FutureBuild 2020 Conference

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The city as a complex system: Challenges to sustainable building and planning

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Summary

1. FRAMEWORK: GLOBALISATION OF TRADE AND FINANCIAL FLOWS
2. FRAMEWORK: THE HIGH COST OF ADAPTATION TO FUTURE CLIMATE CHANGE
3. URBAN METABOLISM AS A NEW PARADIGM OF URBAN POLICIES
4. URBAN SPACE CONSUMPTION ISSUES
5. GREENING THE COMPACT CITY, VALUING PUBLIC SPACE AND THE SERVICES RENDERED BY NATURE
6. URBAN GOVERNANCE: FIVE CASES OF SUSTAINABLE URBAN GOVERNANCE

1. FRAMEWORK: GLOBALISATION OF TRADE AND FINANCIAL FLOWS

Financial flows and new investment patterns in urban projects affect sustainable building and planning

1.1. Trade flows

1956 : the first container ship; 2013: close to $20 trillion trade (source “The Economist” 18/05/2013).

Many mega cities in the world are located on the coast : Tokyo, Mumbai, Sáo Paulo, New York City, Shanghai, Lagos, Los Angeles, Calcutta, Buenos Aires, etc. (source UN – 2011).

1.2. Financial Flows

Financial flows have been boosted by “quantitative easing” policies (USA, UK and BCE).

This monetary injection, estimated at some $10 trillion may have irreversible effects on cities, as long-term urban development projects are adopted or rejected in response to short term concerns, as was illustrated by the MIPIM (http://www.ffue.org/?s=mipim+20 13).

Interlocking but unconnected systems

- Several interrelated but un-mastered systems are at work :

- Financing the financial economy vs financing the “real” economy.
Unshared power of financial interests leading to bubbles and bail-outs.

- Increased consumption of resources while their supply is decreasing.
Public services captured by private groups becoming tax collectors.

- Increased climate instability vs un-met requirements for adaptation.

- Short term governance led by interest groups.
- Responding to systemic phenomena in a mono-disciplinary fashion.

Source: "Building a Low Carbon Economy in a post-crisis world", Foundation for the Urban Environment May 19th 2009, Pr. Jacqueline McGlade, Executive Director European Environment Agency.

2. FRAMEWORK: THE HIGH COST OF ADAPTATION TO FUTURE CLIMATE CHANGE

Two cases in the Low Countries

The Dutch approach – Rotterdam's Maeslantkering protective barrier

The Netherlands has been pioneering long term infrastructure investments to protect its coastal cities from the sea. In the 1980s, it was decided to reinforce dikes in the Delta generally. The epitome was the giant "Maeslantkering" barrier on the main canal serving the Port of Rotterdam. Built in 1997 at a cost of circa €400 million, it has been used only once, in 2007. Questions are being raised in the Netherlands about the economic justification of giant infrastructure works.

The Maeslantkering barrier when open

Economic issues related to the chosen discount rate for infrastructure investments

The Stern Report's assumptions (fixing artificially low discount rates of 2-3%) are opposed by economists who favour the use of standard public or private market discount rates.

"Building your way out of Armageddon by investing now" vs "letting future generations pay later for the effects of climate change, using their own resources".

ALTERNATVE: Preparing human resources for emergency rescues (civil and military).

The Belgian approach – buffer islands

Belgium has taken the opposite approach, shunning large coastal investments and relying on (subsidised) private sector initiatives. The “Vlaamse Baaien” project combines buffer islands against high tides and North Sea storm surges with the construction of large- scale wind parks providing renewable energy aimed at - among others - the future German market.

Storage of energy at times of peak production is to be achieved by creating a supplier-owned “energy atoll”, i.e. a basin equipped with locks and turbines which start to work when there is a surplus of wind electricity, filling the basin. It acts as an energy reservoir.

(c) Martin La Monica – MIT Technology Review – 5 Feb 2013
http://www.technologyreview.com/view/510806/a-manmade-island-to-store-wind-energy/

3. URBAN METABOLISM AS A NEW PARADIGM OF URBAN POLICIES

Inputs

Society / Economy

Outputs

Local extraction, production and space

•minerals, biomass, water, space, etc.

Imports

•raw materials, fossil fuels, products, etc.

Indirect flows associated with imports

To nature:

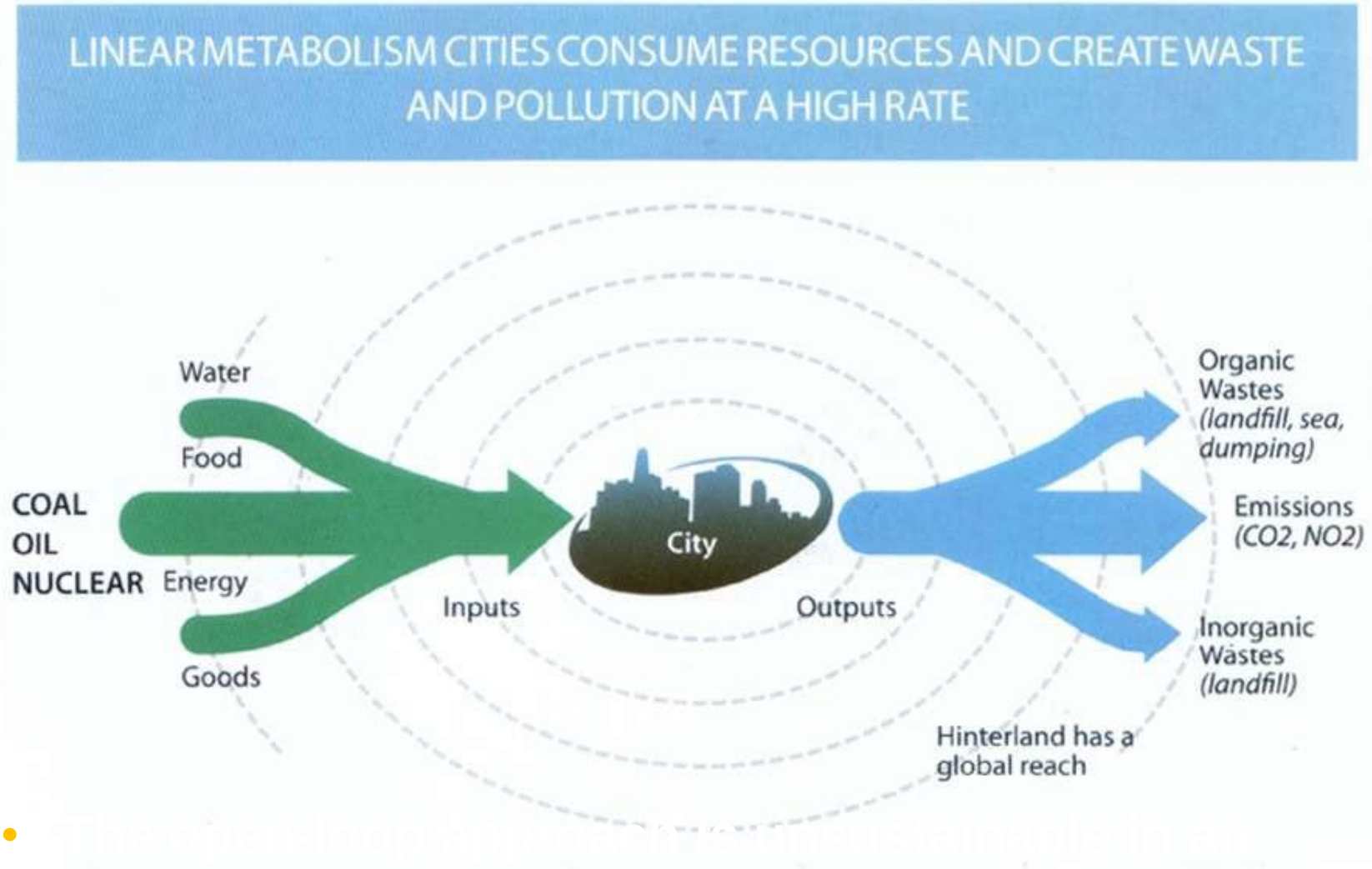
- emissions to air
- emissions to water
- waste to landfill
- dissipation flows

Exports

- waste, emissions, etc.

