

THE CITY OF THE FUTURE – ADAPTING TO STRATEGIC ENVIRONMENTAL CHALLENGES AND OTHER DRIVERS

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Presentation to

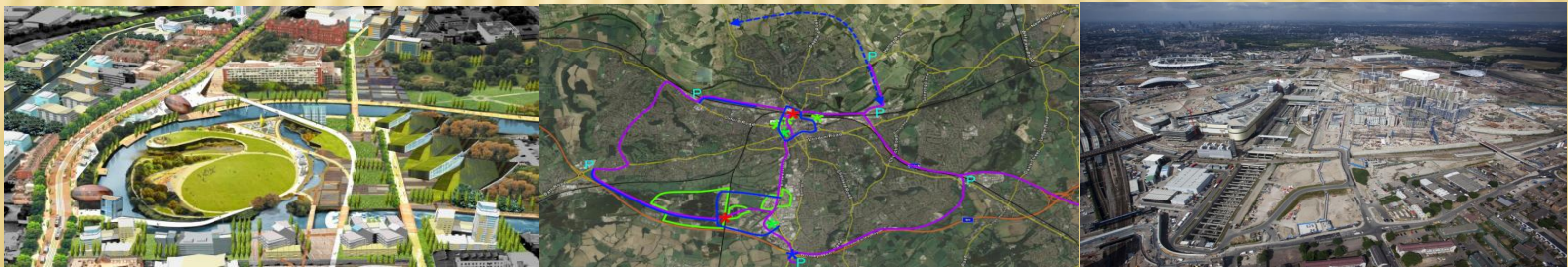
‘Sustainable Urban Mobility – responding to the challenge’

Low Carbon Vehicle Partnership Seminar

hosted by

Institution of Mechanical Engineers

Monday 10th December 2012

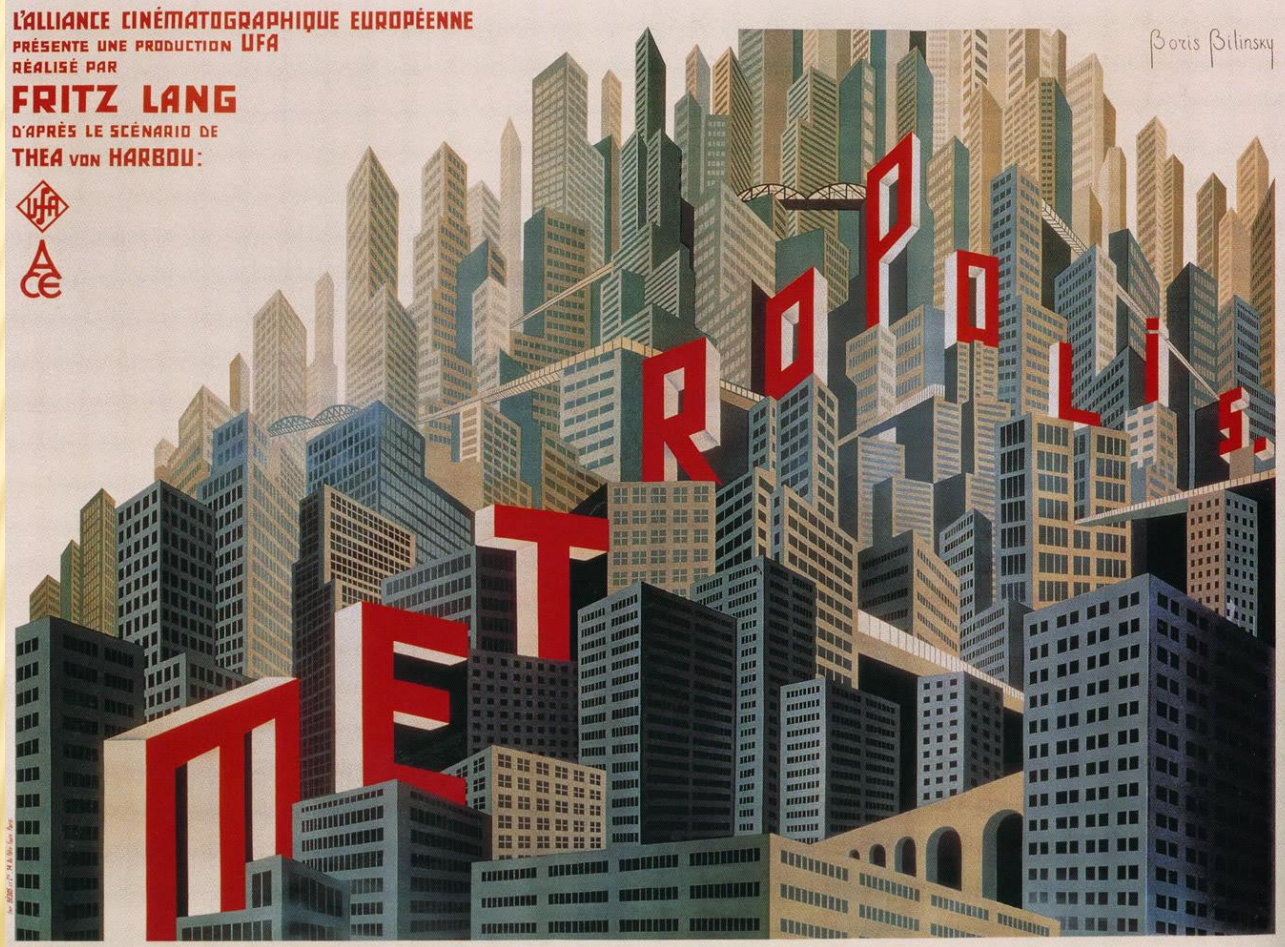


THE CITY OF THE FUTURE?



