M1

Sustainable Concepts in Regional and Urban Planning: a Holistic Vision

.... In order to prevent this !

Content

1. Expanding Challenges

1.1. Global Indications of CC

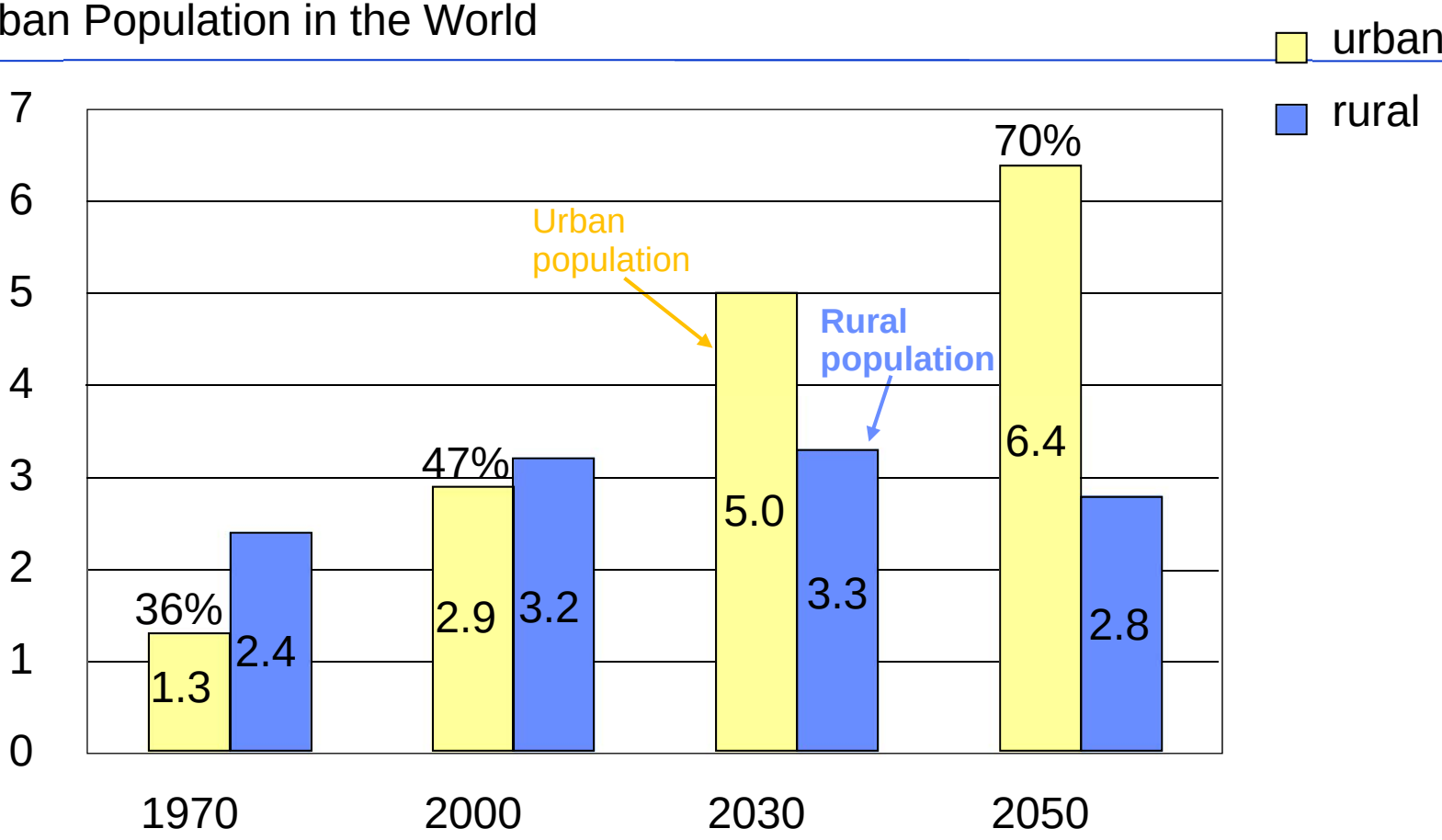
Many undesired processes are underway, for instance:

- Melting glaciers – potentially raising sea level up to 6m globally
- Melting glaciers – less solar heat reflection back to universe but more heat absorbed to sea water and soil to raise temperatures
- Melting permafrost – release of methane gas to atmosphere, much more potent greenhouse gas than CO_2
- Changing the directions of ocean currents – unexpected weather conditions
- Hurricanes and tornados may become more frequent
- Several species of animal likely vanish on the earth (eg polar bear)
- Already dry regions may become even drier
- Already hot regions may become even hotter

- The common target has been to restrict the overall temperature increase to 2 ^{o}C. The target seems to fade away...