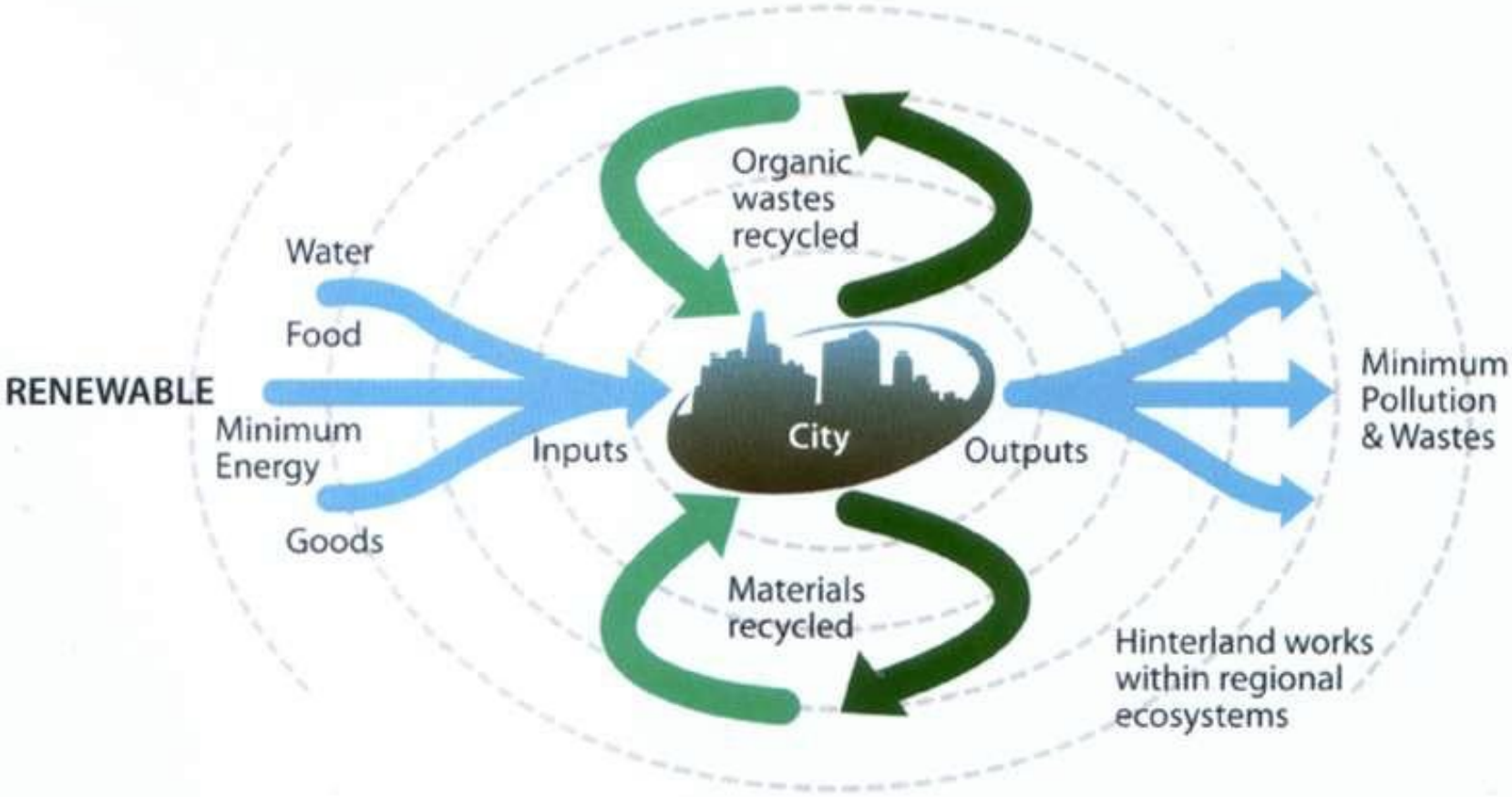
Indirect flows associated with exports

The metabolism of cities: from linear to circular

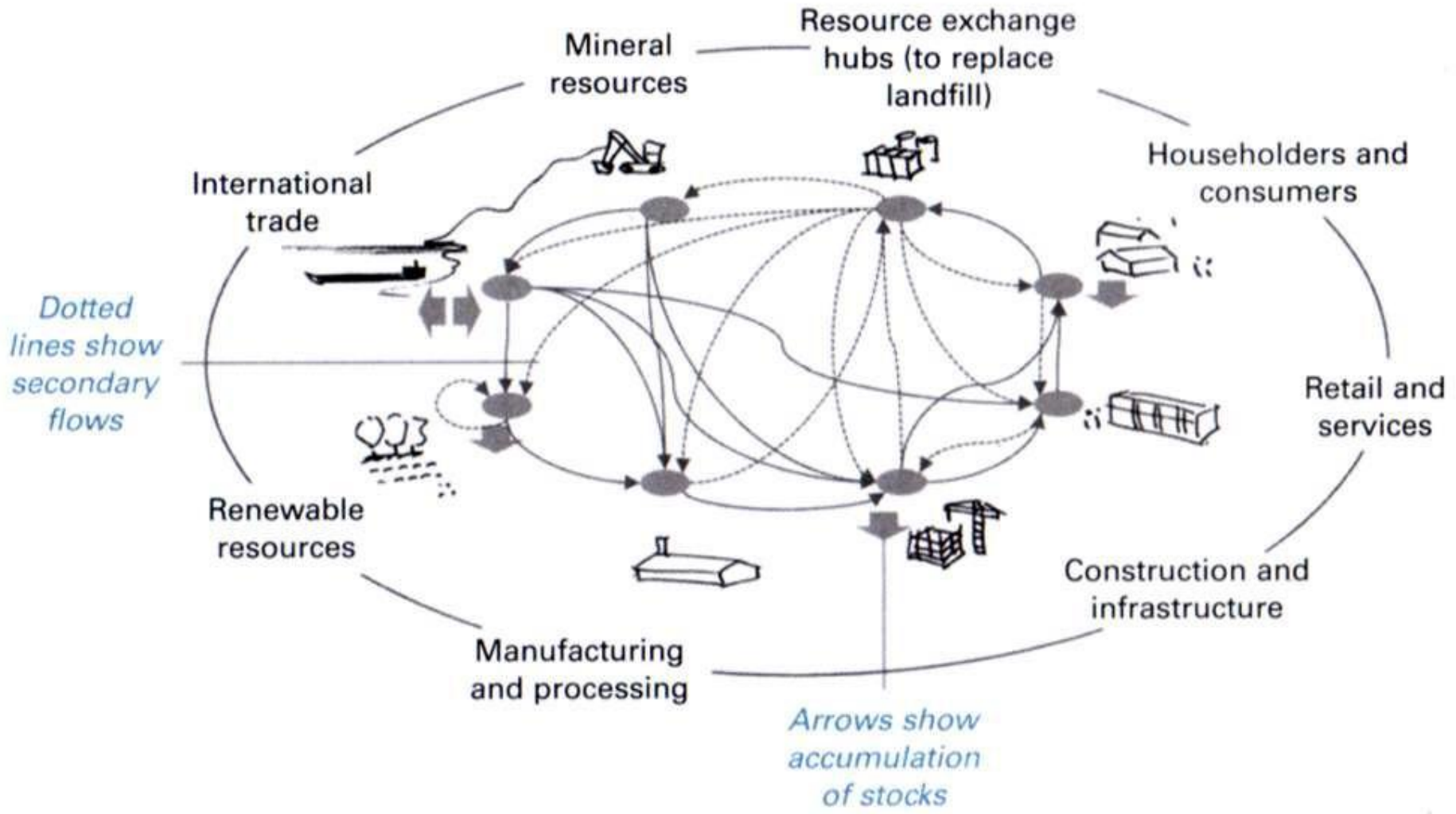


- The open-loop approach is unsustainable in an

CIRCULAR METABOLISM CITIES REDUCE CONSUMPTION AND POLLUTION, RECYCLE AND MAXIMIZE RENEWABLES



Resource flows in the circular urban economy



Waste as a valuable secondary resource

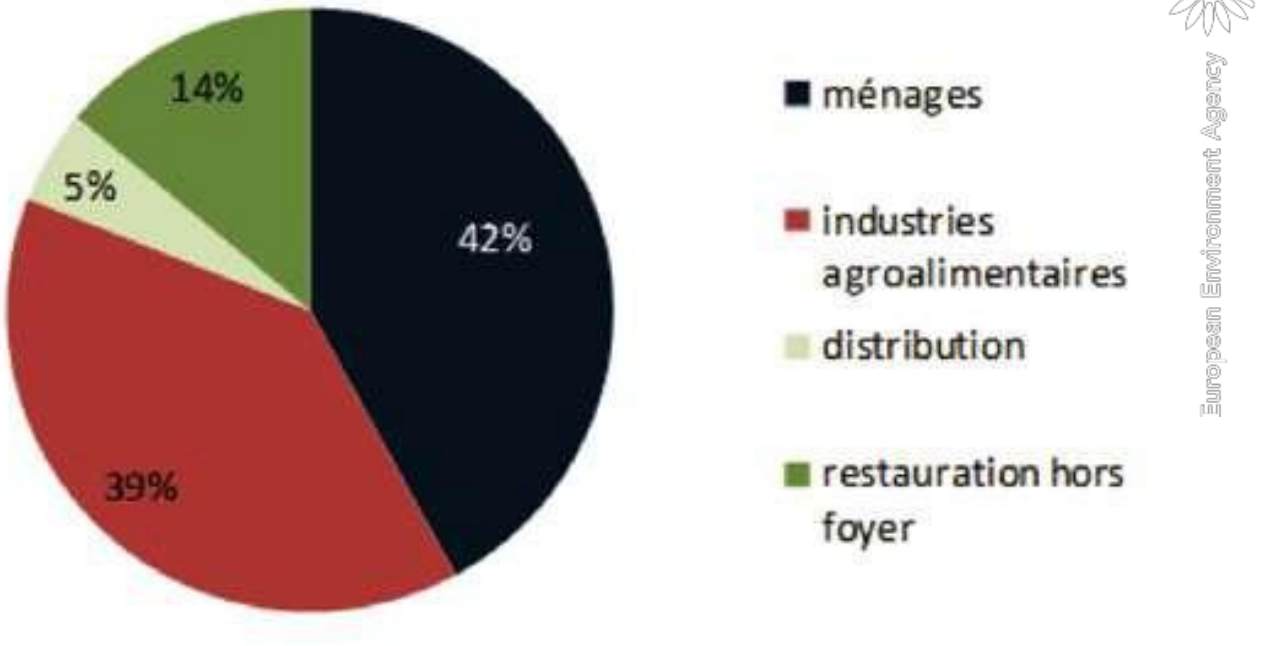
It is possible to reduce waste by

- reducing the quantity of waste produced and
- recycling instead of burning.

Price and/or social incentives are needed.

The cost of food waste

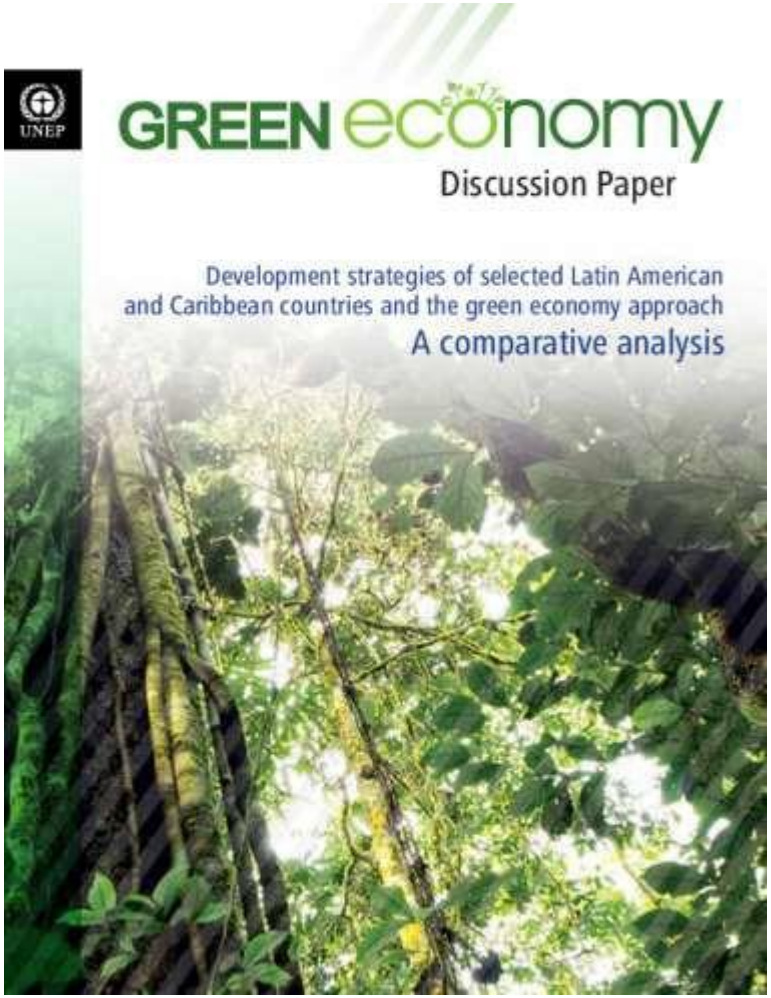
Share of food waste generated in EU27 (2006)

