GLOBAL MASS TRANSIT CONFERENCE

"Energy Efficiency in Public Transport"

Brussels 7 February 2013

THE CONTRIBUTION OF MOBILITY TO LIVEABLE CITIES

Pierre Laconte

President, Foundation for the Urban Environment (www.ffue.org) – Honorary Secretary General, UITP

1. TRANSPORT AND MOBILITY PLANNING - POST-WAR TRENDS AND CONSEQUENCES FOR CITIES AND URBAN DWELLERS.

TRENDS.

This shift in consumer preferences towards a high space and energy consuming way of life found its origin in the United States. It was largely shaped through the common interests of three industrial sectors: the nascent automobile sector (which was championed by Henry Ford); the oil sector (whose market had practically disappeared following the replacement of petroleum lamps by electric lighting but was revived by the oil consuming automobile); and the various industries associated with highway construction and suburban development.

Together, these sectors became incomparably stronger – in political and economic terms – than the large railway companies, which had been all-powerful in the late 19th century and the beginning of the 20th century. While the railways and tramway companies still had to finance their own infrastructure and its maintenance, from that period, road infrastructure and its maintenance were financed by the public purse, and no longer by tolls or user charges as had been the case throughout history.

Therefore personal investment in cars was encouraged, not only by the lifestyle change resulting from increased household income, but also by strong public policies and market distortions. The effect of those one-sided factors is starkly illustrated by the case of Chicago where the street car (tram) was quickly displaced through the advance of the automobile (figure 1).

CITIES

The success story of the automobile may be seen as the main cause of urban SPRAWL and its consequences for people, their health and their quality of life (poor air quality, decay of urban fabric, distances travelled) and for nature (landscapes, open space, agriculture and bio-diversity). An

extreme example is the seemingly endless suburban expansion in the USA (figure 2). The phenomenon of urban sprawl has been analysed by, among others, the European Environment Agency (EEA, 2006) (figure 3).

For mobility, the use of the car as the dominant mode ("auto-mobility") has triggered dramatic changes in both land use and individuals' behaviour.

In URBAN LAND USE, lower density development and longer distances for urban trips have occurred. The car takes about 18 times more space than a pedestrian, as it moves, but it requires parking every time it does not move, i.e. most of its life cycle (figure 4). The 'land spread' effect is thus enhanced by this difference in scale of automobile use, up to one to ninety, as compared with the pedestrian/tramway city. This meant that short trips to nearby services that were once done by walking or cycling, became longer, even more so because the shortest way for the walker or cyclist is not generally the one used by the driver, as the road network is designed for the automobile. As an example, a one way street system increases by half the average length of trips and the amount of fuel used.

PEOPLE

On to the urban dweller's HEALTH, the main effect has been the decline in walking as a means of transport, as human muscle power gave way to fossil-fed horsepower.

This had effects not only on personal mobility (an increase in vehicle km travelled) but also on environmental health (road accidents, pollution-related respiratory diseases and obesity). These relationships were the subject of a 2007 report by the Institute for European Environmental Policy and Adrian (Davis and others 2007).

The effects of urban environments on health (both physical and mental) were the subject of a 2008 Conference held by the UK-Man and Biosphere Urban Forum at UCL London. Proceedings were published under the title "Statins and Greenspaces" (Dawe, G. 2008). The contribution by William Bird and Huw Davies includes data from the UK National Centre for Chronic Disease Prevention which addresses the cost of additional healthcare due to inactivity, by age group (figures 5 and 6). An overview report was produced by ISOCARP for the World Health Organisation (Laconte, P.,2008).

The data on ROAD ACCIDENTS collected by the former European Council of Ministers of Transport (now the International Transport Forum) reveal that "road crashes account for 180,000 deaths every year in OECD and the ITF countries (…) while worldwide the WHO estimates the annual road deaths toll at 1.2 million people" (ITF 2008).

2. INDICATORS OF SUSTAINABLE MOBILITY – FINDINGS AND COMMENTS.

FINDINGS.

Indicators of mobility and land use were analyzed by the International Association of Public Transport (UITP) in its "Millennium Cities Database for Sustainable Mobility" (UITP, 2001). The data covered, among others, demography, urban economy, urban structure, number of private motor vehicles, taxis, road and public transport network, modal choice, transport costs as percentage of metropolitan GDP, energy consumption, pollution and number of accidents, but not health as such.

The general findings, analysed by J. Vivier, could be summarised as follows:

- Public transport consumes on average four times less energy per passenger-kilometre than the single-occupant automobile. This includes both rail and road transport and is subject to strong variations according the density of land use and the level of operating subsidies.
- The dense cities of Europe, well served by public transport and non motorised transport modes, are spending much less for their mobility than the spread-out cities of America, both in monetary terms and in terms of accidents. Sustainable urban mobility requires an integrated supply of built space, public transport, parking and amenities. The higher the density, the higher the patronage. Notable exceptions exist in America, as illustrated by New York or Portland, Oregon.
- Growth in income does not necessarily imply an urban development model based on the automobile and urban sprawl. There is a clear relationship between public transport use and the supply of parking.
- Sustainable mobility calls for an integrated transport policy combining urban planning, parking controls and a significant role for public transport, so that this once again becomes the mode of choice for all, and not just of the elderly and the poor. In the tramway age, public transport was part of the mainstream urban economy, and not a social service. Public transport being part of the mainstream economy is not at all incompatible with subsidies to some groups of users. An early example was the workers' commuter train pass system introduced in Belgium in 1869. This system allowed workers to continue living in their rural environment instead of concentrating in suburban slums, as in France.

