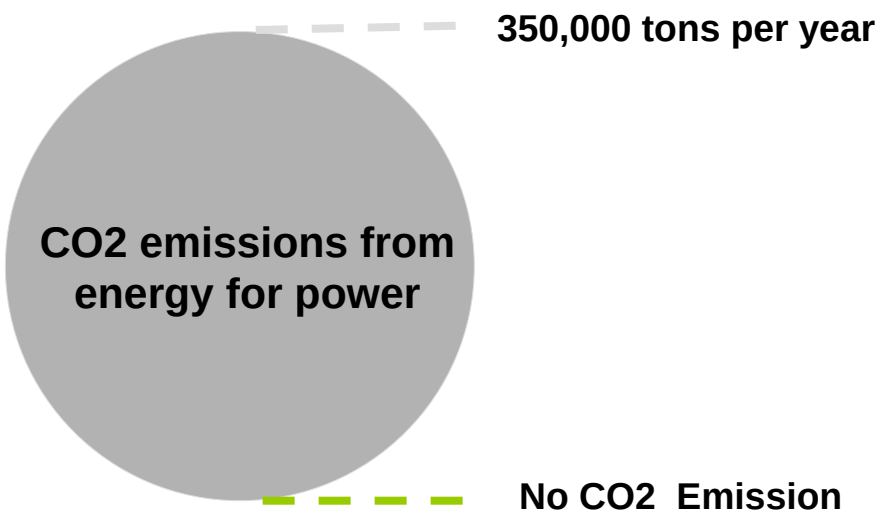
Match Agricultural production to loss of farm land



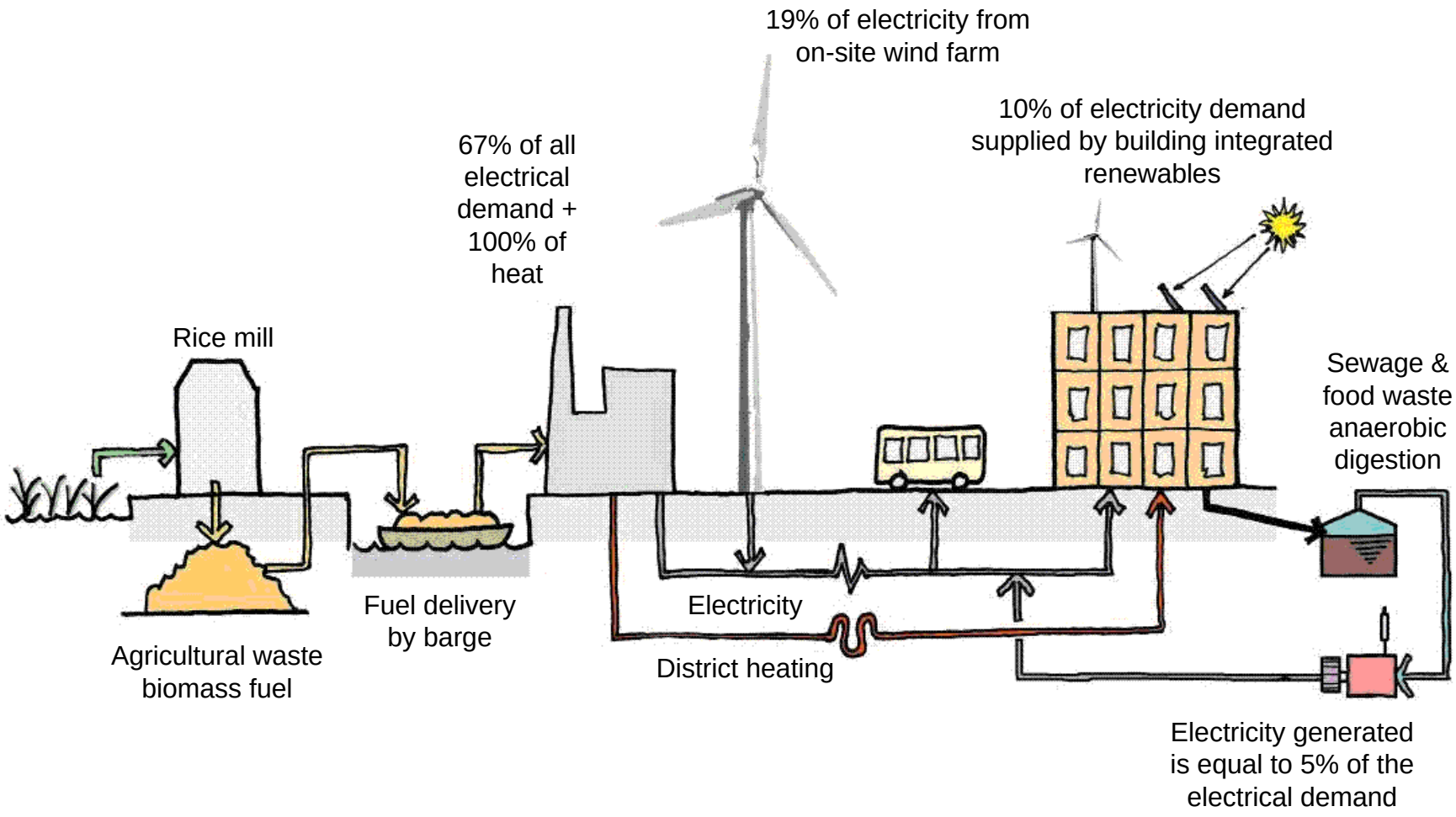
6 Energy Production, Use and Emission Reduction