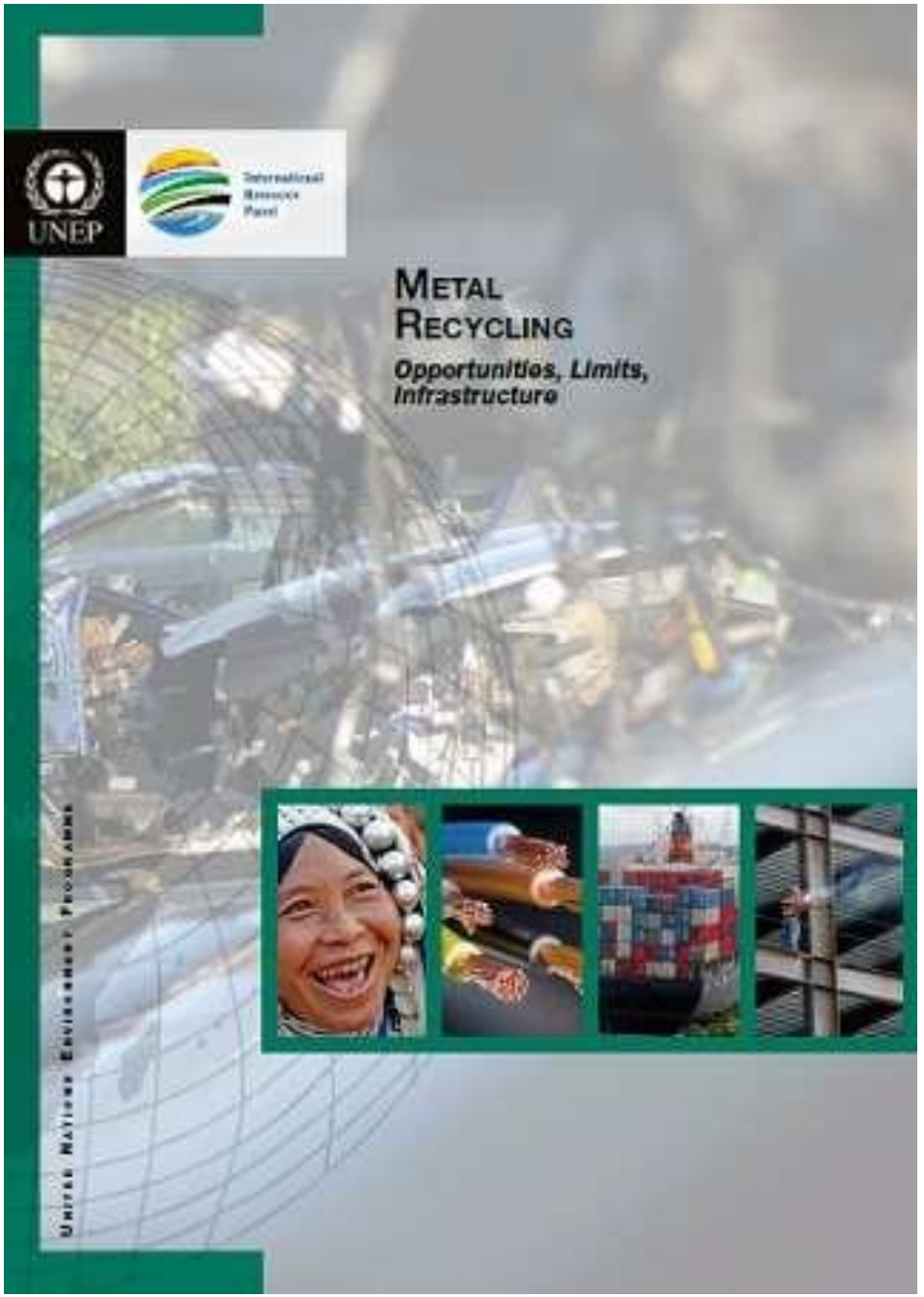


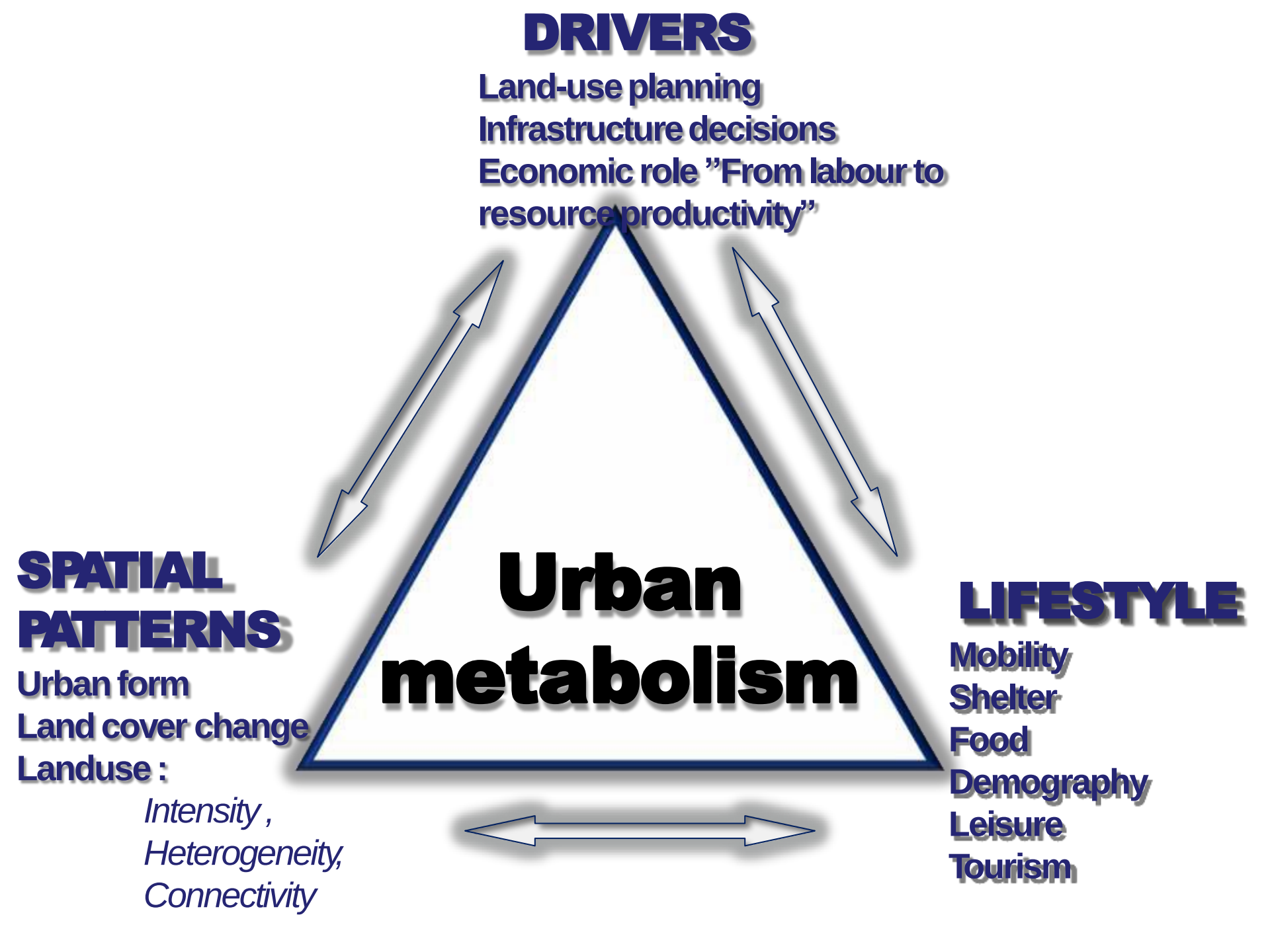
- There is 181 kg of food waste per inhabitant per year (3x more than needed) (Eurostat - 2006)
- To ensure world food safety in 2050, the FAO considers that agricultural production needs to increase by 70% (Jelle Bruinsma, 2009)

Metal recycling :