1. Expanding Challenges

1.2. Urban Population in the World



⇨ Continually increasing urban populations

⇨ Importance of low carbonization efforts, led by cities

Source: United Nations, *World Urbanization Prospects: The 2007 Revision*, Feb. 2008

Slide 4

w1 needs full axis label for population size - is it billions?
wiltshirer; 22.6.2012

1. Expanding Challenges

1.3. Energy per Sector in EU (1)

In 2009 in EU, RES covered 16% of primary energy production, with fossil fuels at 55% and nuclear 29%.

The target is to raise the RES share to 20% by 2020.

Coal and Peat	Crude Oil	Natural Gas	Nuclear	Hydro	Geo and Solar	Biofuels and waste	Heat	Total
166443	104974	153014	233139	28165	19760	111160	631	817286
20 %	13 %	19 %	29 %	3 %	2 %	14 %	0 %	100 %

Values expressed in thousand tonnes of oil equivalent (ktoe)

Source: http://www.iea.org/stats/balancetable.asp?COUNTRY_CODE=30

1. Expanding Challenges

1.3. Energy per Sector in EU (1)

In 2009 in the EU, the residential sector (housing), transport and services accounted for 49% of total energy consumption.

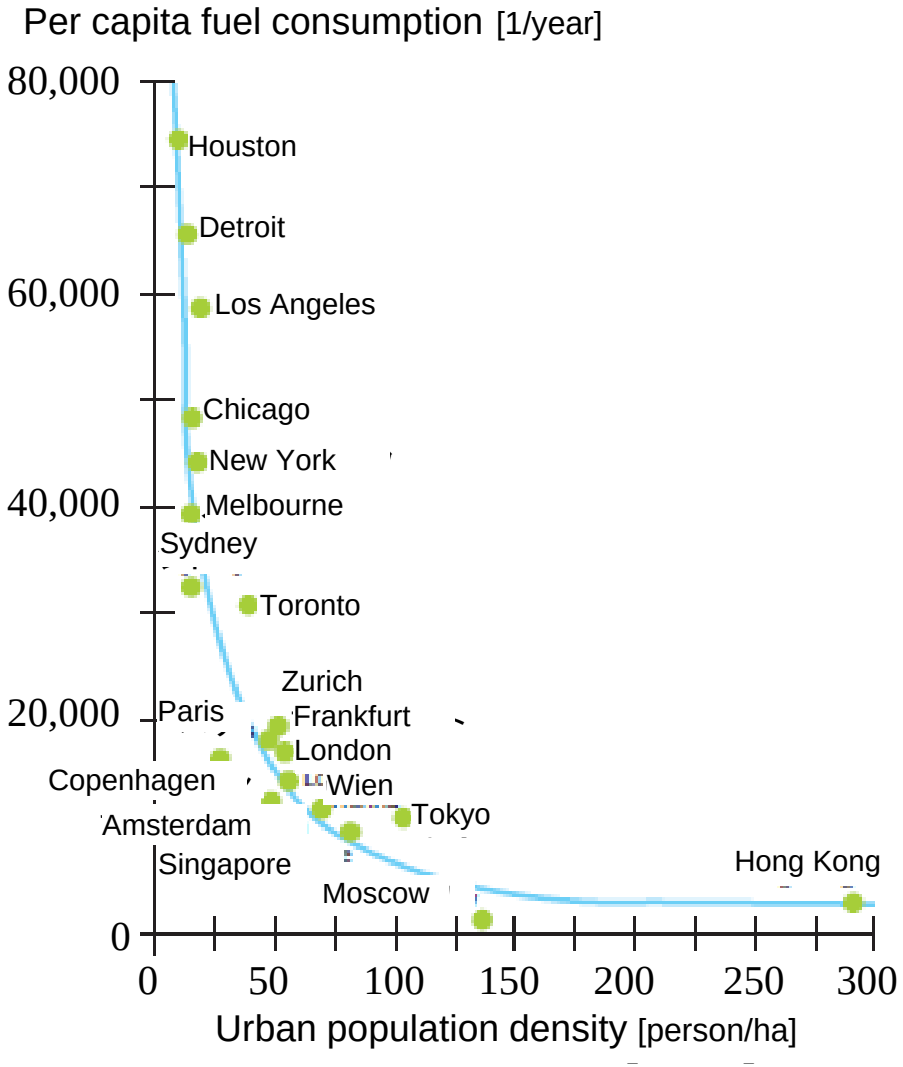
The table shows consumption per sector in million tonnes of oil equivalent (Mtoe)