Fritz Lang's 1927 view of the City in the future

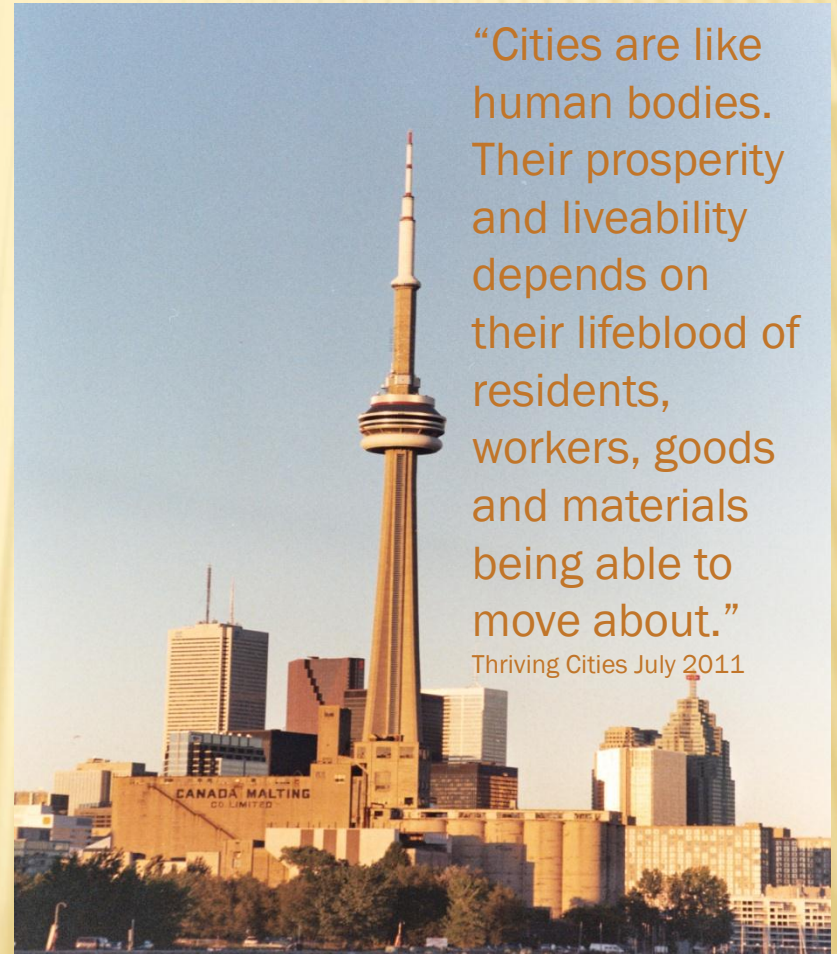
THE CITY OF THE FUTURE?



Fritz Lang's 1927 view of the City in the future

WHY ARE CITIES SO IMPORTANT?

- ✘ Cities are already home to half of the world's 7 billion population and that figure will rise to 70 per cent by 2050, according to the United Nations.
- ✘ The **metropolis** needs to adapt if it is to cope.



“Cities are like human bodies. Their prosperity and liveability depends on their lifeblood of residents, workers, goods and materials being able to move about.”

Thriving Cities July 2011

THE CITY OF THE FUTURE? – CITY OF TODAY?

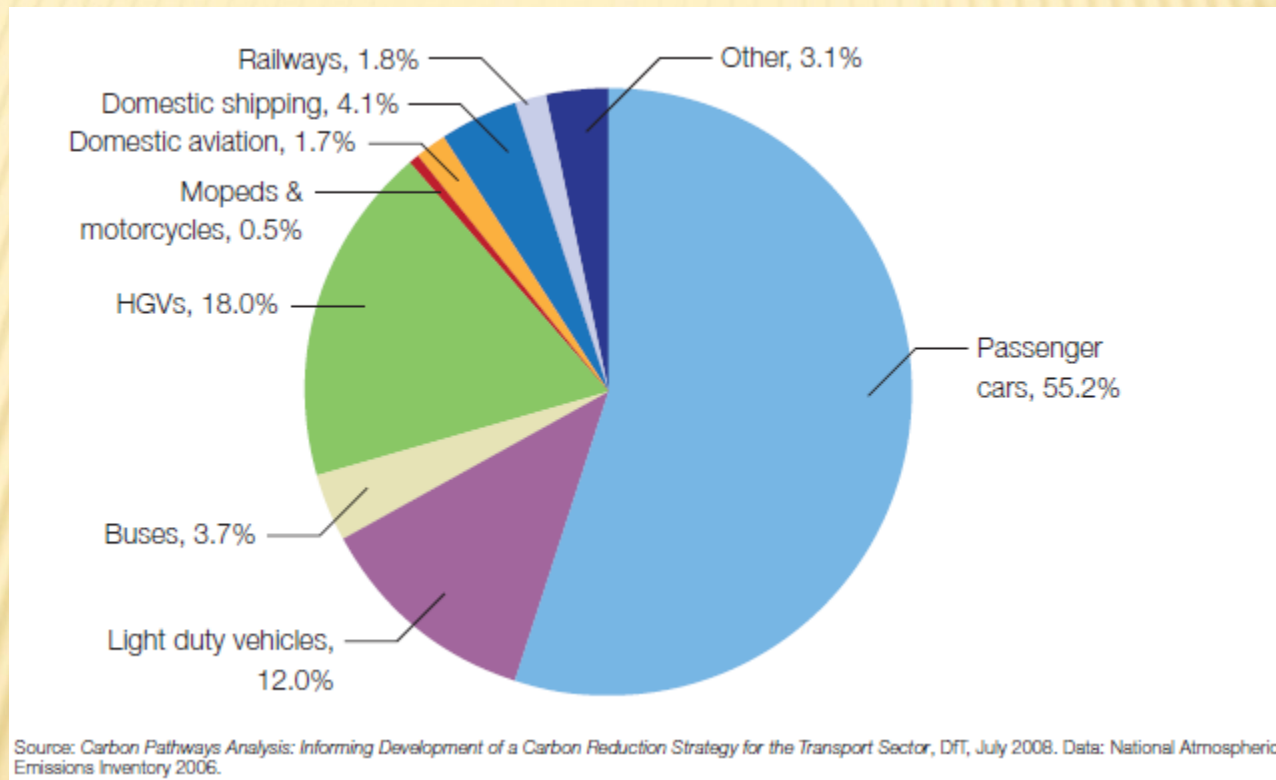


SUSTAINABILITY, CLIMATE CHANGE AND ECONOMIC GROWTH

- ✘ The key challenges facing UK and European Cities are those of tackling CO2 Emissions and Economic Growth - how to achieve the reduction in the first and the increase in the latter whilst creating the conditions for sustainable development and rejuvenation of local economies.
- ✘ Sustainability is the core principle underpinning both local government and the UK planning system.
- ✘ Sustainable development is often misconstrued as being mainly related to environmental concerns.
- ✘ UK Government agreed 5 guiding principles for achieving sustainable development:
 - + Living within environmental limits
 - + Ensuring a strong healthy and just society
 - + Achieving a sustainable economy
 - + Promoting good governance
 - + Using sound science responsibly