64% reduction in energy demand with no emissions from energy for power/heat, saves 350,000 tonnes of CO2 per year





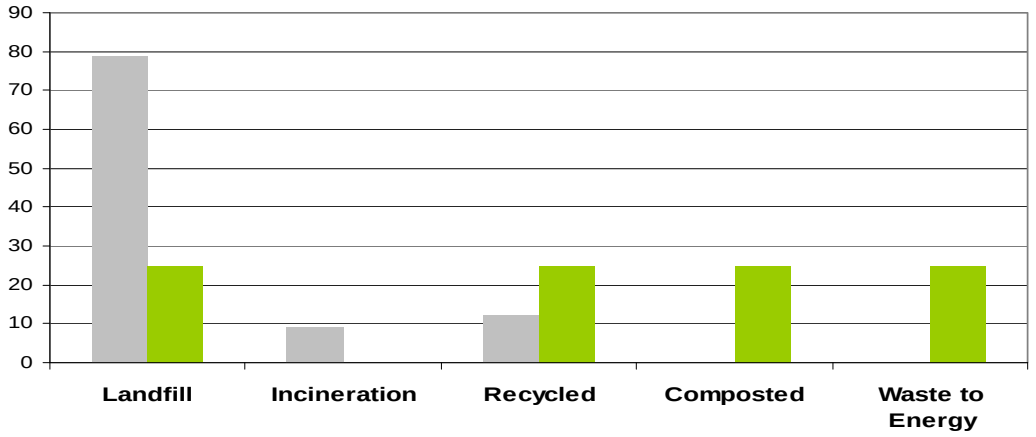
6 Energy Production



7 Waste and Materials

- Minimise waste
- Increase reuse, recycle, and composting
- Enable waste to energy strategies
- Develop waste management systems