Industry	255	17 %
Transport	322	21 %
Other	476	31 %
Residential	295	19 %
Services	141	9 %
Agriculture / Forestry	25	2 %
Fishing	1	0 %
Non-Specified	15	1 %
Total	1530	100 %

Source: http://www.iea.org/stats/balancetable.asp?COUNTRY_CODE=30

1. Expanding Challenges

1.4. Challenge to Urban Structures (1)



Left: *Petroleum Consumption in Cities with Different Structures*

Development of CO_2 reduction plans not only on an individual scale, but also at an entire city scale

(1) High-density redevelopment of urban centres in consideration of such factors as building height and use

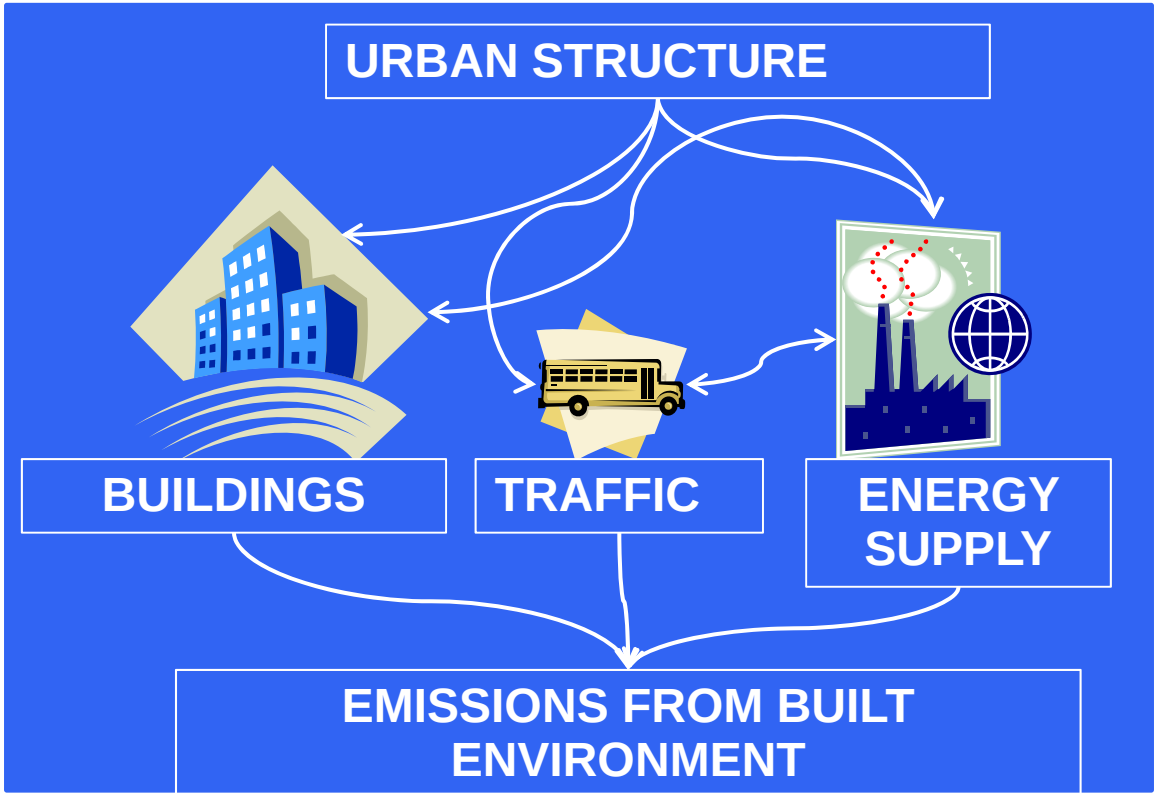
(2) Development of public transportation