TRANSPORT SECTOR CO2 EMISSIONS



CITY OF THE FUTURE - SMART CITIES

TECHNOLOGY AND MOVEMENT

- ✘ The concept of the smart city as the next stage in the process of urbanisation has been quite fashionable in the policy arena in recent years.
- ✘ The main focus has been on the role of ICT infrastructure, but much research has also been carried out on the role of human capital/education, social and relational capital and environmental interest as important drivers of urban growth.



CITY OF THE FUTURE - SMART CITIES?

Definitions

- ✘ Smart cities can be identified under six headings.
 - + a *smart economy*;
 - + *smart mobility*;
 - + a *smart environment*;
 - + *smart people*;
 - + *smart living*; and,
 - + finally, *smart governance*.
- ✘ A city can be defined as 'smart' when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic development and a high quality of life, with a wise management of natural resources, through participatory action and engagement.



CITY OF THE FUTURE - NEW SMART CITIES?

New build smart cities show what technology can do on a blank canvas

Masdar , Abu Dhabi

Masdar City a planned city being built by the Abu Dhabi Future Energy Company.

The city 17 kilometres (11 mi) east-south-east of the city of Abu Dhabi, beside Abu Dhabi International Airport.

The city planned to cover 6 square kilometres (2.3 sq mi) house 45,000 to 50,000 people and 1,500 businesses, primarily commercial and manufacturing facilities specialising in environmentally friendly products

60,000 + workers expected to commute to the city daily.



CITY OF THE FUTURE - NEW SMART CITIES?

Masdar , Abu Dhabi

The city will rely entirely on solar energy and other renewable energy sources, with a sustainable, zero-carbon, zero-waste ecology and will be a *car free city*.

Initial design - automobiles would be banned within the city as travel will be accomplished via public mass transit and personal rapid transit (PRT) systems, with existing road and railways connecting to other locations outside the city.

A test fleet of 10 Mitsubishi i-MiEV electric cars was deployed in 2011 as part of a one-year pilot to test a point-to-point transportation solution for the city as a complement to the PRT and the freight rapid transit (FRT), both of which consist of automated electric-powered vehicles



CITY OF THE FUTURE - NEW SMART CITIES?

New build smart cities show what technology can do on a blank canvas

Songdo, South Korea

Started in 2000, Songdo in South Korea is leading the charge to become a blueprint for the city of the future.

Built on an artificial island 56km west of Seoul, the 6 sq km city, on completion in 2016 home to 65,000 people, with a further 300,000 commuting in daily.

Entire city wired with fibre optic broadband keeping people connected and sending a constant data stream to computer processors that keep Songdo operating.

Sensors embedded in streets and buildings monitor everything from temperature to road conditions to help the city run efficiently and react to problems

To deal with traffic, RFID (radio frequency identification) tags on cars send location data to a central hub identifying black spots and tweaking signals to ease congestion



CITY OF THE FUTURE - SMART CITIES?

Definitions

- ✘ Smart cities can be identified under six headings.
 - + a smart **economy**;
 - + smart **mobility**;
 - + a smart **environment**;
 - + smart **people**;
 - + smart **living**; and,
 - + finally, smart **governance**.
- ✘ These six *connect with regional and neoclassical theories of urban growth and development*.
- ✘ In particular - theories of regional competitiveness, transport and ICT economics, natural resources, human and social capital, quality of life, and participation of citizens in the governance of cities.



CITY OF THE FUTURE - NEW BUILD VERSUS ESTABLISHED CITIES

- ✘ Telling that the only real examples so far are new build overseas - very different legislative, cultural and physical environments
- ✘ What is the reality closer to home?- Is there really such a thing as an instant city?
- ✘ Cities evolve and are organic, responding to the changing patterns of commerce and technology
- ✘ Are they self sufficient ?
- ✘ ..and more importantly self contained?
- ✘ New build or retrofit.... The greatest challenge is in modifying the existing cities - especially where urban sprawl established.
- ✘ New technology enables us to contemplate ways of sustainable planning - only part of the answer when we look at existing conurbations.



IS THE UK RISING TO THE CHALLENGES?

- ✘ Building a new city is a challenge in its own right and a showcase for the latest technology, but does it represent the real challenge facing the UK.
- ✘ What is needed is a masterplan and a strong enforceable planning system to bind together all the elements that make up a smart city.....may be a test for UK.
- ✘ Previous attempts at **Eco Towns** in England have not got very far.
- ✘ Response to housing crisis in UK, but only one of 15 shortlisted sites to go ahead.
- ✘ The new environmentally-friendly towns - low-energy, carbon-neutral developments - intended to be largely car-free, with pedestrian and cycle-friendly environment.
- ✘ Intended to provide up to 20,000 new homes, the towns were to be "zero-carbon" developments and exemplary in at least one area of sustainability, such as energy production or waste disposal.



IS THE UK RISING TO THE CHALLENGES?

The standards eco-towns should meet provide a useful checklist for future city growth and Regeneration:

- ✘ **Affordable housing:** a minimum of 30% affordable housing in each eco-town.
- ✘ **Zero-carbon:** eco-towns must be zero-carbon over the course of a year (not including transport emissions).
- ✘ **Green space:** a minimum of 40% of eco-towns must be greenspace.
- ✘ **Waste and recycling:** eco-towns must have higher recycling rates and make use of waste in new ways.
- ✘ **Homes:** homes must reach **Code for Sustainable Homes** level 4 or higher (surprisingly not the highest standard available, casting doubt on the credibility of these requirements).