Waste management

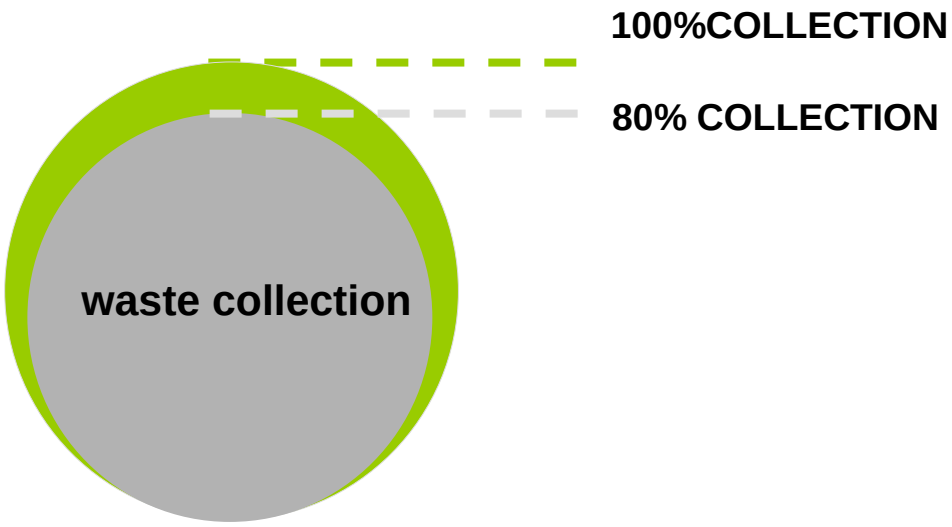


Source: WWF / One Planet Living

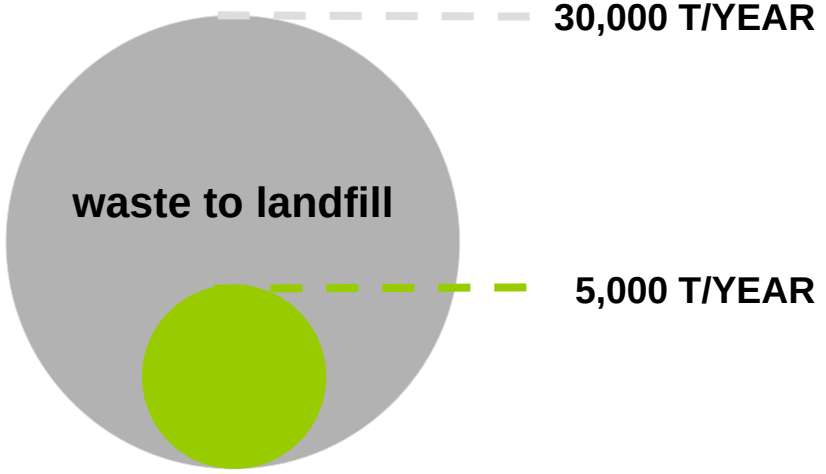
7 Waste Management

effective **waste collection**
waste to landfill **down by 83%**

RESOURCE & WASTE MANAGEMENT



RECOVERY OF RESOURCES



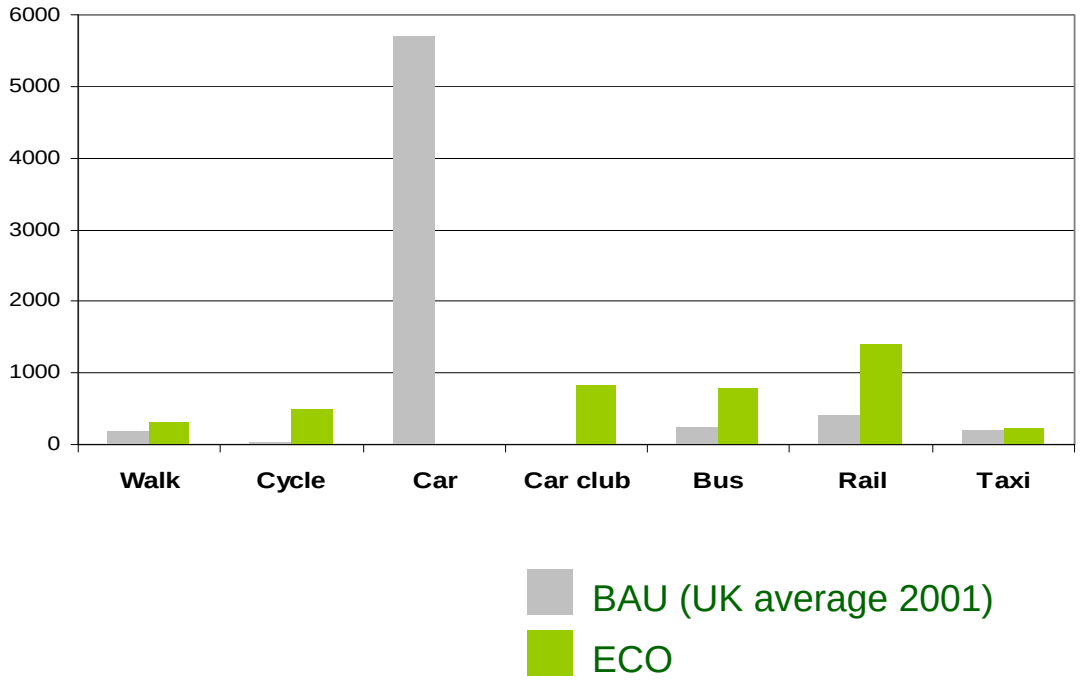