MODAL COMMENTS.

RAIL Public transport is usually recognised as the best way to ensure citizens' mobility in large conurbations. The emergence of an efficient guided mode of transport serving a specific route usually entails a reallocation of trips to make use of this new mode where it is available. A case in point is the tram network of Nantes. The central city tram network has been planned for use as the only motorised mode for a trip, complemented by walking or cycling rather than by feeder buses or park and ride (figure 7). Bordeaux has a comparable philosophy (figure 8).

BUS Rapid Transit (BRT) networks, with full right of way and off-vehicle ticketing are a valid and affordable alternative to rail services. They are, however, more space-consuming than rail, unless the bus is guided, for example through an optical guidance system (Rouen). The pioneering BRT city was Curitiba, starting in 1976 and still expanding (Linha Verde). Its concept was successfully adopted by Bogota (Figure 9). BRT has now been implemented all over world, in China (Kunming), India (Delhi), Australia (Brisbane) and Turkey (Istanbul).

Automated people movers (APM) have proven a mode well adapted to short distances (Trans.21 2010), and are sometimes cable-driven (Mexico Airport). An very original light APM is the Brazilian Aeromovel. This compressed air propulsion system, was invented in Brazil by Oskar Coester and is due to open for regular traffic in 2014. The vehicle is driven by a pneumatic system which converts electrical power into compressed air and transmits thrust directly to the vehicle without gears or intervening electric circuits. Stationary electrical blowers, located close to the passenger stations produce the pressurized air needed to propel the vehicles (figure 10).

3. POLICIES AND MEASURES FOR SUSTAINABLE MOBILITY – SOME URBAN BEST PRACTICES.

Achieving an integrated urban planning and mobility concept could include some of the following policies and measures:

- Encouraging LIFE STYLES favouring non motorised transport clusters throughout the urban region, and reducing subsidies for fossil fuel.

COPENHAGEN is a notable example through its high-density, low-rise urban planning, its pedestrian streets (introduced from 1962), its bicycle network (36% of commuters using bikes), and its expanding driverless metro network. The Copenhagen metro lines reinforce the "finger-plan" (Figure 11), while the commuter rail line linking Copenhagen, Kastrup airport and Malmö has created an integrated trans-border urban agglomeration (figure 12). With changing urban life styles, more account is being taken of water in and around the city, not only as resource and tool for urban climate change adaptation but also as means of mobility tool. Copenhagen is a pioneer in this respect, providing a year-round scheduled boat system, accessible with the same tickets as the metro and buses. A multidisciplinary approach to water in the city would lead towards water-centric communities (Novotny, V., Ahern, J., Brown, P. (2010).

- DECOUPLING income progression from increase in energy use.

The most obvious case of decoupling is affluent SINGAPORE, through - among others - its pioneering car ownership restraint (with a monthly auction of new license plates), its congestion pricing, its network of driverless subway trains linked with pedestrian malls, and its convenient intermodal and multi-use Easylink card (Mah, B.T., 2009). Singapore is considered a good example of integrated sustainable transport (figures 13-15). Protection of pedestrians walking in the streets in equatorial conditions could still be improved by trees providing shade and canopies. In the case of multi-use cards, London's Oyster Card and Hong-Kong's Octopus are also regarded as best practices.

Among smaller cities, FREIBURG (Germany) is a notable example, thanks to its urban development clusters and its synergy between low energy buildings and low energy mobility. The university city of Heidelberg is also highly ranked. Even in lower density areas, such as rural cantons of Switzerland, public transport has a chance, if it is reliable (Mees 2009).

The university town of LOUVAIN-la-NEUVE (New Louvain), 27 km south of central Brussels is an early example of public transport oriented development (TOD) (Laconte 2009). Begun in 1969, it has become a regional growth magnet. This high-density low-rise development, modeled on the historic university town of Leuven, is centered on a new railway station and is entirely pedestrian, parking space being provided outside or underground. The new town also displays many energy saving features (figures 16-18).

- Contributing to integrated mobility through effective tram/bus rights-of-ways and innovative use of rented bicycles for short trips.

PARIS is a case in point. The extensive use of bus rights of way (more recently also for trams), protected from trespassing automobiles by "banquettes" and information at stops about waiting times has triggered a strong revival of surface transport. The Paris bicycle rental "Velib" scheme, which provides close to 20.000 bikes dispersed around the city, is reported as having substantially modified life-styles in favor of non-motorized transport, as well as having been politically rewarding. Some 30 million rentals were recorded in the first full year of operation (2008), together with a 94% rate of user satisfaction. The scheme was pioneered in Lyons and is now replicated all over Europe,

lately in London (see also figure 7). The private investors and operators of the Paris scheme were among the Time magazine's "Heroes of the Environment". Extension of the system to the periphery and a network of bicycle lanes remain to be implemented (Guet, J.F., 2009).

For very large world conurbations, the traditional underground rail system remains unequalled for capacity and speed. The state of the art system remains that in Singapore, with its high-capacity driverless trains (see figure 15).

- Assessing the health effects of the switch from motorized transport to non-motorized bicycle transport.

There may be a case for stronger collaboration between mobility and health services.
As an example, the findings of Professor Richard Davison, of Napier University in Edinburgh (and Chair of the British Association of Sport and Exercise Sciences), quantify the benefits of cycling according to gradient levels. They confirm that hilly cities are not necessarily deterring cyclists: this is also shown by the Paris Velib's success, notwithstanding the hills.