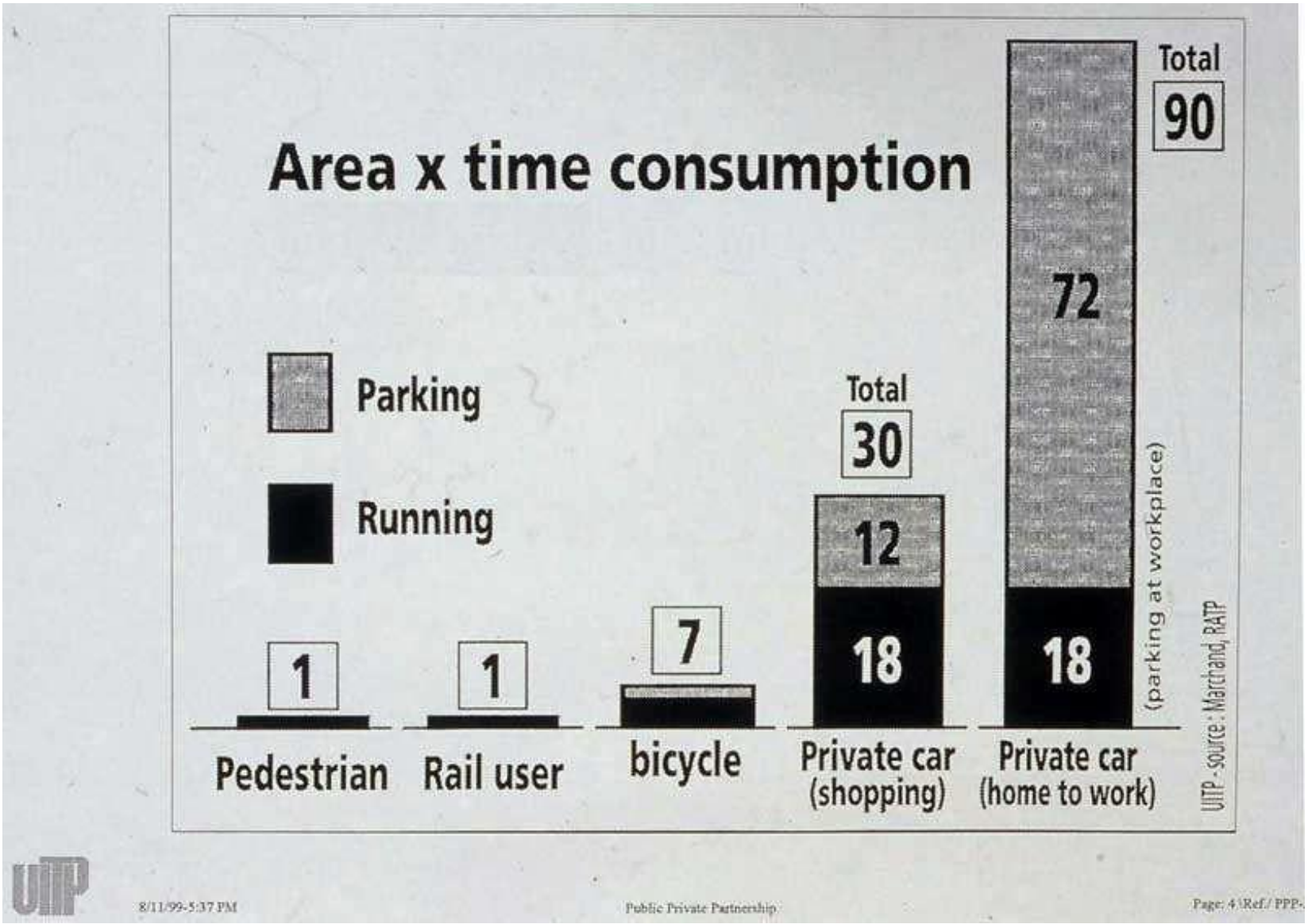
opportunities, limits, Infrastructure






DRIVERS
Land-use planning
Infrastructure decisions
Economic role ”From labour to resource productivity”
SPATIAL PATTERNS
Urban form
Land cover change
Landuse :
Intensity ,
Heterogeneity,
Connectivity
Urban metabolism
LIFESTYLE
Mobility
Shelter
Food
Demography
Leisure
Tourism

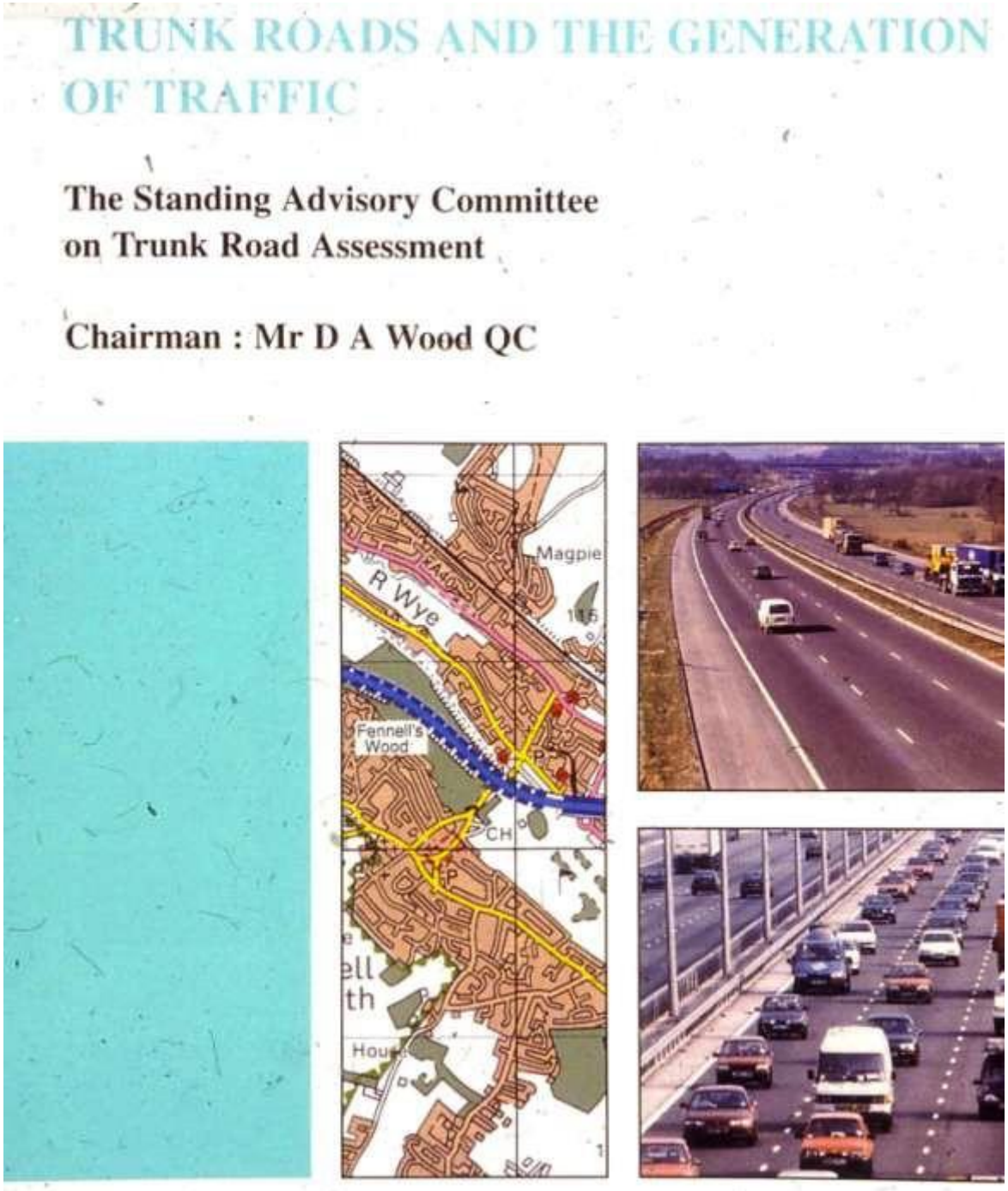
4. URBAN SPACE CONSUMPTION ISSUES



If one takes the land consumption of a pedestrian as the benchmark, the car takes up about 18 times more space as it moves, but it requires parking for the time it does not move, i.e. for some 90% of its life cycle. Land consumption therefore has an area x time dimension (Source: Louis Marchand, RATP, for UITP).

The SACTRA report showed that new road space attracts more new traffic than its additional capacity.

Source: http://webarchive.nationalarchives.gov.uk/20050301192906/http:/dft.gov.uk/stellent/groups/dft_econappr/documents/pdf/dft_econappr_pdf_022512.pdf



Historic cities consume less space

The future "low-energy" and resource-efficient city is already partially built (source: "La ville post-carbone : les formes urbaines et la transition énergétique", Jean-Pierre Traisnel 2011).
The buildings, pavement, streets, etc. mostly remain the same but the use of the city changes (view of St Pancras-King's Cross station redevelopment).

Energy- and space-saving neighbourhoods and cities are easier to measure and economically reward than low carbon cities.

KWH are accounted and billed. Transport of energy has a price that helps decision makers in estimating trade-offs between locally produced energy and long distance transportation of it.

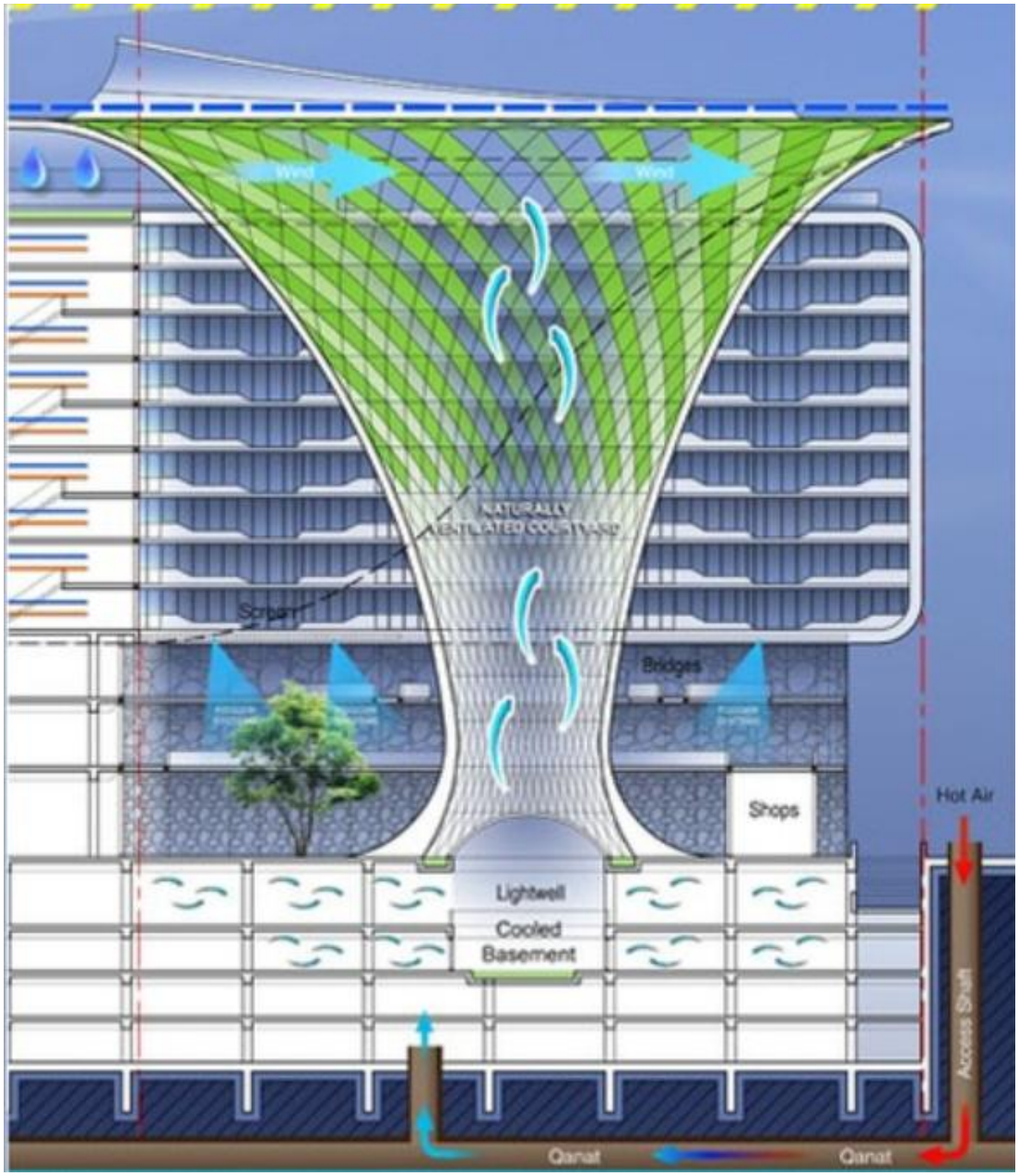
GHG by contrast is the result of a complex calculation and opens the way to manipulations (European emissions trading system).