IS THE UK RISING TO THE CHALLENGES?

The standards eco-towns should meet provide a useful checklist for future city growth and regeneration.

- ✘ **Employment:** at least one job opportunity per house accessible by public transport, walking or cycling (*although the standards are silent on how housing developers might guarantee this and it is largely discredited in the current economic crisis*).
- ✘ **Services:** there must be shops and a primary school within easy walk of every single home, and all the services expected from a town of up to 20,000 homes.
- ✘ **Transition/construction:** facilities should be in place before and during construction.
- ✘ **Public transport:** real-time public transport information in every home, a public transport link within ten minutes walk of every home.
- ✘ **Community:** there must be a mixture of housing types and densities, and residents must have a say in how their town is run, by governance in new and innovative ways.



THE CITY OF THE FUTURE - SMART CITIES TECHNOLOGY AND MOVEMENT

- ✘ The concept of the smart city as the next stage in the process of urbanisation has been quite fashionable in the policy arena in recent years.
- ✘ The main focus has been on the role of ICT infrastructure.
- ✘ What then of transport and its integration with land use planning and change?
- ✘ What role does movement and access play and how can it influence sustainability?



THE CITY OF THE FUTURE: URBAN FORMS AND ROLE OF TRANSPORT IN SHAPING STRUCTURE AND TRAVEL IN CITIES

- ✘ Transport and the location of activities are mutually dependent
- ✘ Structure of the city for governed by four main factors;
 - + the **geography** of its location
 - + **developmental control**:-
 - ✘ Planning system and constraints
 - ✘ Politics and policies
 - + dynamic factors often unique to the city
 - + **relative accessibility** to locations within the city.
- ✘ Mutual dependence between land use and transport is reflected in the location response of business and individuals to accessibility.
- ✘ Pricing distortions present for a very long time and their accumulated effects have been widespread. The effect enshrined in the structure of the city.



FUNDAMENTAL ROLE OF TRANSPORT IN SHAPING STRUCTURE AND TRAVEL IN CITIES

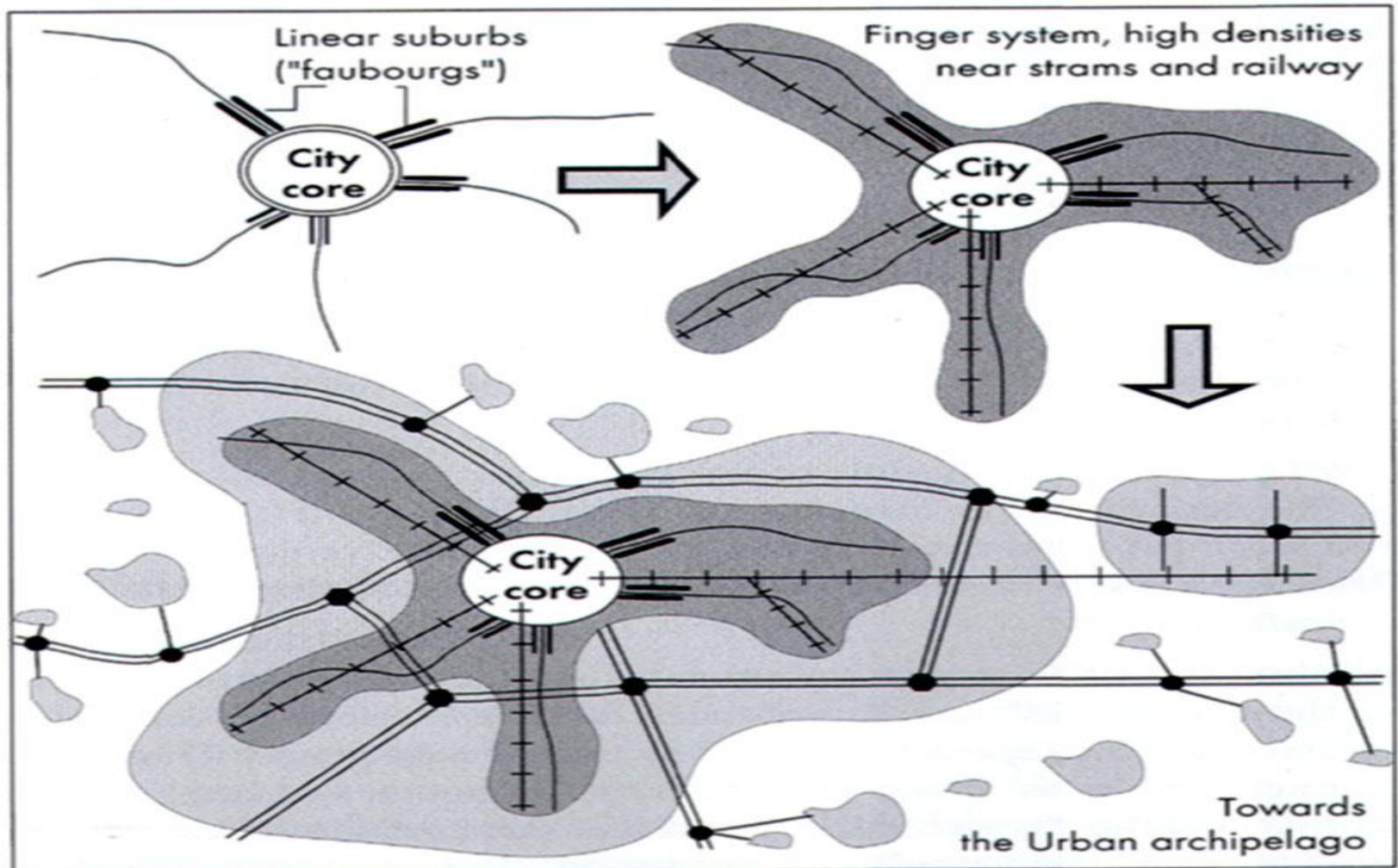
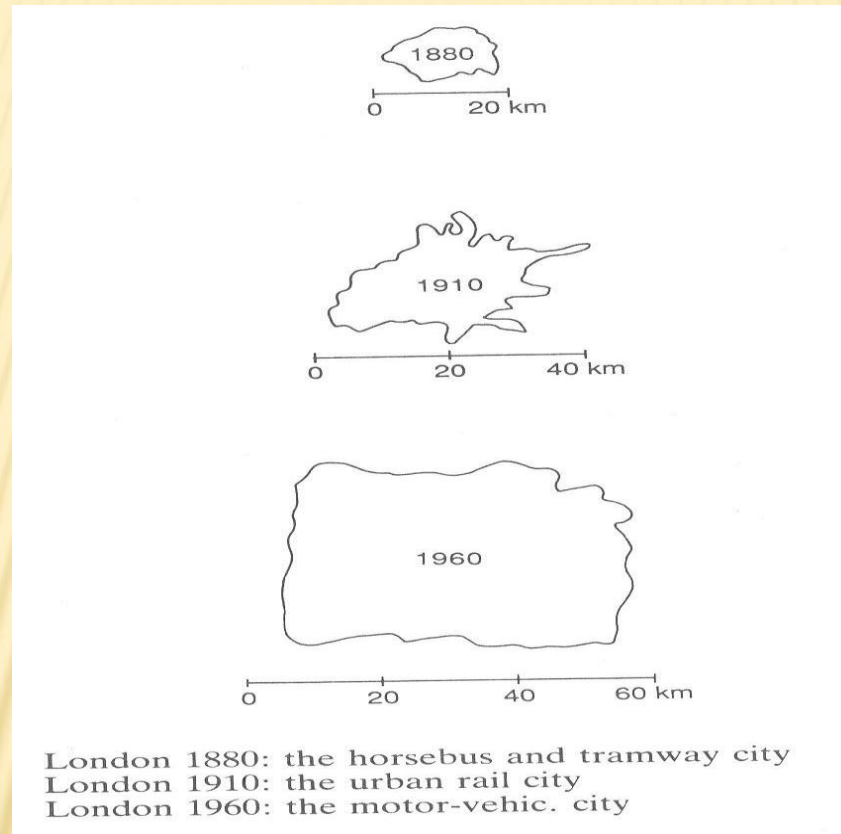