- Implementing synergy between the supply of regional public transport and restraint on the use of the car in the city.

A case in point is the city of Zurich and its region. Trams and buses enjoy absolute on-street priority. Traffic calming is ensured by shortening the traffic lights cycle. On-street parking without a time limit is reserved for Zurich-registered residents with a sticker, while car commuters entering the city from other municipalities are subject to a limitation on their parking time. Conversely rail commuters have benefited from an increased service supply and easier rail travel. These parking measures have brought a return of inhabitants to the city (to be able to park) and have been politically rewarding to the city fathers, while suburban rail travel was easier for commuters. It also suggests that oblique approaches can be the most successful, especially in a difficult political context (figures 19 -21).

- Governance and continuity

Implementation of any policies and measures in favour of sustainable cities requires not only a tool kit but also appropriate governance and timing (Rydin 2010). An outstanding example of governance and continuity is provided by the city of Bilbao, which has been led by the same team since 1989 (Vegara 2005). Bilbao was the winner of the Singapore World-Cities Award 2010.

CONCLUSION.

Achieving integrated sustainable urban mobility could include some of the following energy components:

- Decoupling income progression from increased energy use by citizens of a city and its region.
- Encouraging life styles favouring non motorised transport clusters all over the urban region, reducing subsidies for fossil fuel and increasing the population density.
- Optimising the energy use of each transport mode and integrating them. That means ensuring effective rail networks, networks of tram/bus rights-of-ways, convenient intermodal hubs, easy use of bicycles and availability of rented bicycles and taxis.
- Assessing the health effects of a switch from motorised transport to non-motorised transport (walking and cycling).

- Implementing synergy between the supply of public transport and restraint on the use of the car in the city.

Let us end by referring to the Austrian painter Hundertwasser who summarized the contribution of mobility to the liveable city through three posters illustrating the notions of transport networks irrigating the city, the compact city as a prerequisite for sustainable mobility, and citizen enjoyment as key to liveability (figures 22-24).

REFERENCES.

Davis, A., (2007) "Unfit for Purpose: How Car Use Fuels Climate Change and Obesity". Report by the Institute for European Environmental Policy, Adrian Davis et al., London: IEEP 2007.

Dawe, G., Millward, A., eds (2008) "Statins and Greenspaces", proceedings of conference held by the UK-Man and Biosphere Urban Forum at UCL, London: UCL 2008.

EEA, 2006 European Environment Agency report "Urban Sprawl in Europe", Copenhagen: EEA 2006 (www.eea.europa.eu)

Gauchet, M. (1985) « Le désenchantement du monde », Paris: Gallimard 1985

Guet, J.F. (2009), « Mobility and the compact city: The bike is back", ISOCARP Review 04, 2009.

ITF (2008) "Eliminating Deaths and Serious Injuries in Road Transport" Paris: press release 3 October 2008.

Laconte, P. (2007) "Policy advice on urban planning, environment and health", Paper presented at the World Health Organisation Expert Meeting, Bonn, Germany, of 24-25 November 2008.

Laconte, P., (2009), "La recherche de la qualité environnementale et urbaine: Le cas de Louvain-la-Neuve (Belgique), Lyons : Editions du Certu 2009.

Mah, B.T. (2009) "Building Sustainable Cities: The Singapore Experience" keynote address delivered by Minister Mah Bow Tan at the 45th ISOCARP Congress 2009.

Mees, P. (2009) Transport for Suburbia: Beyond the Automobile Age, Earthscan 2009.

Novotny, V., Ahern, J., Brown, P. (2010) "Water Centric Sustainable Communities: planning, retrofitting, and building the next urban environment", New York: Wiley 2010.

Rydin, Y (2010) "*Governing for Sustainable Urban Development", London:* Earthscan / James & James 2010

Trans.21 2010, "Building a Sustainable Tomorrow with Smart Urban Mobility", Trans.21 2010.

UITP (2001) International Association of Public Transport "Millennium Cities Database for Sustainable Mobility", Brussels: UITP 2001.

Vegara, A. (2005) General Assembly Address at the 41st ISOCARP Congress, Bilbao: The Hague: ISOCARP 2005.

ACKNOWLEDGEMENTS

The author acknowledges the kind help and comments of John Cartledge, and Peter Hall, in finalising the manuscript.

LIST OF ILLUSTRATIONS.

1. Street view in Chicago

2. Urban sprawl in Arizona

3. Area x time land consumption

4. EEA publication on urban sprawl in Europe

5. Health effects of obesity

6. .Effects of inactivity

7. Nantes

8. Bordeaux

9-11. Copenhagen

12. Aeromovel

13-15. Singapore

16-18. Louvain-la-Neuve

19-21. Zurich

22-24. Hundertwasser

Figure 1.

Cars vs trams.

View of Chicago in the 30's, showing the street full of cars while the streetcars (trams) could no longer move, as they had no right of way even though they paid entirely for their infrastructure and its maintenance. Streetcar companies went bankrupt one after the other and public transport gradually left the realm of urban business services to enter the realm of public social services.

Figure 2.

US urban sprawl.

Urban sprawl is well illustrated by this aerial view of a suburb near Phoenix, Arizona. Homes are exclusively reached by road.