5. GREENING THE COMPACT CITY, VALUING PUBLIC SPACE AND THE SERVICES RENDERED BY NATURE

- Rivers and canals as an urban recreational landscape
- Squares as the living rooms of the city
- A park fo everyone within walking distance
- Playgrounds for children
- Greenery wherever possible:
  - on public space (1 million trees Bloomberg programme in New York)
  - on private land (view of Taipei green building by Vincent Callebaut) (under construction).

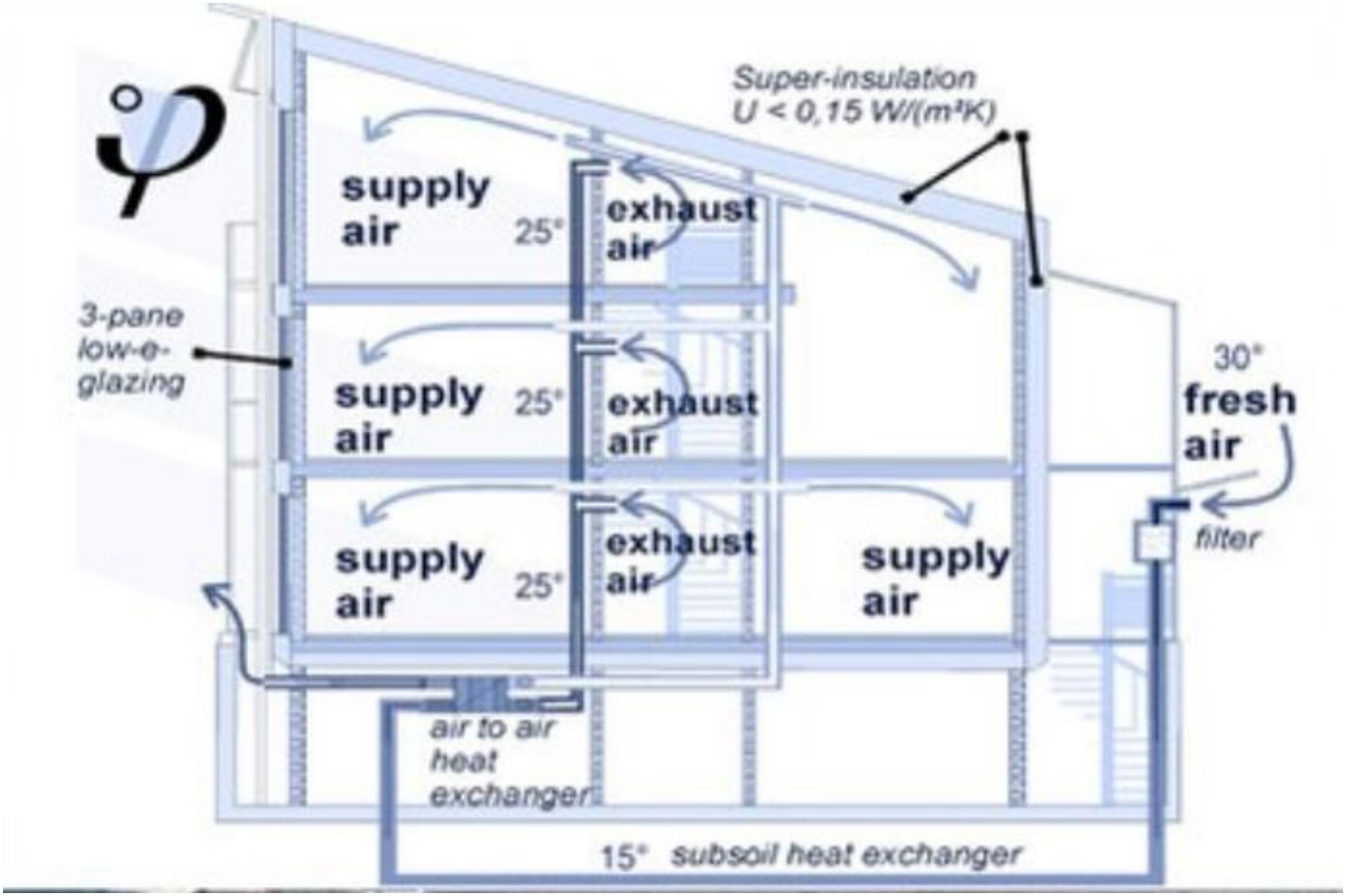
NOZHA NEW GREEN PROJECT IN CAIRO - "THE GATE RESIDENCE"

Wind chimney/catcher



© Nozha New Green Project - The Gate Residence, VINCENT CALLEBAUT ARCHITECTURES / PARIS

Passive geothermal cooling



Passive geothermal cooling

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Solar photovoltaics

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Solar water heating

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Vertical axis wind turbines

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Rooftop community garden

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6. URBAN GOVERNANCE: FIVE CASES OF SUSTAINABLE URBAN GOVERNANCE

Challenges facing decision-makers in societies marked by mass individualism

Room for "obliquity" approaches (John Kay)

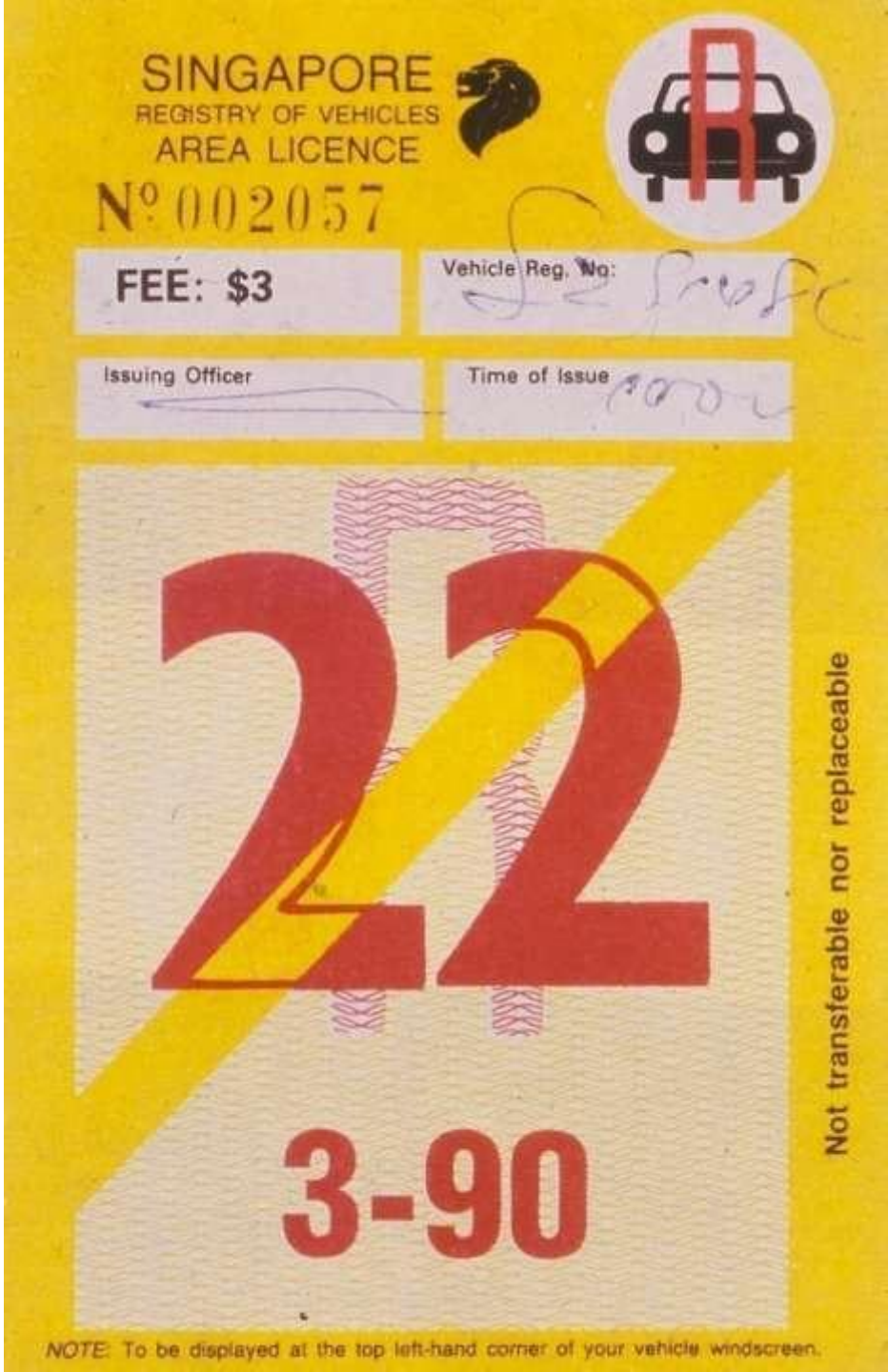
CASE STUDIES OF GOVERNANCE APPROACHES IN FAVOR OF URBAN SUSTAINABILITY

Five cases of integrated sustainable metropolitan governance:

Land, buildings, mobility and socio-political acceptance

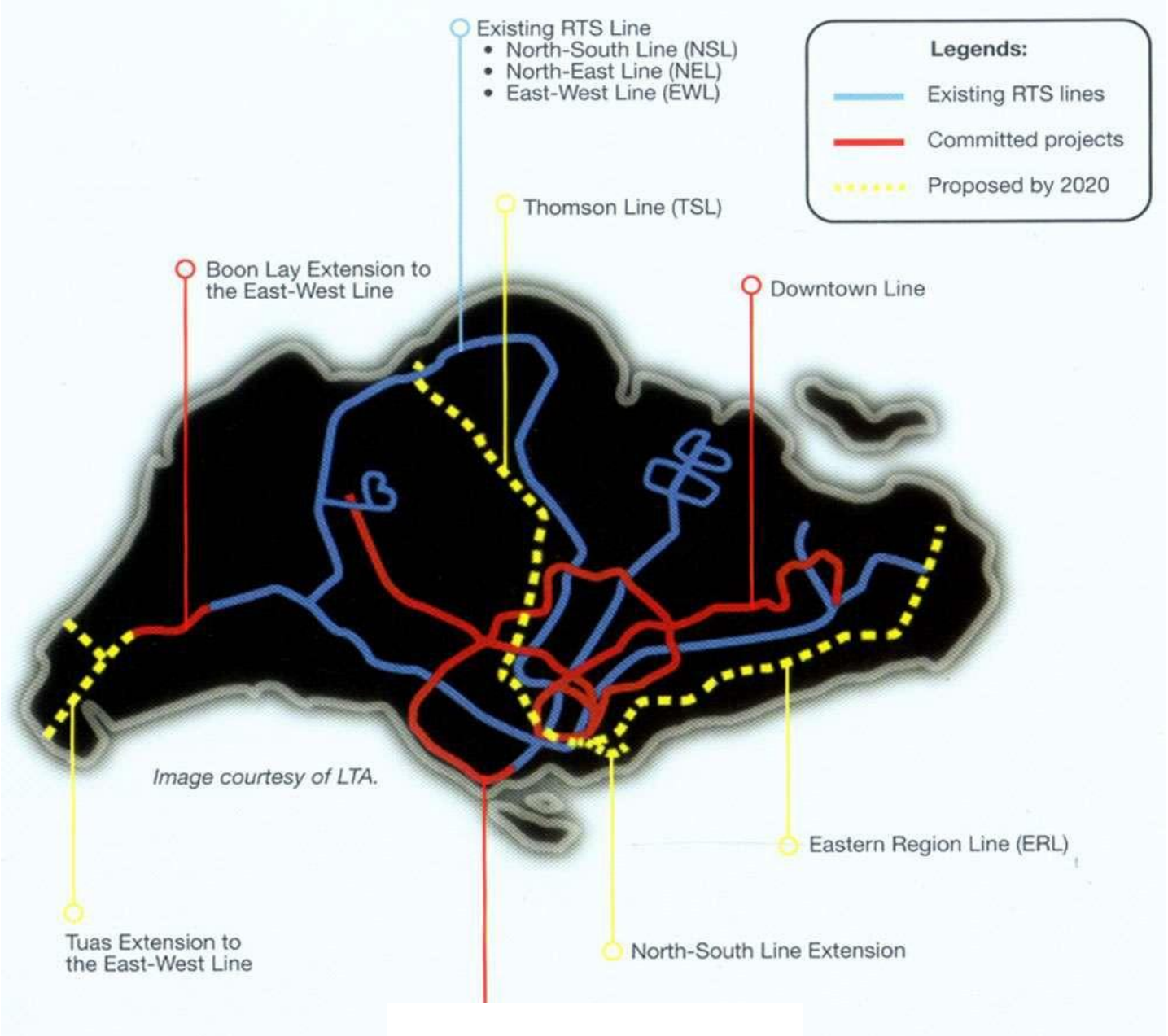
1. Singapore
2. Curitiba
3. Portland
4. Amsterdam
5. Louvain new university town

- 6.1. SINGAPORE
- From 1975 Singapore has endeavoured to save scarce land and natural resources through market mechanisms such as auctioning of new car plates (replicated in Shanghai), and pricing of road access to the city for solo drivers (no fee if there are 3 passengers). This was easily accepted as it gave drivers the choice of paying for solo driving or accepting 3 passengers.



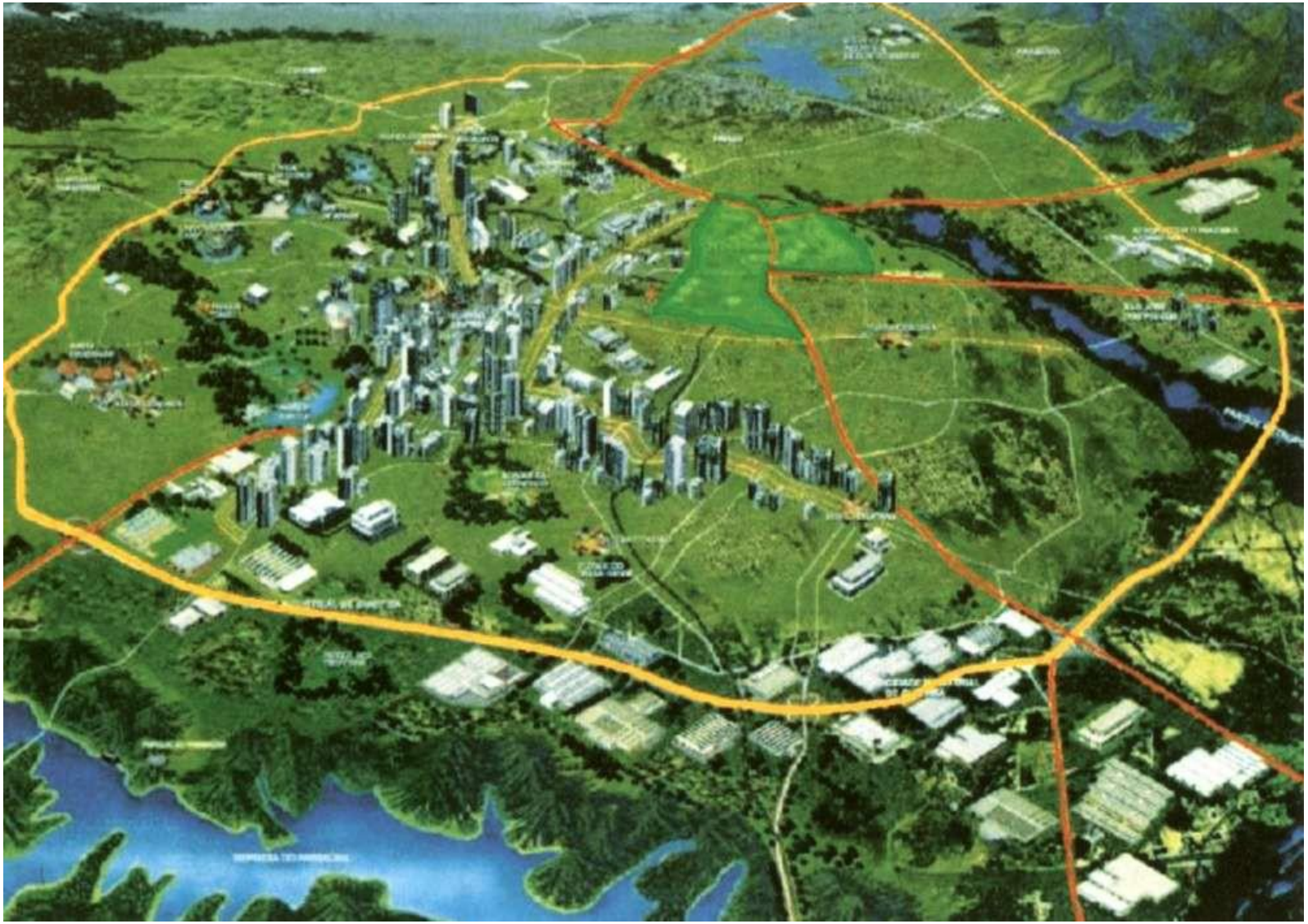
In 1998 the system was replaced by electronic road pricing, achieved through pre-paid cards debited when used (so no invoice-related privacy problem).

- Level of charges can change at any moment, according to the level of congestion (easily accepted as it is not an additional tax). In the future, the ERP will be operated from satellite at any point of road congestion (gantries no longer needed).

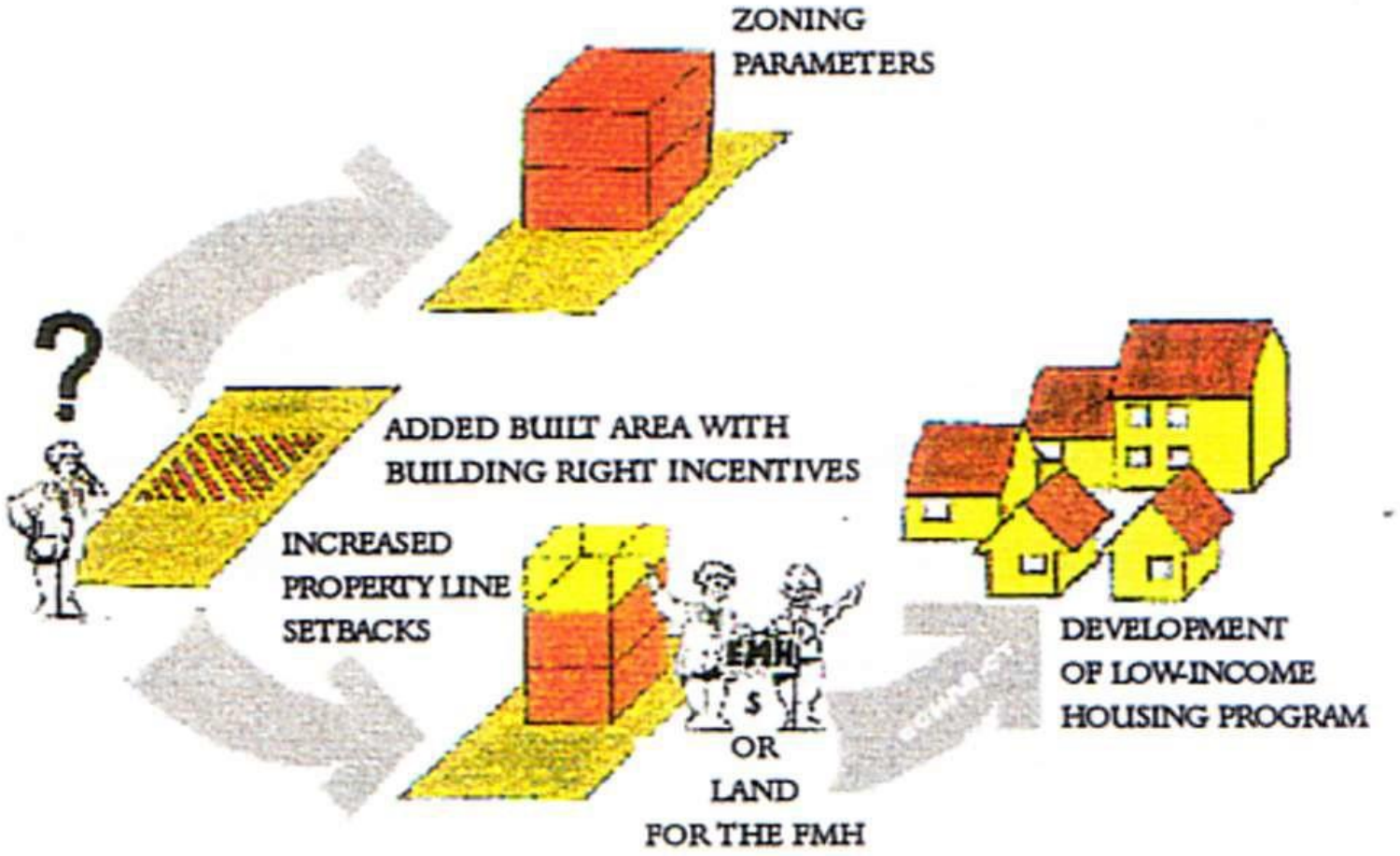


Singapore minimizes the space used for road transport while maximizing the space for parks and recreation, water reserves and recycling used water.