Figure 1: The three successive stages of the European urban growth (after Beaucire, 1996)

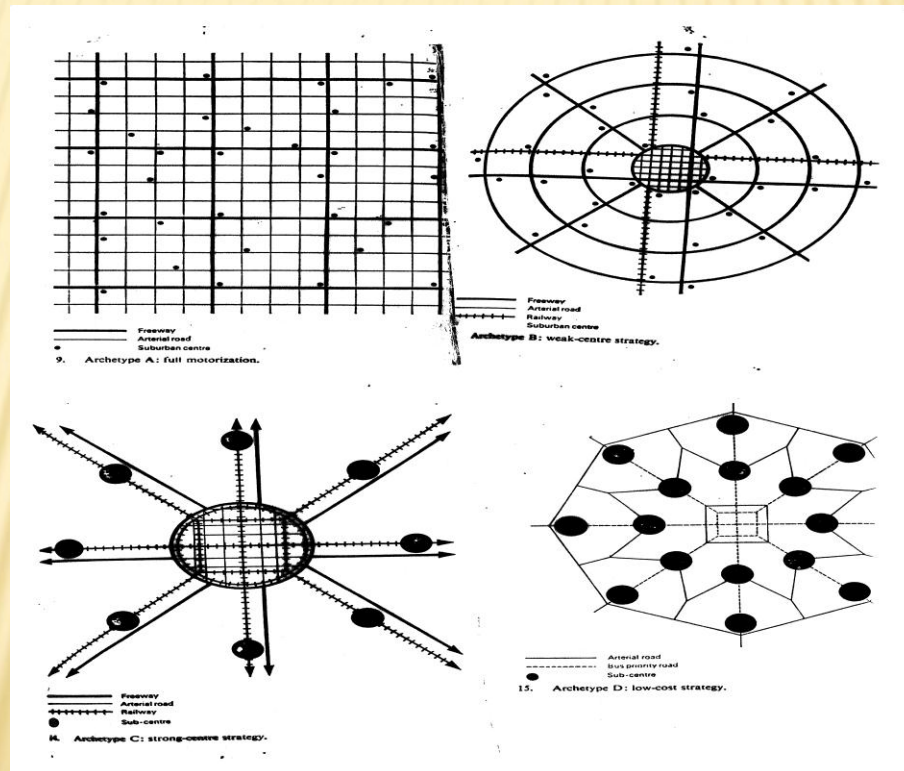
URBAN FORMS AND TRANSPORT SYSTEMS: THE FUNDAMENTAL ROLE OF TRANSPORT IN SHAPING THE STRUCTURE AND TRAVEL CHARACTERISTICS OF CITIES



Transport technology and the expansion of London

URBAN FORMS AND TRANSPORT: THE FUNDAMENTAL ROLE OF TRANSPORT IN SHAPING THE STRUCTURE AND TRAVEL CHARACTERISTICS OF CITIES

City structure governed primarily by relative accessibility to locations within the city



URBAN FORMS AND TRANSPORT SYSTEMS: THE FUNDAMENTAL ROLE OF TRANSPORT IN SHAPING THE STRUCTURE AND TRAVEL CHARACTERISTICS OF CITIES

UK settlement size and distance travelled (km) per person per week by mode

Urban Area	Car	Bus	Rail	Walk	Other	All modes
Inner London	45.3	12.0	34.1	2.5	16.6	110.5
Outer London	113.3	8.9	23.3	2.6	18.5	166.6
Metropolitan Areas	70.6	16.9	4.7	3.4	17.1	112.7
Other urban over 250,000	93.6	11.2	8.3	4.2	23.9	141.2
100,000 – 250,000	114.8	8.6	11.3	3.2	22.6	160.5
50,000 – 100,000	110.4	7.2	13.0	3.7	20.2	154.5
25,000 – 50,000	110.8	5.7	12.5	3.7	18.2	151.0
3,000 – 25,000	133.4	7.2	8.0	3.0	24.1	175.7
Rural	163.8	5.7	10.9	1.7	28.9	211.0
All Areas	113.8	9.3	11.3	3.2	22.0	159.6