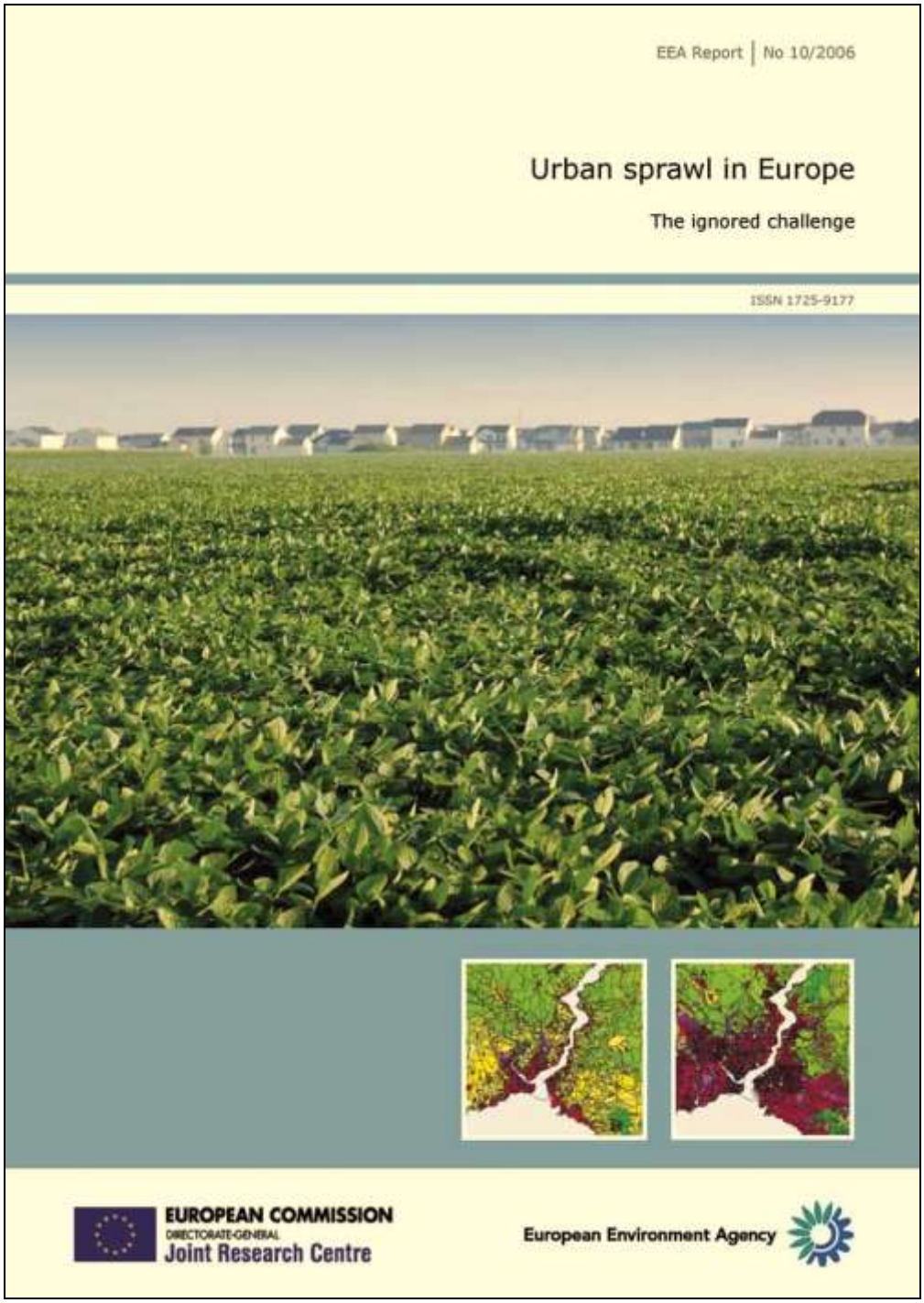


Figure 3.

Urban sprawl.

Urban sprawl was analysed, among others, by the European Environment Agency in its 2006 Report "Urban Sprawl in Europe"