⇨ Compact cities

Source: The World Business Council for Sustainable Development [WBCSD], *Energy-Efficiency in Buildings*

1. Expanding Challenges

1.4. Challenge to Urban Structures (2)

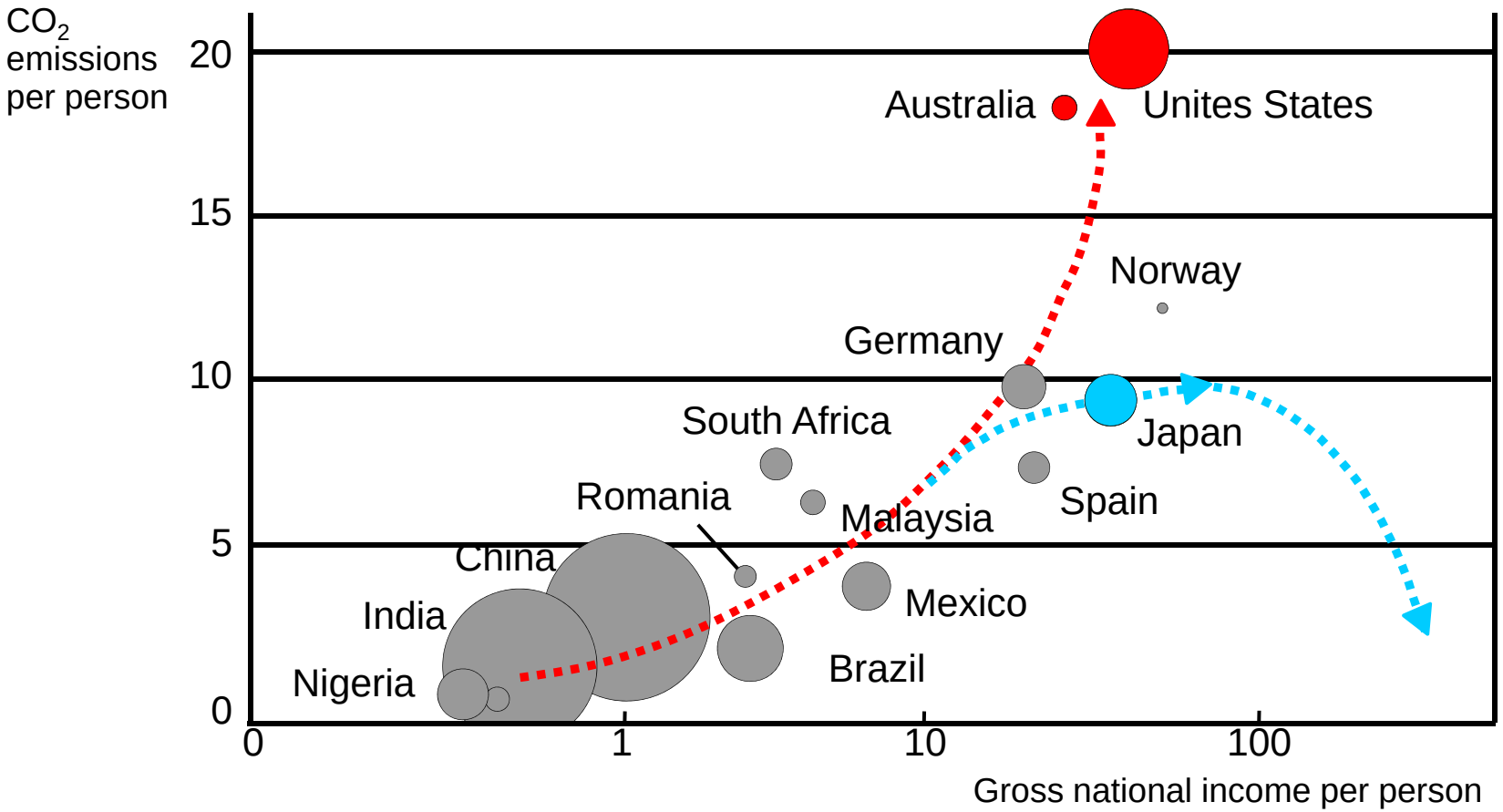


Source: J. Kurnitski, ww.sitra.fi

- A compact urban structure both directly and indirectly influences emissions
  - Directly: Shorter utility lines and and roads
  - Indirectly: Energy system conversion, impact on traffic

1. Expanding Challenge

1.5. Paradigm Shift from a Mass-Production Society to a Low-Carbon Society



(Source: Pekka Huovila, The 2008 World Sustainable Building Conference)

- Farewell to mass-production and mass-consumption society
- Successful creation of a low carbon society will help bring about a paradigm shift

2. Climate Change and Energy

2.1. Sustainability Concept (1)

“Sustainability ?”