6.2. CURITIBA: self financing development plan



The urban development of Curitiba is centered on five central boulevards where high rise buildings are allowed. However, the development rights have to be bought from owners of low-lying flood-prone land or from protected landmarks.



Scheme of incentives for transfer of building rights - FMH
(Municipal Housing Fund)

http://www.ippuc.org.br

The boulevards were made accessible to high capacity buses with right of way and off-bus ticketing. At stops entry and exit take place through very large doors allowing very short stop times and a commercial speed of more than 30 km/h - comparable to a metro but at a fraction of the cost. The system started in 1976 and is still expanding (“Linha Verde”).

AFTER 40 YEARS THE SYSTEM IS STILL EXPANDING

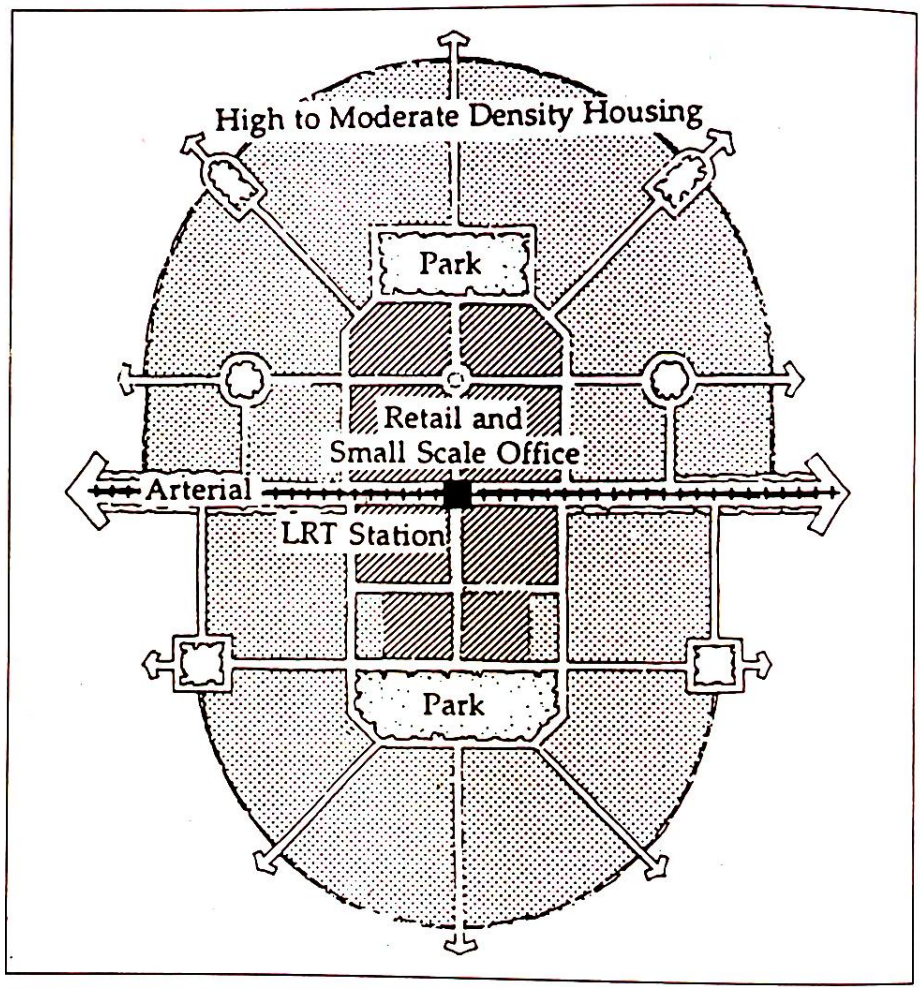
(LINHA VERDE)

6.3. PORTLAND, Oregon

The early UK new towns model.

3. Fuel taxes (which are the main source of transport funding) can only be used to fund road investment. More flexibility would require a change in Federal law.

Figure 66: Urban transit oriented development*[1]

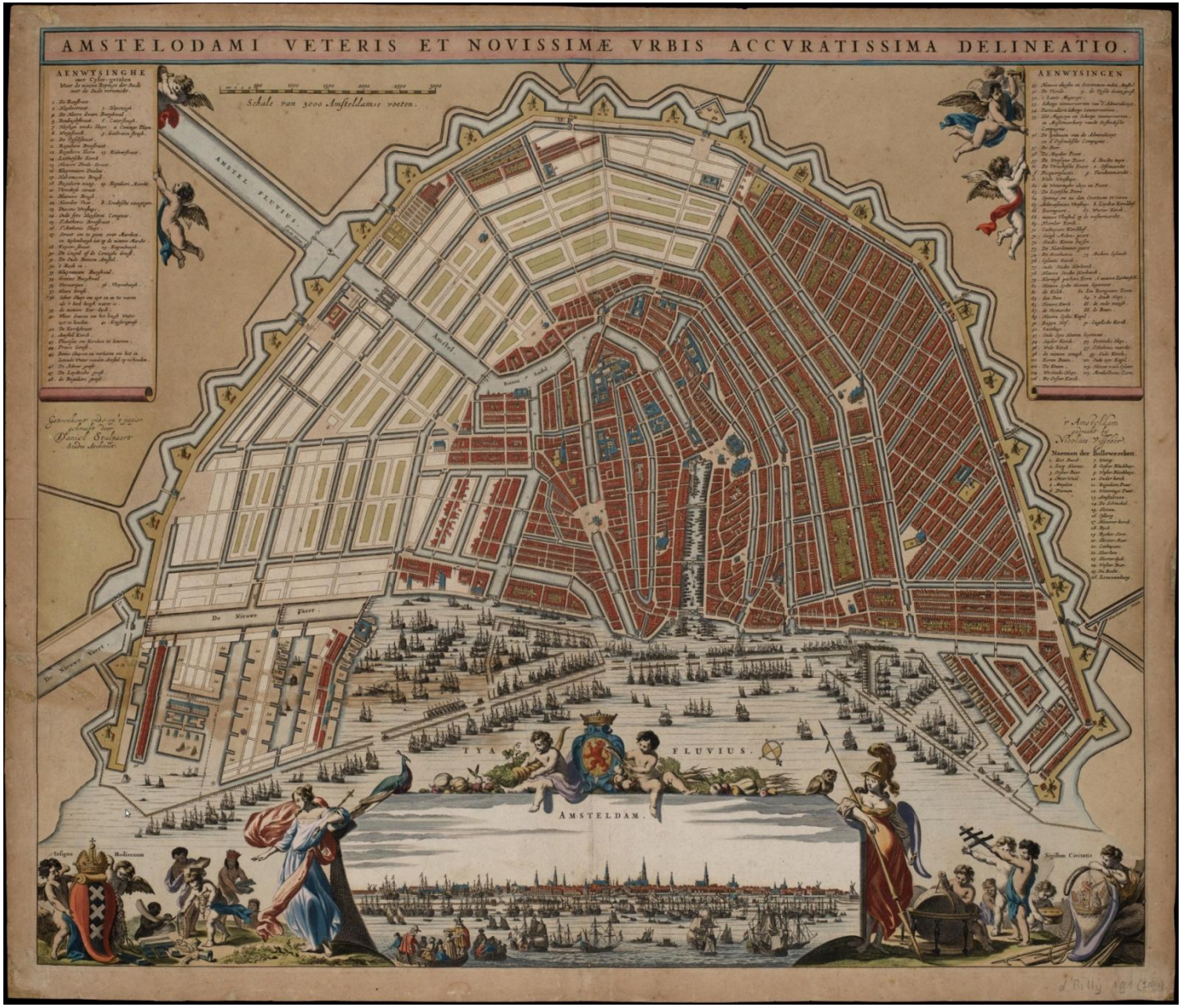


*Source: *Cambridge Systematics et al.*, The LUTRAQ Alternative: Analysis of Alternatives, 1000 Friends of Oregon, Portland 1992.

1 An indicative arrangement of development around light rail transit stops, with a mix of moderate to high density housing, shopping and civiv facilities, and parks.


Downtown Diner
Portland

6.4. AMSTERDAM The Medieval town. The medieval town developed southwards from the port along an inland waterway opening to the sea, as shown in the Braun and Hogenberg map (Braun) but was confronted in the early 17th Century by the need to accommodate a major population growth.



The “Novissima Urbs”. The City adopted a curvilinear development framework (Abrahamse), surrounding the old town by a triple circle of canals and a grid of service streets linking them. This plan was implemented over some 400 years and became a World Heritage site in 2010.