URBAN FORMS AND TRANSPORT SYSTEMS: THE FUNDAMENTAL ROLE OF TRANSPORT IN SHAPING THE STRUCTURE AND TRAVEL CHARACTERISTICS OF CITIES

UK density and distance travelled (km) per person per week by mode

Density (Persons per hectare)	All Modes	Car	Local Bus	Rail	Walk	Other
Under 1	206.3	159.3	5.2	8.9	4.0	28.8
1-4.99	190.5	146.7	7.7	9.1	4.9	21.9
5-14.99	176.2	131.7	8.6	12.3	4.3	18.2
15-29.99	152.6	105.4	9.6	10.2	6.6	20.6
30-49.99	143.2	100.4	9.9	10.8	6.4	15.5
50 and over	129.2	79.9	11.9	15.2	6.7	15.4
All Areas	159.6	113.8	9.3	11.3	5.9	19.1

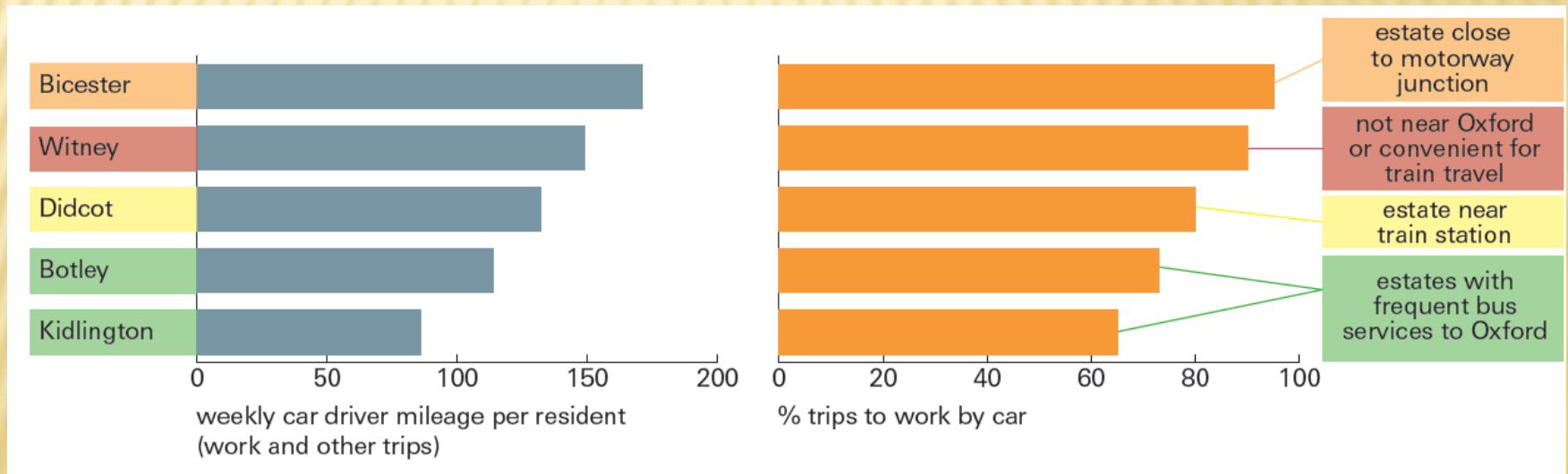
AN INTEGRATED PLANNING APPROACH

- ✘ Eight key factors that determine the car dependence :
 - + Overall location within a conurbation
 - + Density of residential or commercial uses
 - + Local facilities and jobs
 - + Street layout and design
 - + Public transport quality and proximity
 - + Car parking
 - + Restraint to car movements
 - + 'Smart' travel measures secured through the planning system



ROLE OF INTEGRATED PLANNING.

- ✘ The first and most fundamental choice is the **overall location of new development, urban change and growth** in relation to urban centres and transport corridors.
- ✘ Studies confirm that travel habits are strongly influenced by the type of transport corridor that is closest,
- ✘ Developments situated adjacent to or within the nearest conurbation have lower car use.



AN INTEGRATED PLANNING APPROACH

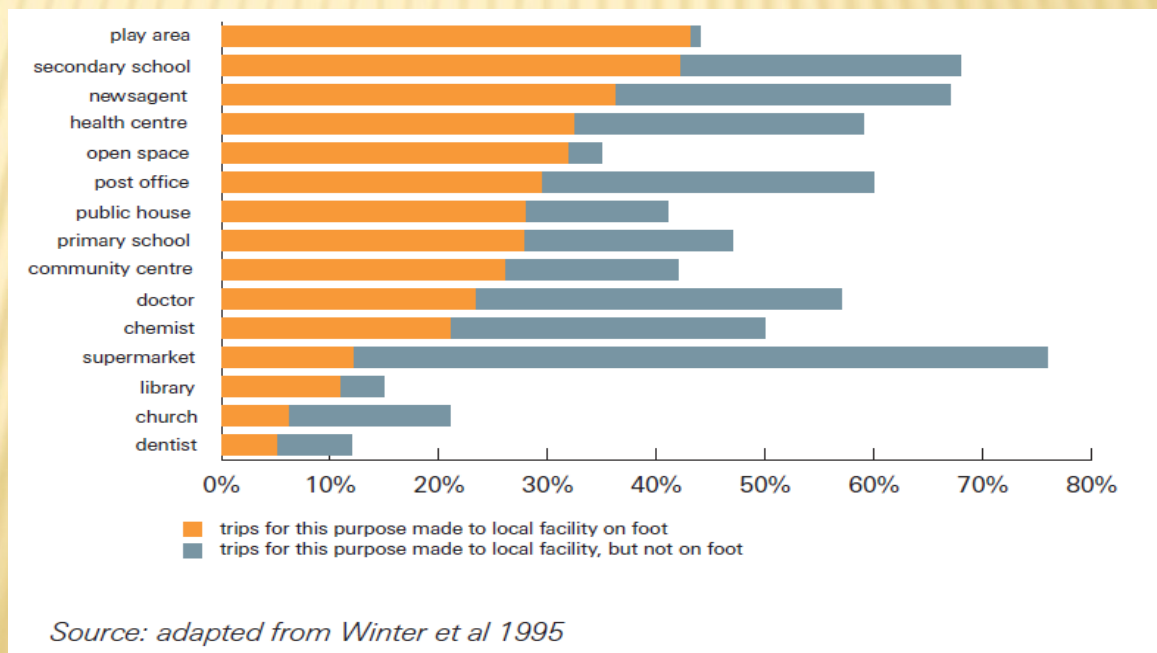
Development density.