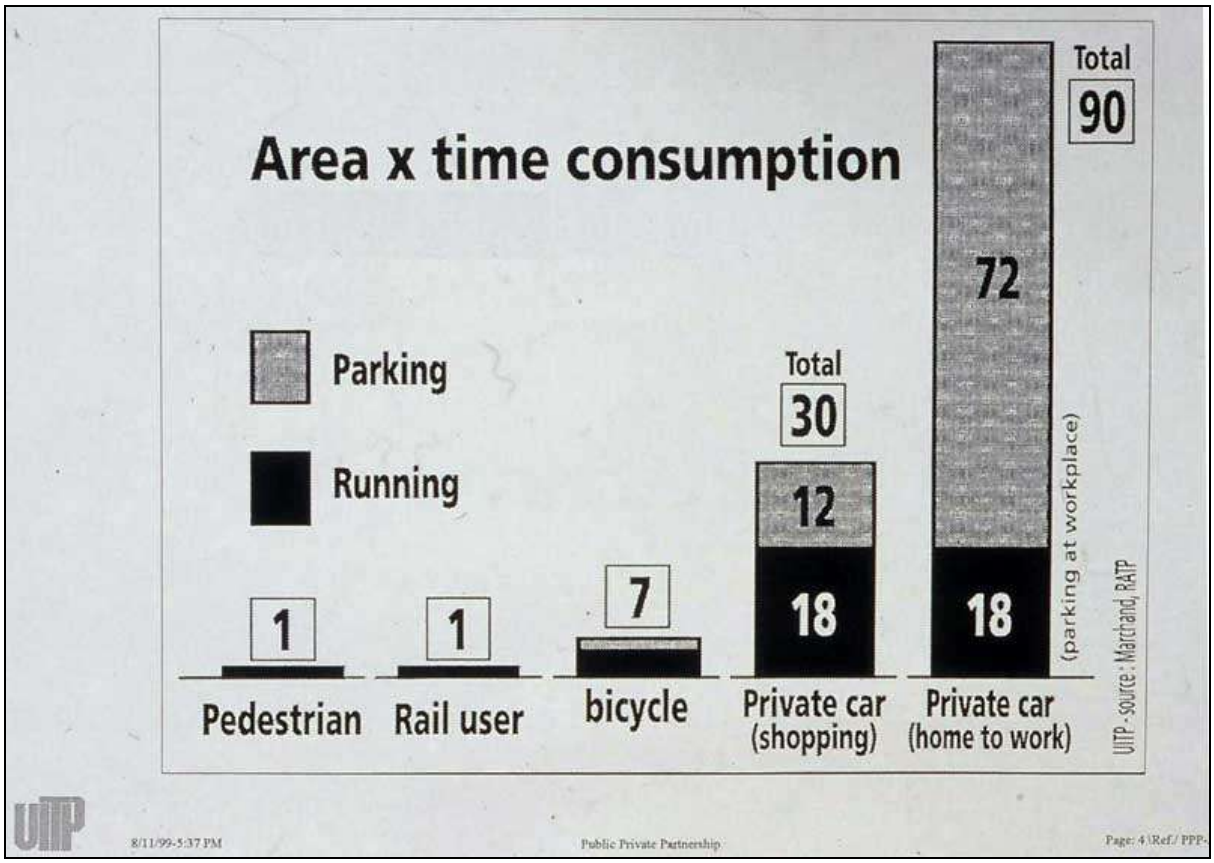
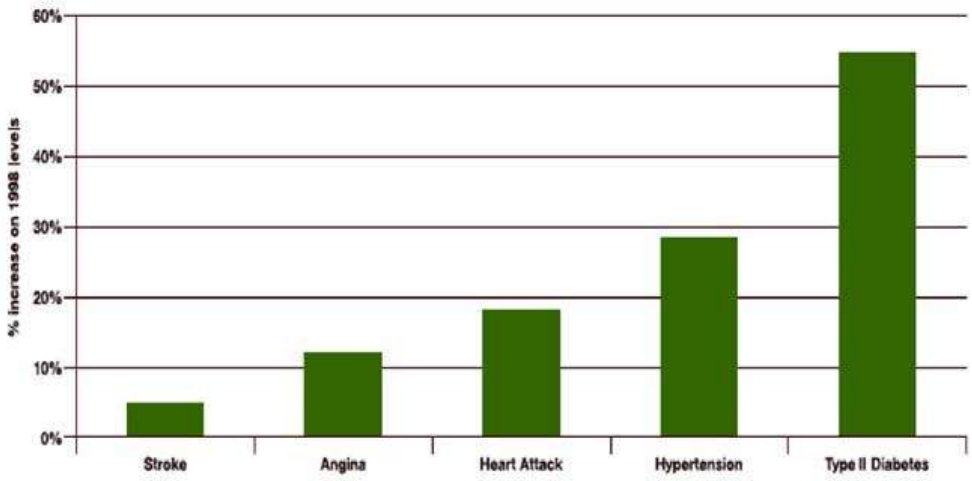


Figure 4

Space consumption.

If one takes the land consumption by a pedestrian as the benchmark, the car takes up about 18 times more space than a pedestrian, 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).

Figure 3: A dramatic rise in diseases linked to obesity is expected by 2023



Source: taken from Department of Health, 2004a

Figure 5.

Transport, physical activity and obesity.

According to the UK Department of Health, the rampant increase in obesity will result in a strong increase in related diseases (Source: 2008 Conference held by the UK-Man and Biosphere Urban Forum at UCL London. Proceedings were published under the title "Statins and Greenspaces" (Gerald Dawe and Alison Millward, eds.). See list of references.