First introduced in1987: Brundtland Report, *Our Common Future*

The term has been used with diverse and evolving meanings.

However, these definitions usually include the following elements:

- Minimizing actions that degrade the planet's life support systems and living resources,
- Moving toward actions that are designed to restore and sustain these systems and resources.

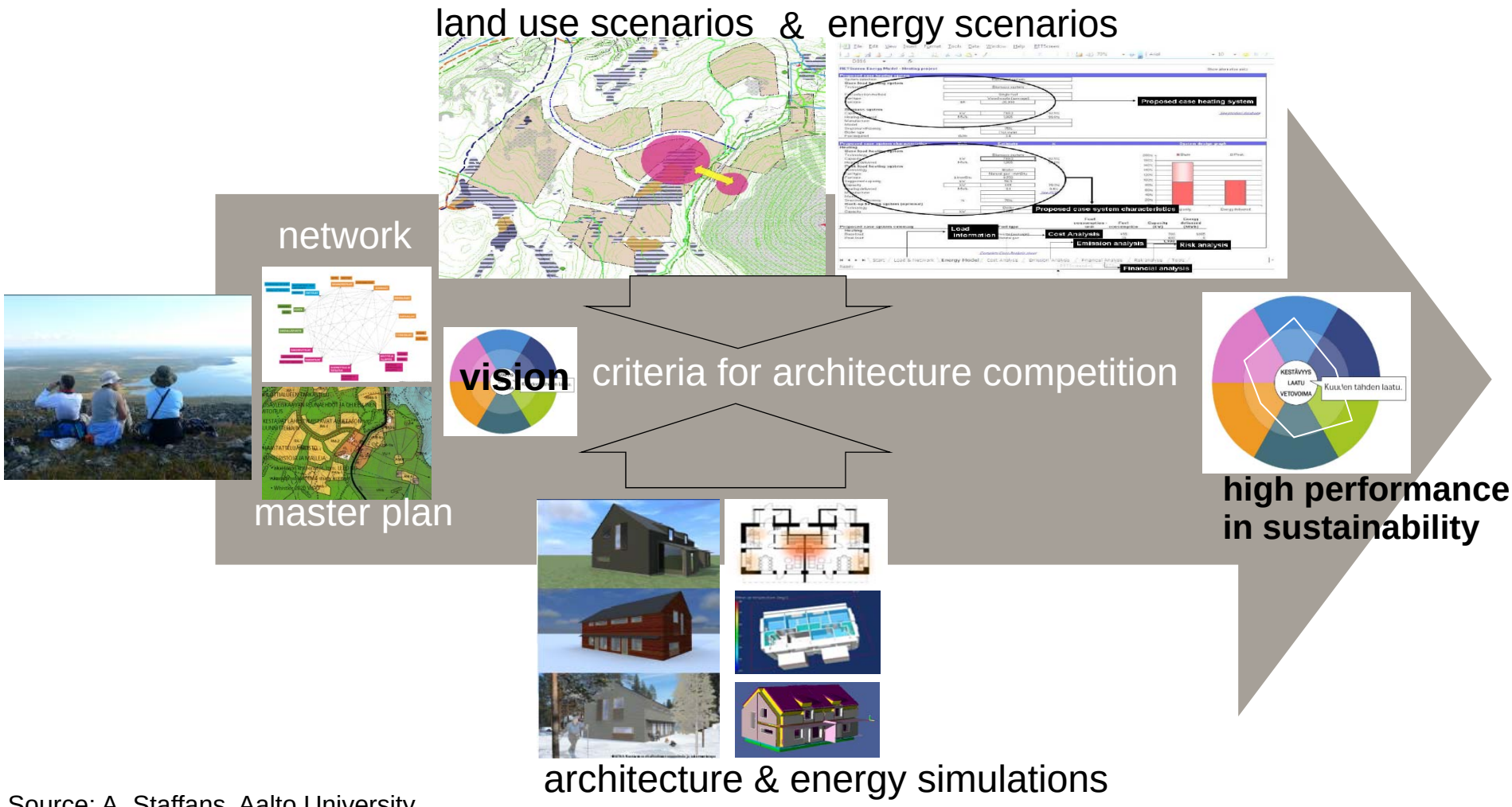
2. Climate Change and Energy

2.1. Sustainability Concept (2)

Sector	Main emission issues
Green-field construction	Tight requirements on energy efficiency
Rehabilitation construction	Fossil based heating of small houses Electric appliances and heating in blocks of flats Electric appliances of commercial and industrial buildings