- ✘ Many studies from city-wide down to the level of a single neighbourhood, show that **development at higher density results in lower car use.**
- ✘ All sorts of other aspects of land use are determined by **density levels.**
- ✘ **Low densities cannot support shops** within walking distance, road layout becomes uninteresting and over-extended for walking or cycling, and the catchment area for public transport is too thinly populated for services to be viable.
- ✘ **Critical density threshold** above which high frequency rapid transit services become financially viable - although influenced by local context roughly 100 dwellings per hectare.



EVIDENCE FOR AND BENEFITS OF INTEGRATION

- ✘ Masterplanning can influence travel behaviour by provision of **local facilities and jobs - mixing together living accommodation, shops, services and jobs**, so that the need for travel is reduced.
- ✘ Where local facilities, i.e. health centre or supermarket are available as part of a housing development, research shows that they capture a large proportion of the trips residents make to those types of destination.



EVIDENCE FOR AND BENEFITS OF INTEGRATION

- ✘ Provision of public transport will not, of itself, guarantee that travel patterns are sustainable. The other aspects of land-use planning discussed here
- ✘ It is possible, to choose the right location for a new development, but to build it in such a way that the majority of trips will be made by car.
- ✘ A key consideration for effective public transport and land-use planning is provision of parking
- ✘ Quantity and the price of parking are important determinants of travel patterns.



Studies show that car commuting to businesses with free parking was 50% greater than car commuting to businesses that charge their staff for parking.

IMPLICATIONS FOR THE FUTURE OF OUR CITIES

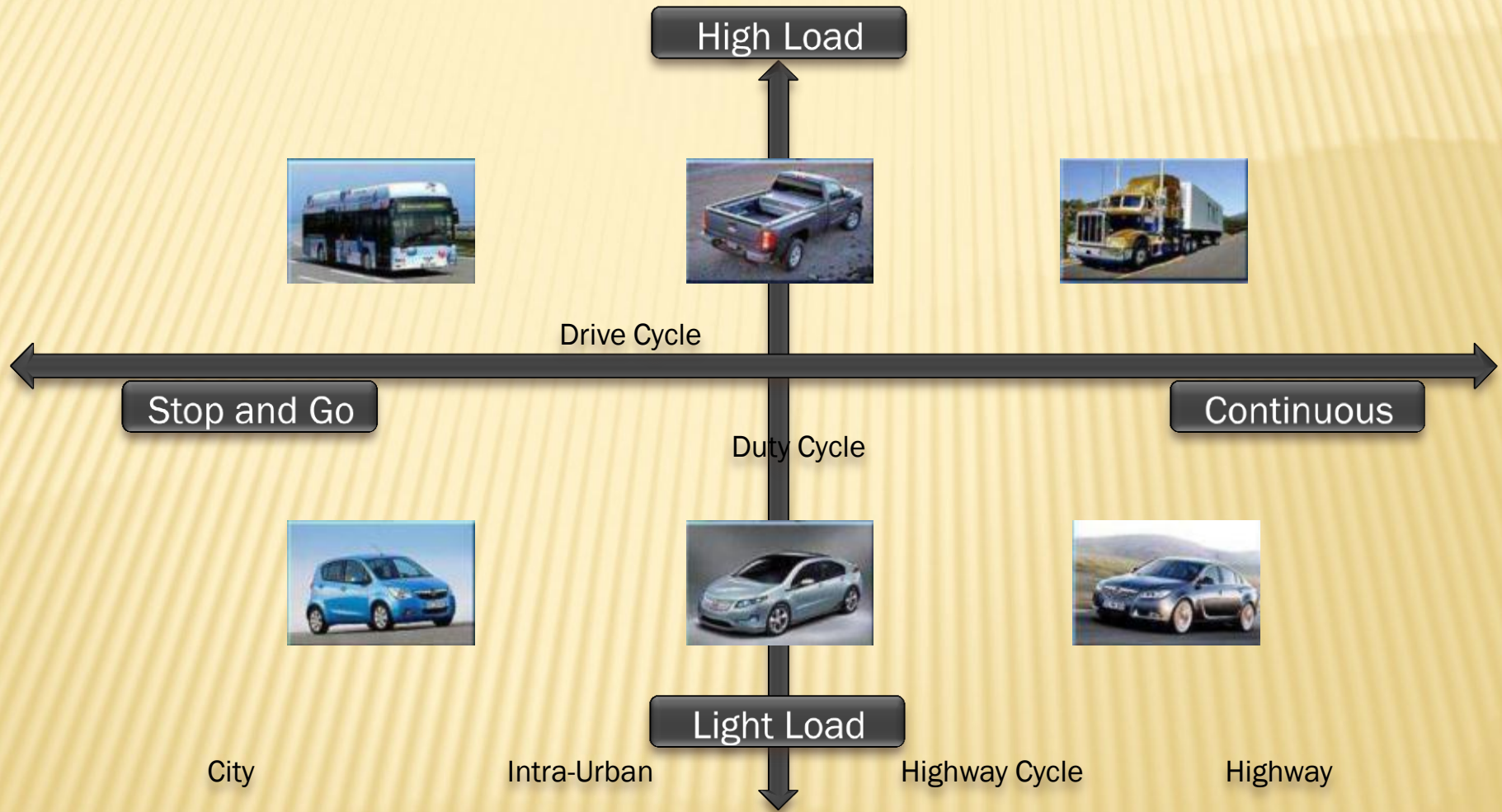
- ✘ Process of developing and re-developing our towns and cities should start from insight into how their transport and movement infrastructure shapes urban structure and v.v
- ✘ In UK extent to which an understanding of the transport infrastructure has been the starting point for land use planning to date is strikingly limited.
- ✘ Achieving sustainable patterns of transport would enable towns and cities to function better and feel better to their occupants - and is vital to support sustained economic growth.
- ✘ Better integration of transport infrastructure within the planning of development, could pre-empt situations that are almost impossible to remedy retrospectively
- ✘ We can only really seek to influence the land use transport integration with new development, change and economic growth.
- ✘ What's done is done and we have to cope with the legacy and seek to marry integrated planning with technology to create smarter cities

WHERE NEXT? – A ROLE FOR ELECTRIC VEHICLES?