8 Accessibility and Transport

Modal shift to more environmentally friendly modes of transport

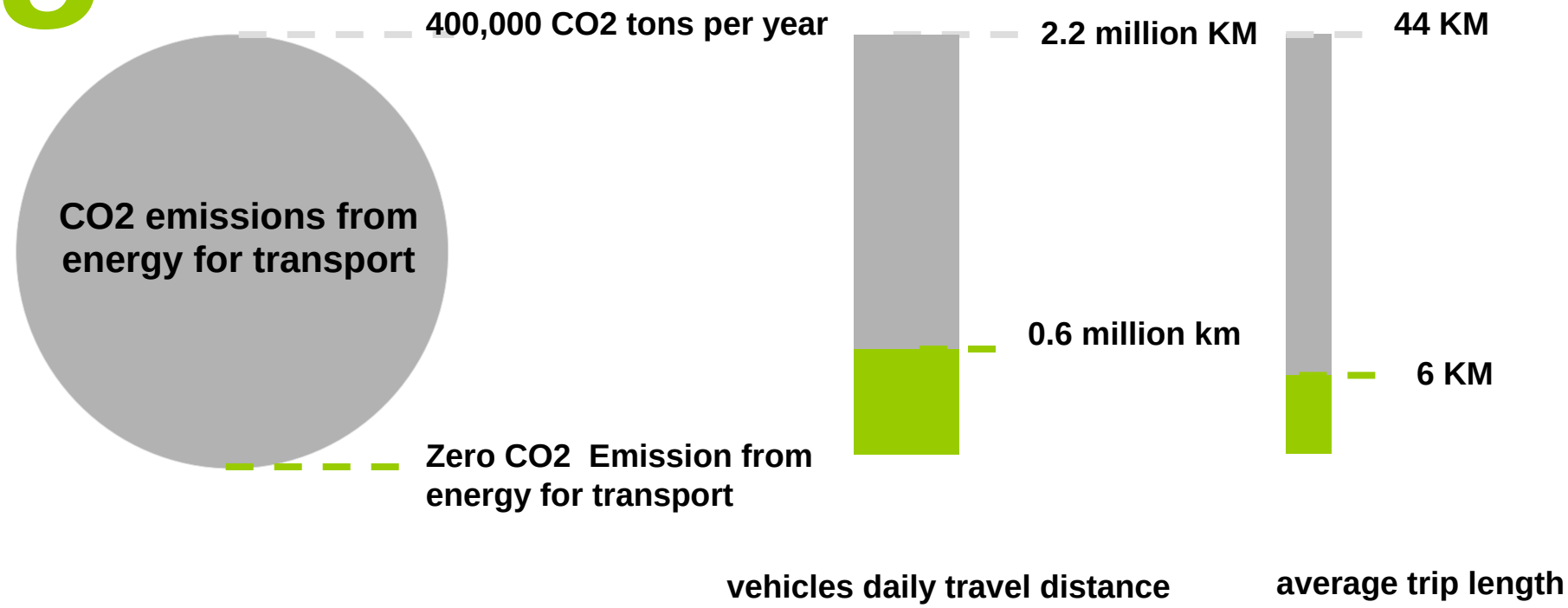
Encourage cycling and walking

Car parking management

Travel Pattern (miles / person / year)



8 Accessibility and Transport



Improved accessibility reduces travel distances by 1.8M km.