Traffic	Management of traffic input/output Share of electric vehicles
Urban structure	Compacting Awareness of impacts
Decentralised production	Solar power and heat Heat pumps Wind power and biofuels at small scale
District heating	Renewable fuels Waste to energy: incineration and heat recovery
Centralised power production	Wind power (centralised) Carbon capture systems –CCS

2. Climate Change and Energy

2.1. Sustainability Concept (3)



Source: A. Staffans, Aalto University

2. Climate Change and Energy

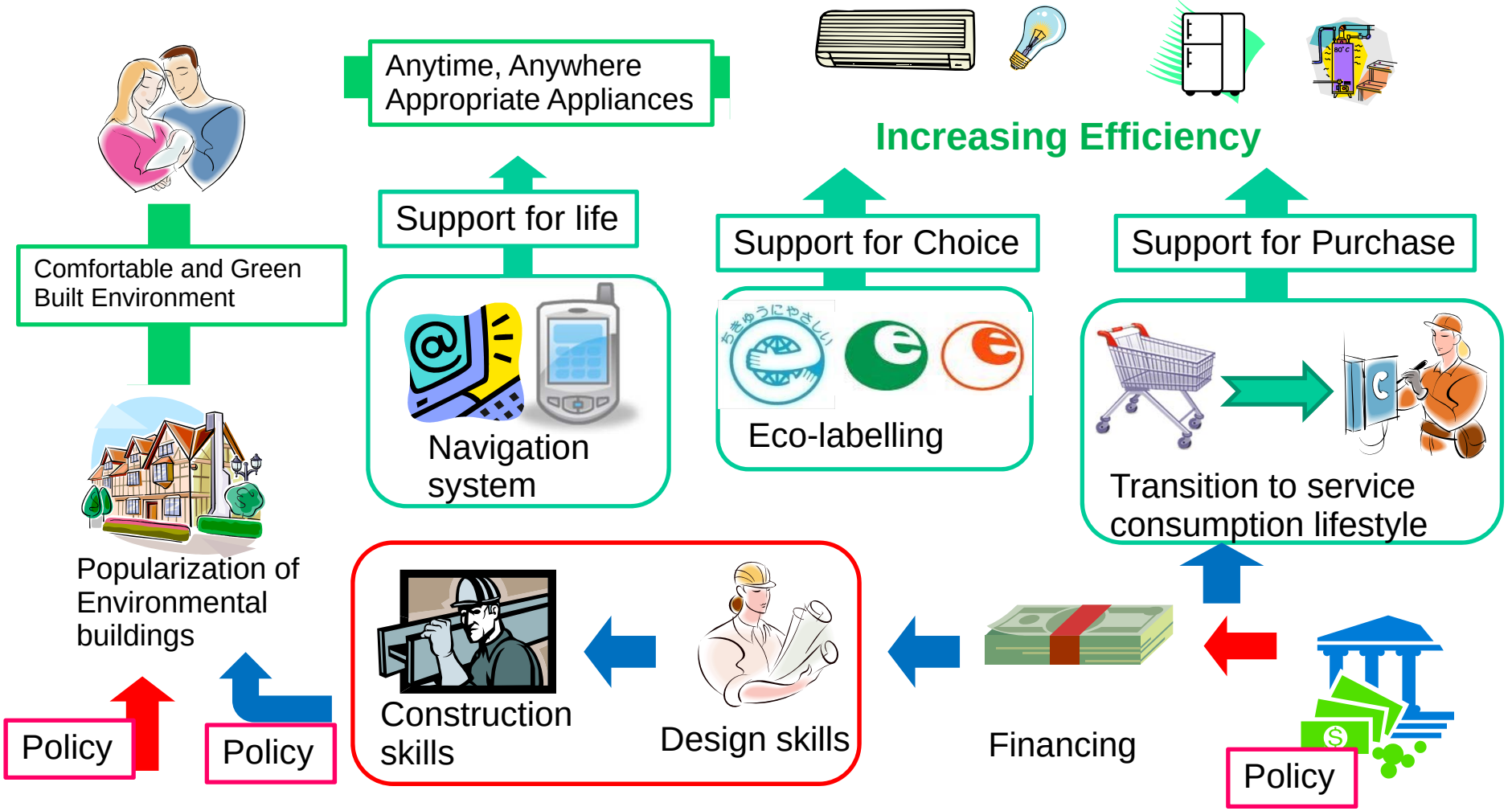
2.1. Sustainability Concept (4)