- ✘ Technology and smart systems will play an increasingly important role in our lives and in that of cities
- ✘ We will travel less, importantly by more sustainable modes?
- ✘ Electric Vehicles – background and Plugged in Places
- ✘ Benefits and usage
- ✘ Energy demand and implications
- ✘ Infrastructure and network
- ✘ Grant funding and offers



THE FUTURE OF LOW CARBON TRANSPORT



THE FUTURE OF LOW CARBON TRANSPORT

THE UK STRATEGY



UK Strategy

- Move to Low Carbon Transport
- Electric Vehicle Subsidy
- Plugged in Places (PiP) programme

East of England Strategy

- Transport Carbon Study in November 2009
- Plugged in Places bid
- EValu8
- Innovation - Competitiveness



PiP Geographical Coverage



THE FUTURE OF LOW CARBON TRANSPORT

THE UK STRATEGY- PLUGGED IN PLACES



1st Wave (2010)

- London
- Milton Keynes
- North East

2nd Wave (2011)

- East of England
- Manchester
- Midlands
- Northern Ireland
- Scotland

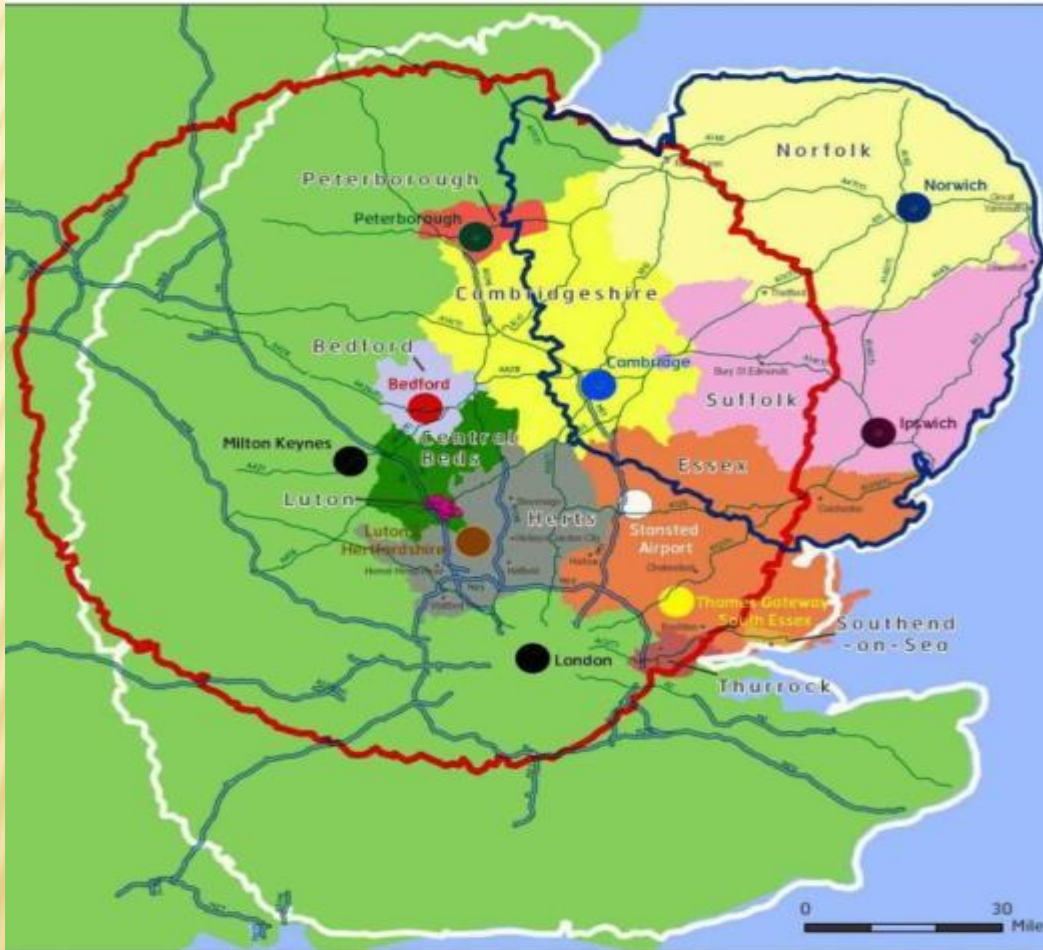
THE UK STRATEGY- PLUGGED IN PLACES

SOURCE EAST EV CHARGING NETWORK EVALU8 TECHNOLOGY INNOVATIONS LTD

- **Evalu8** Technology Innovations Ltd - Wholly owned subsidiary of University of Hertfordshire
 - One of 8 OLEV Plugged in Places networks
 - 7,500sq mile East of England EV charging network
 - Encourage low carbon transport
 - 195 active charge points already installed
 - Innovation network – Designed as a test bed to develop new products, services and technologies
 - Support packages to businesses
 -*Future Research on Behavioural Factors and Market Response*
-

EVALU8 TECHNOLOGY INNOVATIONS LTD

EValu8 - East of England's Plugged in Places network



THE UK STRATEGY- PLUGGED IN PLACES

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- ✘ Technology and smart systems will play an increasingly important role in our lives and in that of cities.
- ✘ We will travel less, importantly by more sustainable modes?
- ✘ The future for electric vehicles- integrating transport and movement and land use planning as part of a growth strategy is essential to maximise the benefits of new technology.



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