With zero emission transportation this reduces CO2 emissions by 400,000 tonnes per year

9 Construction Impact

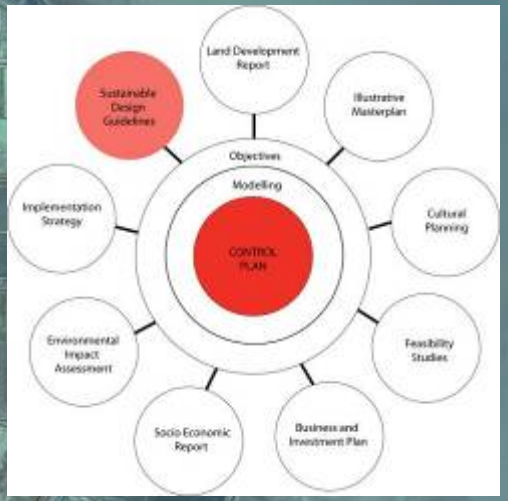
Sustainable ECO-CITY

- Twice the volume of materials
- Balance of cut and fill
- Consolidation center for management of deliverables
- Bunds to manage water and pollution
- Off –site manufacture and pre-assembly to reduce waste
- Local sourcing where possible
- Sustainable housing for workers

Conventional Approach City

- Lower material volume
- Low control of spillages
- Higher waste column
- Sourcing from all over China
- Unsustainable housing for workers
- Higher impact on Eco-system

SUSTAINABLE DESIGN GUIDELINES



The guidelines provide the performance specification for the design of the Eco-City for future developers and their design teams in terms of macro scale or site wide requirements and district level requirements

ARUP

DONGTAN

DONGTAN 2010

DELIVERING A SUSTAINABLE PHASE 1

ARUP

DONGTAN

Dongtan in 2010

THE PLACE TO BE...

Dongtan

21st Century City - SHANGHAI IN 2010

Pudong

20th Century City - SHANGHAI IN 1990s

Puxi

19th Century City - SHANGHAI IN LATE 1800s

the dongtan experience

THE PHASE 1 IN 2010

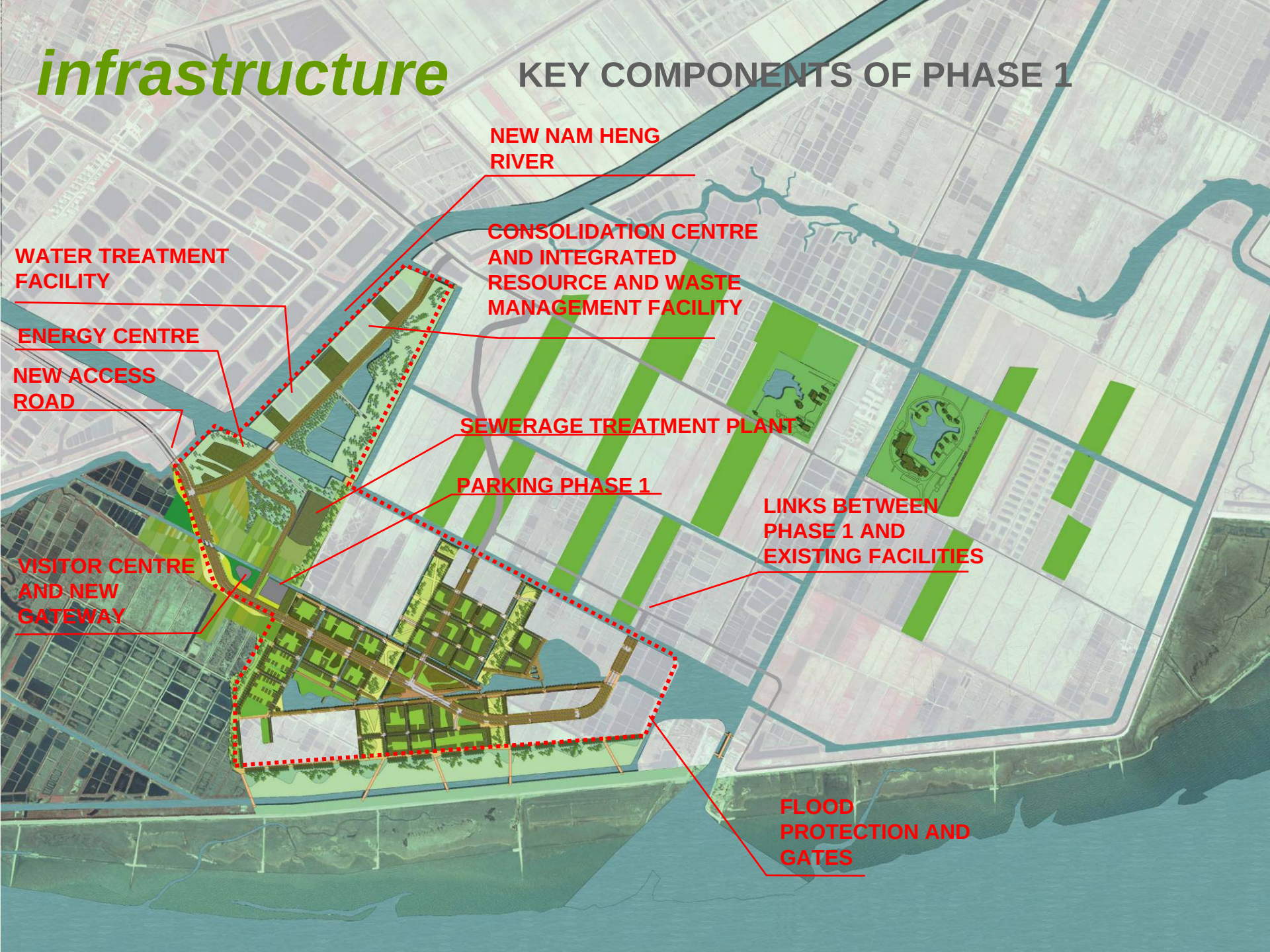
demonstration of sustainable technologies,