Steps to follow by the urban planner to integrate energy and emission issues to the plan in a sustainable way:

- ⇨ Plan various drafts for alternatives for urban development
- ⇨ Hire an energy/emission consultant to analyze the alternatives and to provide the alternative specific energy consumption and emission values as well as the investment and operational cost estimates
- ⇨ Let the decision makers evaluate the alternatives based on the new quantitative consumption, emission and cost information
- ⇨ Based on the decision and the quantitative information, plan the more advanced and sustainability plan for the urban community.

2. Climate Change and Energy

2.2. How to achieve a Carbon-free life? (1)



Source: Shuichi Ashina, National Institute for Environmental Studies (CGER/NIES) “Urban Planning and Sustainable Development”,March 4, 2010

2. Climate Change and Energy

2.2. How to achieve Low-Carbon Life? (2)

Leading citizens towards creation of low-carbon societies:

- ⇨ Extremely difficult to reach the mid- and long-term reduction target set by governments by means of the current energy saving measures;
- ⇨ Even if high-performance energy-saving buildings and cities are created, we cannot achieve the expected energy saving if citizens use energy extravagantly;
- ⇨ How can we motivate people to change from a high-carbon to a low-carbon life style?
- ⇨ Presenting a model of the future low-carbon city in a visible form.
- ⇨ Motivating people to be conscious of saving energy, thus leading them to a low carbon lifestyle.

2. Climate Change and Energy

2.3. Why Cities and Municipalities?

Because the cities and municipalities are:

- Administrative units directly connected to citizens' lives
- The main bodies that draw up and execute policy measures
- They hold a viewpoint directly connected to citizens' daily lives
- Responsible for promoting policies for EE and CO_2 emission reduction
- Influential to the stakeholders that consume energy
- Responsible for a stable energy supply in the region.

CO_2 emission reduction policies involve expectation of collaboration and co-operation among municipalities

"When national political and world leaders talk about tackling Climate Change, leaving cities out of the equation is like fighting fire with a garden hose"

- Robert Doyle, Lord Mayor of Melbourne, Australia

2. Climate Change and Energy

2.4. Exercise: Carbon Footprint of Trainees (1)

A carbon footprint is the total amount of greenhouse gases produced both indirectly and directly by a human, organization, event or product.

For example: when a car is driven the engine burns fuel, creating an amount of carbon dioxide depending on the car's fuel consumption and the distance the car is driven. A footprint is measured by assessing the amounts of greenhouse gasses emitted into the atmosphere by this product and is usually measured in tons of CO2.

A human's carbon footprint is the sum of all emissions of CO2 into the atmosphere caused by that particular person's activities in a given time period, usually a year.

Once organizations and individuals know the size of their carbon footprint, a strategy can be devised to reduce the amount of pollution caused by that person or organization. Carbon offsets are used to manage the amounts of carbon released into the atmosphere.

2. Climate Change and Energy

2.4. Excercise: Carbon Footprint of Trainees (2)

Ways of calculating your individual carbon footprint are available for free online on various Websites. Tables are also available online that provide a list of products and the amount of CO_2 released.

For instance:

http://www.carbonfootprint.com/calculator.aspx

The UP-RES Consortium

Contact institutions for this module: **Aalto University**

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  www.aalto.fi/en/school/technology/
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  www.unideb.hu/portal/en