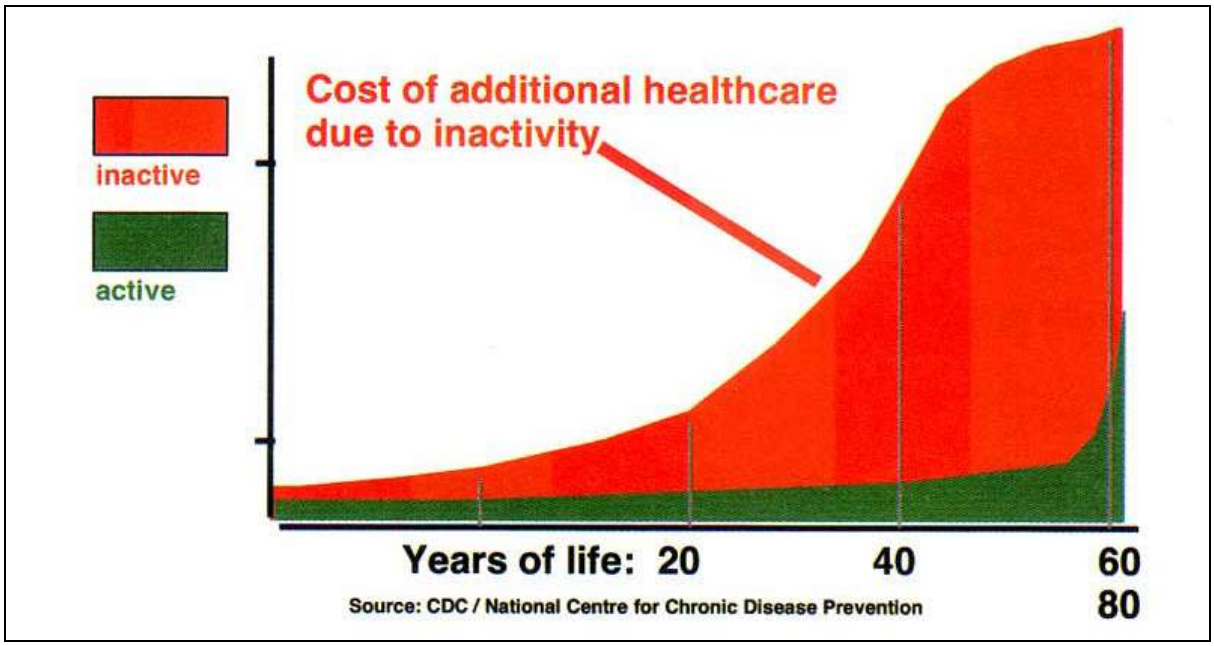


Figure 6.

Transport, physical activity and health.

This graph shows the cost of additional health care entailed by inactivity as estimated by the UK National Centre for Chronic Disease Prevention (Dawe, G., 2007). See list of references.

Figure 7. Nantes.

Nantes has been a pioneer of the tramways revival since 1982, complemented today by a bicycle rental scheme. Tramways are not only a tool for sustainable mobility. They are an opportunity for enhancing the street network and creating pedestrian-friendly environments. As initiated in Karlsruhe, Germany in 1992, some tram networks are using existing railway tracks, and complementing them with new tramway routes, thus allowing seamless travel (source: City of Nantes).

Figure 8.

Bordeaux.

Bordeaux opted for a light rail network instead of a metro line and connecting buses. A notable feature is the absence of catenaries (overhead and supporting poles) in the historic part of the city, for aesthetic reasons (source: City of Bordeaux).

Figure 9

Bogota.

The Bogota TransMilenio is derived from the pioneering Curitiba Bus Rapid Transit (BRT) network that started in 1976 which has proven its mass transport capacity while providing for enhanced safety and security through its staffed stations. BRT achieves very high commercial speeds, as it is given a total right-of-way and all ticketing takes place at stations. Note the opportunity for express buses to pass all-stops buses. Photo: Transmilenio.