a place to live and learn

…and nature

infrastructure

KEY COMPONENTS OF PHASE 1



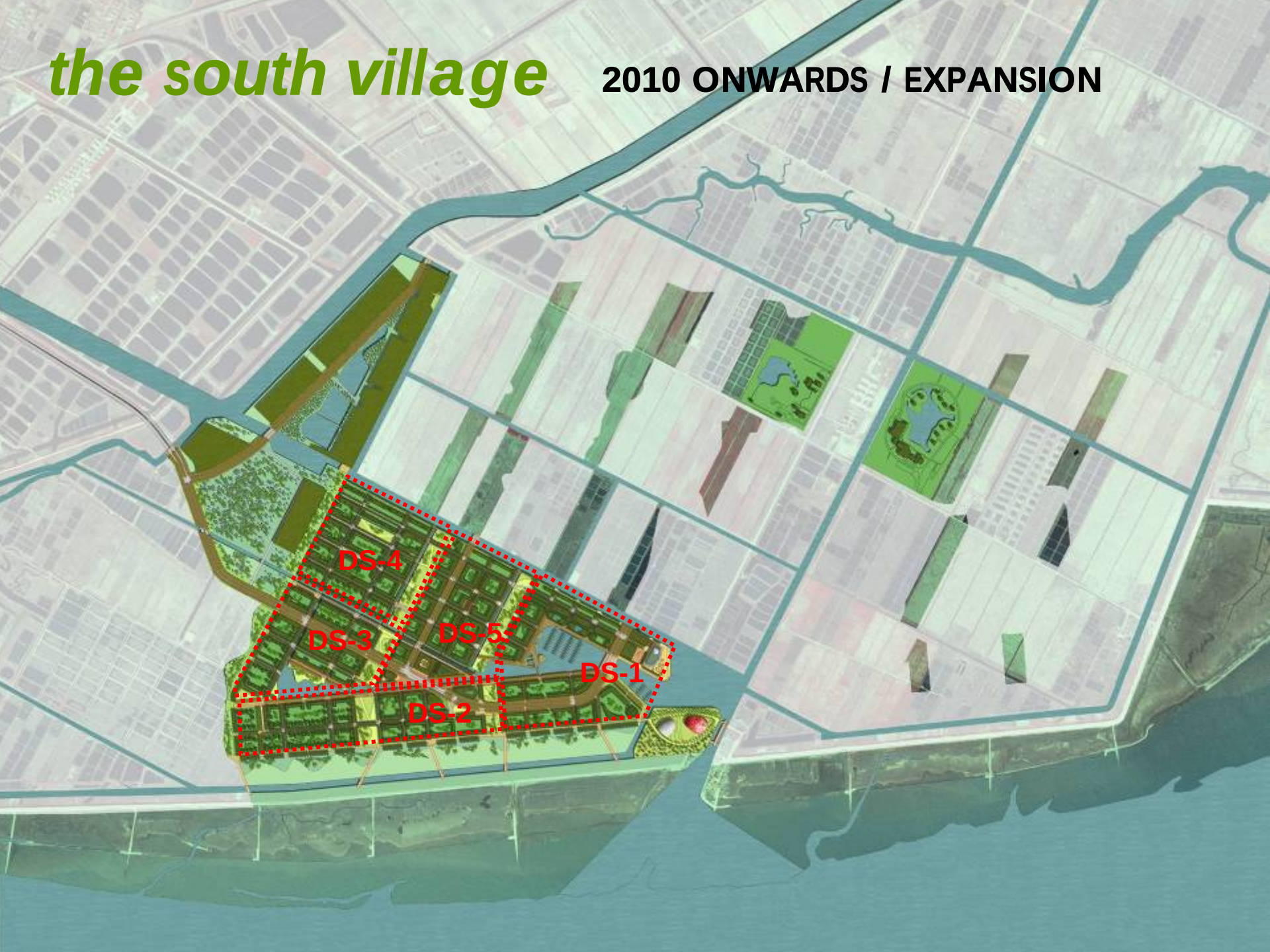
open space GATEWAY GARDENS

open space URBAN PARKS AND PROMENADES

open space NON URBAN PARKS & ECO FARMING

the south village

2010 ONWARDS / EXPANSION



Dongtan Eco City – The Sustainable Approach

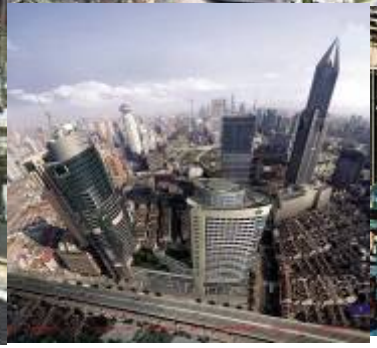
“Dongtan Eco-City will change the way city environments relate to the natural world by creating a sustainable, resource efficient, culturally rich environment, where quality of life will be unique compared to anywhere in the Yangtze River Delta.”

Extract from the report on the work of the Government

Wen Jiabao

Premier of the State Council

March 5 2007



“We will take strong measures to save energy, lower energy consumption, protect the environment and use land intensively”

——必须坚持全面协调可持续发展……坚持生产发展、生活富裕、生态良好的文明发展道路，建设资源节约型、环境友好型社会，实现速度和结构质量效益相统一、经济发展与人口资源环境相协调，使人民在良好生态环境中生产生活，实现经济社会永续发展。——胡锦涛总书记在十七大上的报告 2007年10月15日

- We must make sustainability part of everyday life

-We must develop industry and living conditions in a balanced way

-We must develop a society which is saving its resources and is environmental friendly

-We must create a balance between quantitative and qualitative industrial development

-We must balanced economic growth with the sustainability of population, resources and environment

President Hujintao, 17th Party Congress
15th October 2007

——建设生态文明，基本形成节约能源资源和保护生态环境的产业结构、增长方式、消费模式。循环经济形成较大规模，可再生能源比重显著上升。主要污染物排放得到有效控制，生态环境质量明显改善。生态文明观念在全社会牢固树立。——胡锦涛总书记在十七大上的报告 2007年10月15日

- Towards an ecological civilisation
- We must develop a new focus on service industry and research and design
- We must create a more resource efficient society
- We must develop a circular economy and enhance the use of renewable energy
- We must control the emissions effectively and improve the ecological environment
- We must make the society ecologically aware

President Hujintao, 17th Party Congress
15th October 2007

Words used in China today

Industrial Age gives way to Ecological Age

Harmonious Society

Energy use Reduction

Pollution Control

Renewable Energy

Resource Efficiency

Zero Emission Transport

Market Economy

Safe Guarding GDP against Detrimental Environmental effects

Urban Rural relationships

Sustainable Development

Dongtan Eco-City, Shanghai

谢谢!
Thank you

ARUP

DONGTAN