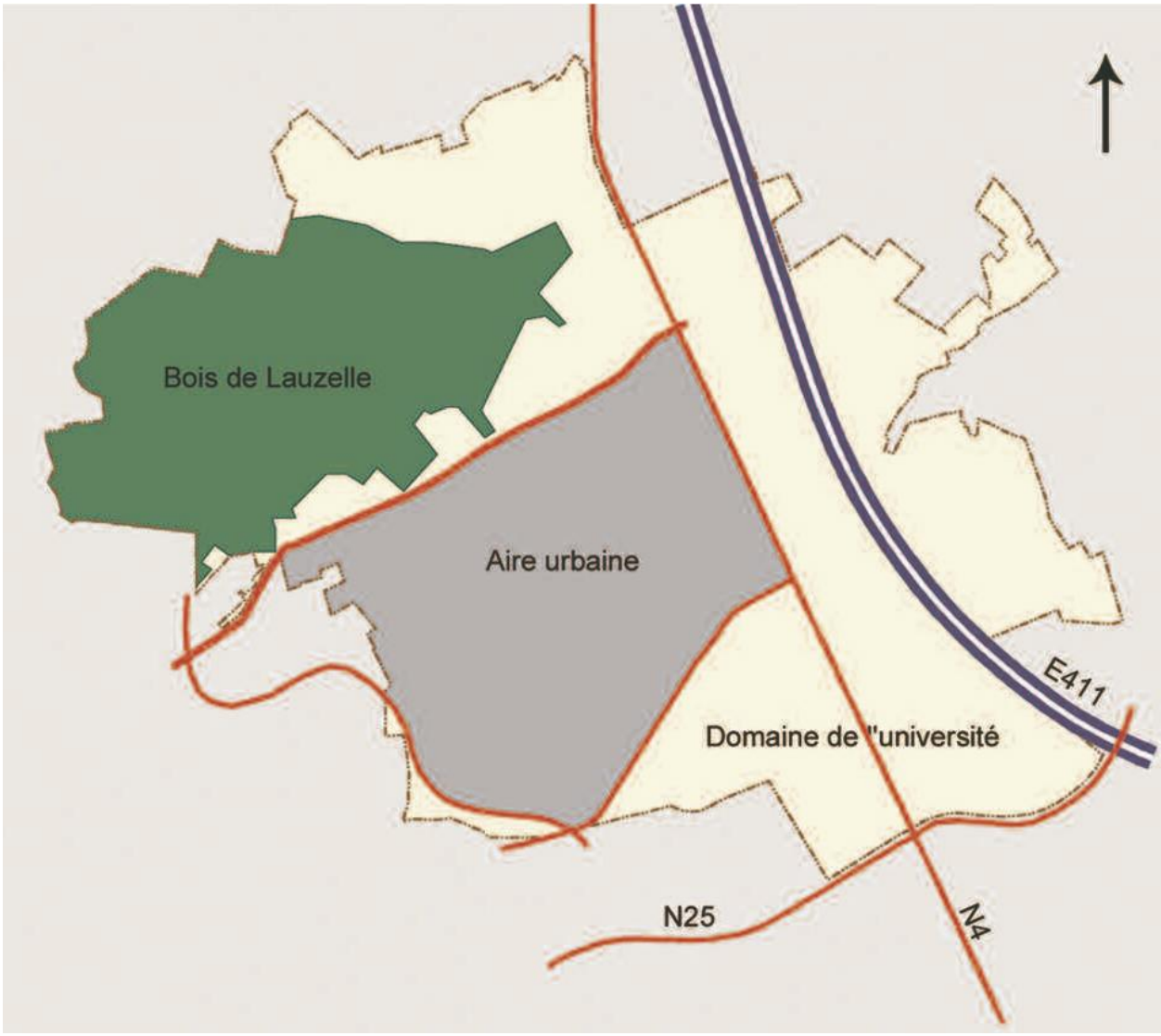
View of Amsterdam Singel canal area. It indicates the three ring canals frameworks.
Source : Wikipedia (AmsterdamGrachten.jpg).

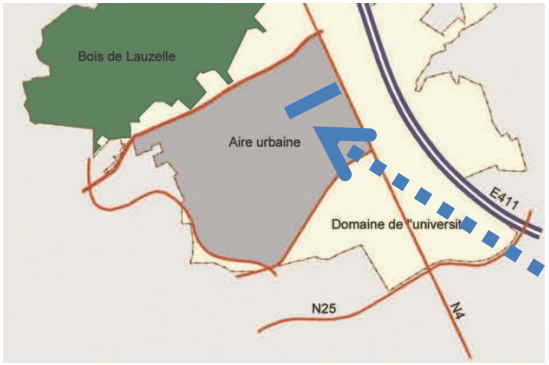
View of Central Station, Amsterdam. This photo, taken in 1900 shows the link with the old town and the canal area, while remaining outside of it. Source : Wikipedia.

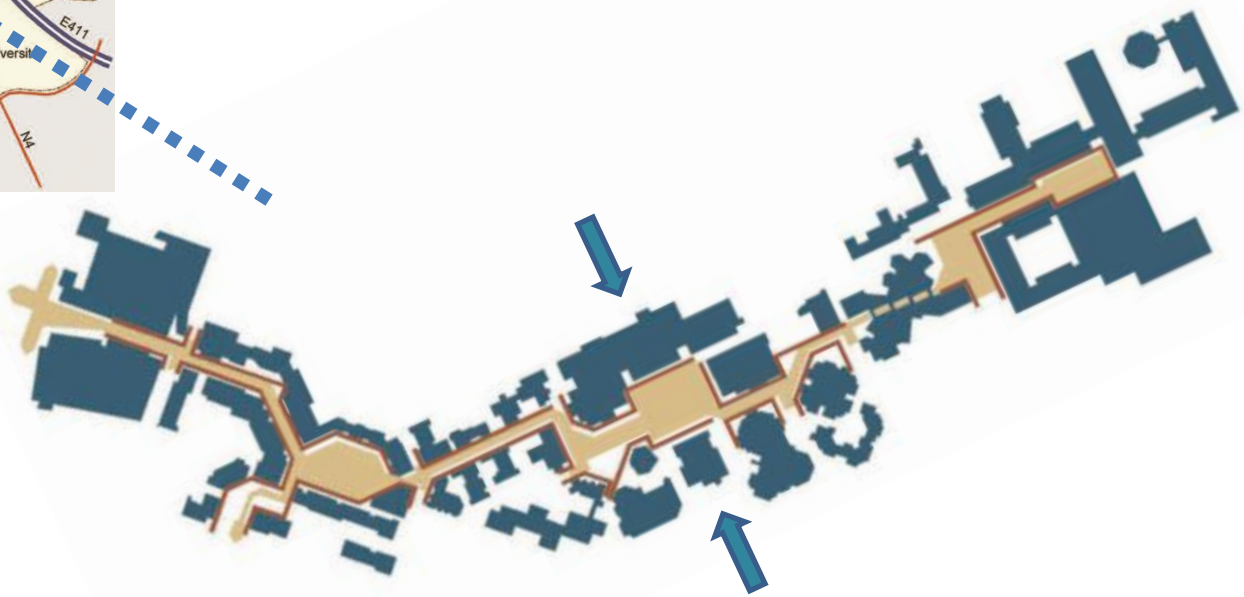
View of early building phase. *The Bend in the Herengracht* by Gerrit Berckheyde (1671-72).

Random view of a canal today. This shows the multimodal use of the canals, adapting to changes in transport modes, while remaining an amenity in their own right. Source: http://www.webklik.nl

6.5. The case of the new university town - The university bought ca 1000 ha of agricultural and forest land in a rural area close to Brussels Namur road (N4): the central part was set aside for urban development; forest land in the North was preserved. The overall master plan and architectural coordination was entrusted to the Groupe Urbanisme- architecture (R. Lemaire, J-P. Blondel and P. Laconte).







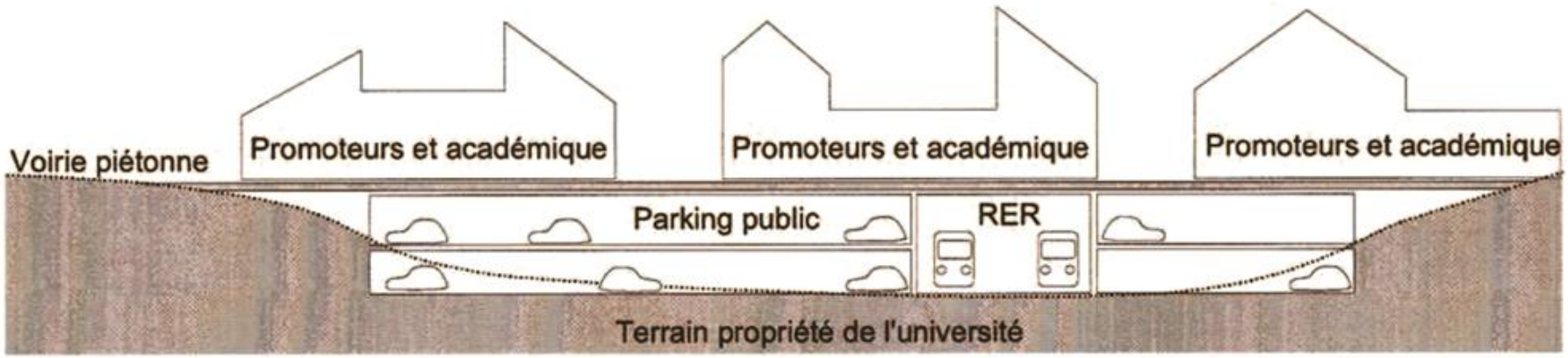
The pedestrian place-making. It was implemented in the main pedestrian street in the first phase, starting from the existing road east of the site, in 1972 (lower part of the picture), and later extended to the railway station opened in 1976 (upper part), the centre of the city, and the extension towards the western part of the site. Car access to buildings and parking is placed outside the spine, with some underpasses. Property development of the whole university-owned site (1000 ha) is by long term leases (75 to 99 years).

A string a public spaces for movement of leisure. The centre of the first phase was the Science Library, a huge concrete building seen as the cathedral of a university town with its plaza (parvis), above an automobile underpass. It is a social gathering place with university buildings, shops and restaurants (arch. A. Jacqmain).

All parking spaces are planted with different tree species in order to attract different kinds of birds. They have become an ornithological reserve.

Transit oriented development. A new station was built, by the national railway company in 1976. It was entirely underground, in view of being covered at a later stage. The full development of the East-West spine includes a slab on the lower part of the site, hosting the services, the parking and their underground access, in addition to the rail tracks.

The Station. The arcaded entrance of the station (arch. Y. Lepere) on the pedestrian spine is the place where the slab starts.



The functioning of the slab. The diagram shows how the underground remains property of the university while the infrastructure and buildings are leased (leases of up to 99 years) to public and private investors.

Latest developments. An aerial view of the city taken in 2003 shows the overall high-density low-rise development and the potential for further extensions close to the lake.