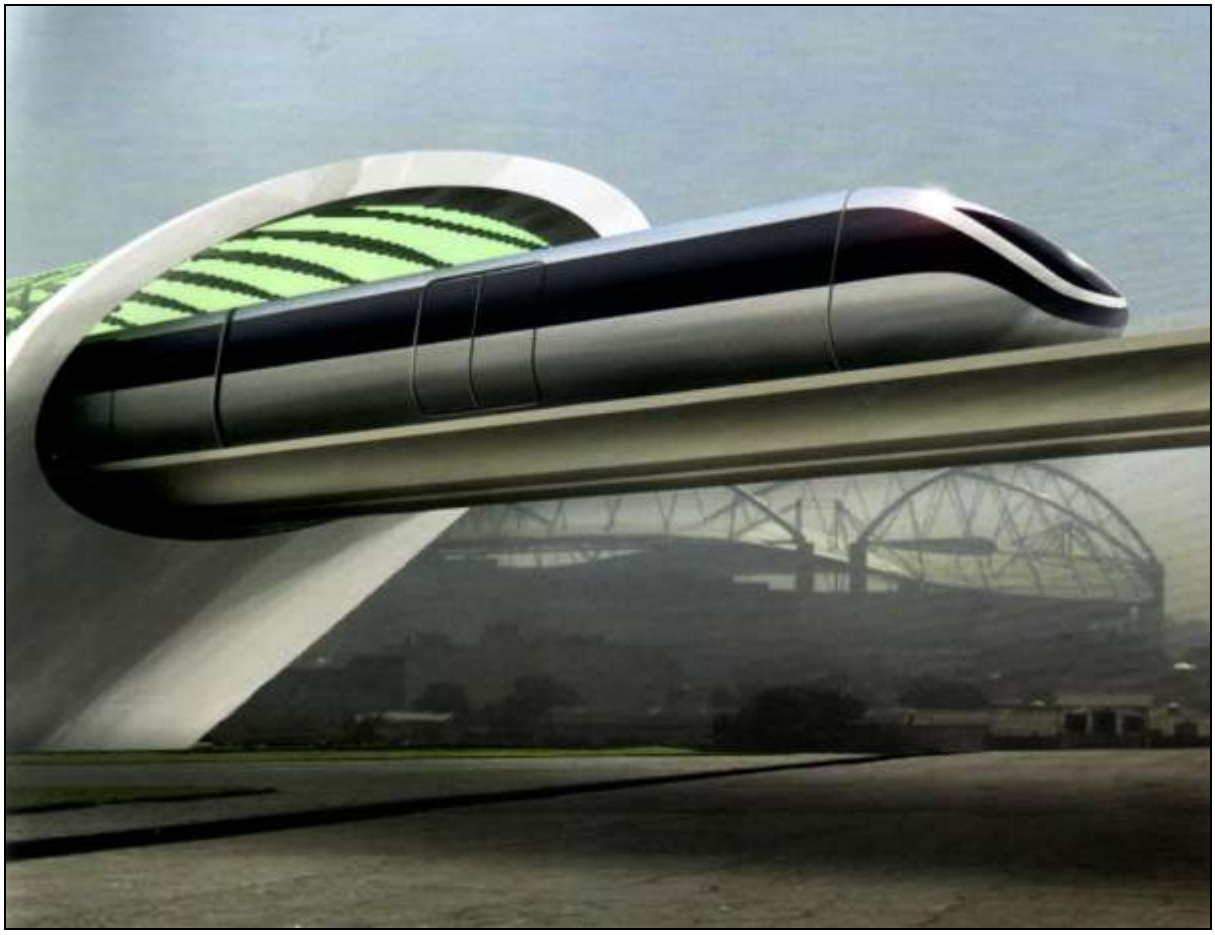


Figure 10

Porto Alegre (Brazil): Aeromovel.

Automated people movers (APM) have developed worldwide for short distance mass transit. For the occasion of the World Cup 2014, Porto Alegre (Brazil) intends to introduce the Coester Aeromovel, a pioneering, low-energy compressed air automated people mover. This system was first developed in Porto Alegre (inspired by a 19th century project by the British engineer Isambard Brunel), but until now only a short line operates in Jakarta, Indonesia (photo: Design e Arquitetura: Ado Azevedo). Another pioneering project under implementation is the London Heathrow ASTRA Personal Rapid Transit system linking car parks to the Airport's Terminal 5.

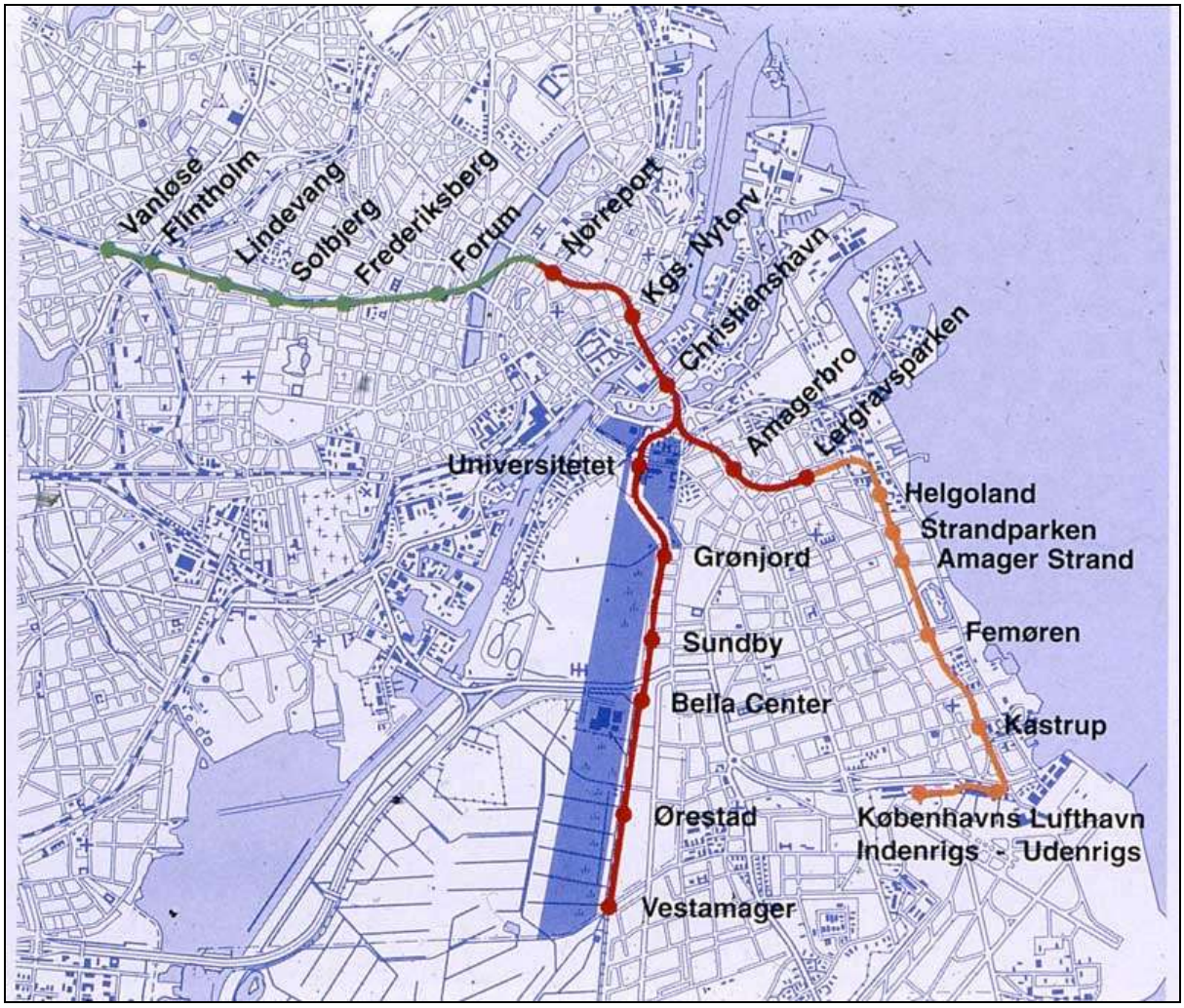


Figure 11

Copenhagen:

Copenhagen's high-density low-rise urban planning, its pedestrianised streets (introduced from 1962), its bicycle network (36% of commuters use bicycles, notwithstanding the Scandinavian climate), and its expanding driverless urban metro network have enhanced liveability. The Copenhagen metro lines also reinforce the "finger-plan", which concentrates development along radial public transport corridors. (source: City of Copenhagen)

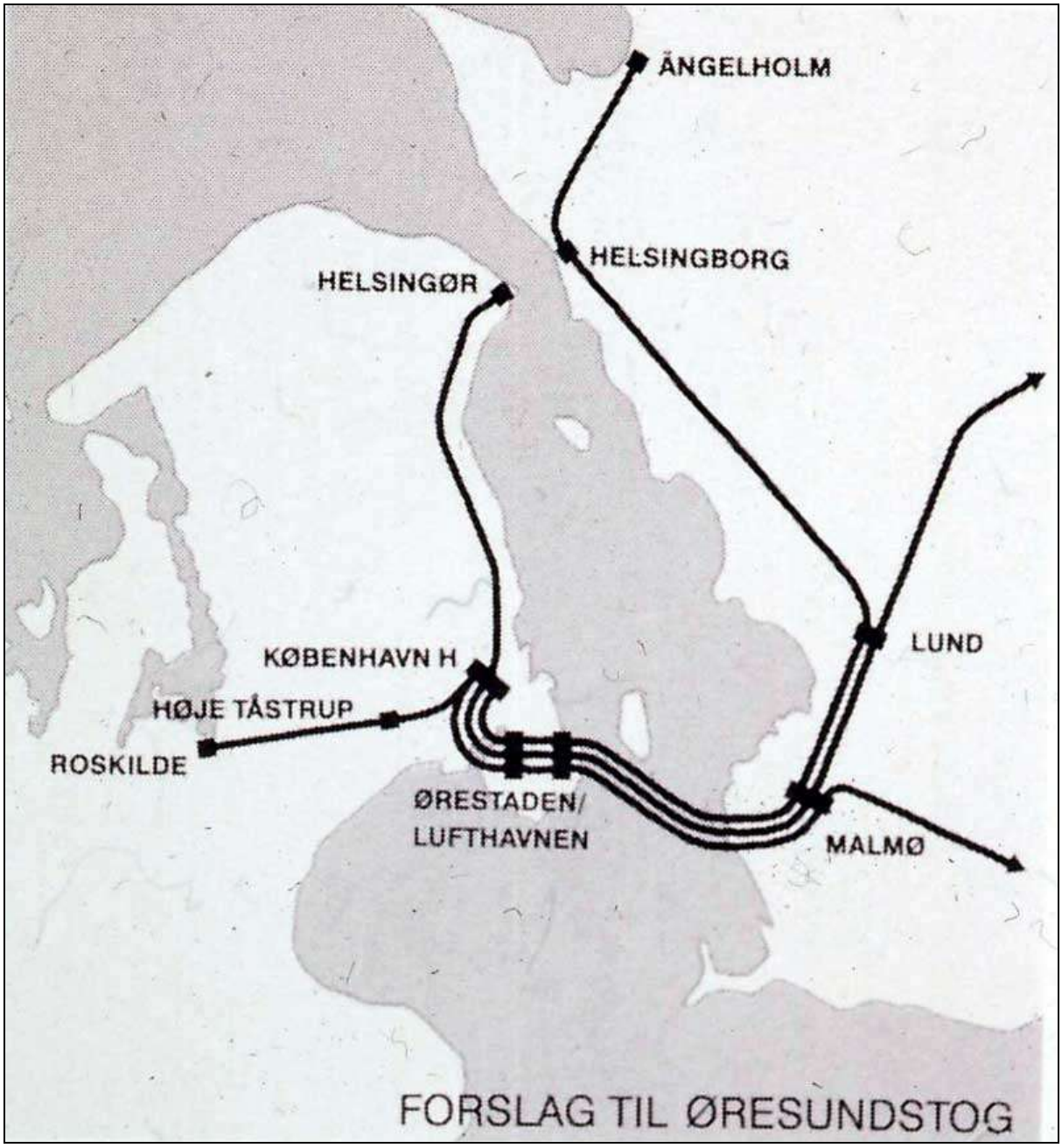


Figure 12

Copenhagen.

In addition to the intra urban metro, the commuter line linking Copenhagen, Kastrup airport and Malmo has created an integrated, trans-border urban agglomeration (source: City of Copenhagen).

Figure 13:

Singapore. Area Licensing Scheme 1975-2000.

Through its pioneering restraint of car ownership (a monthly auction of new licensing plates, with a maximum yearly increase in car ownership of 2.5 %), its congestion pricing, its network of driverless subway trains linked with pedestrian malls and its highly convenient intermodal multi-use Easylink card, Singapore is considered an example of best practice in sustainable transport. Its “area licensing scheme” was launched in 1975, requiring drivers entering the city to pay a fee or accept three passengers. It confirms that oblique approaches are politically the most successful, especially in a difficult context (nobody could protest against such a scheme). Photo: P. Laconte

Figure 14

Singapore:

In 2000 in Singapore the fee to enter the city was replaced by Electronic Road Pricing. The new system was applied to all drivers but the fee level varied according to the level of traffic congestion (the fee increases at peak times as a way to reduce congestion). This was also a signal to the user that the fee was in effect a congestion charge, not an additional tax on automobile use. Photo: P. Laconte.

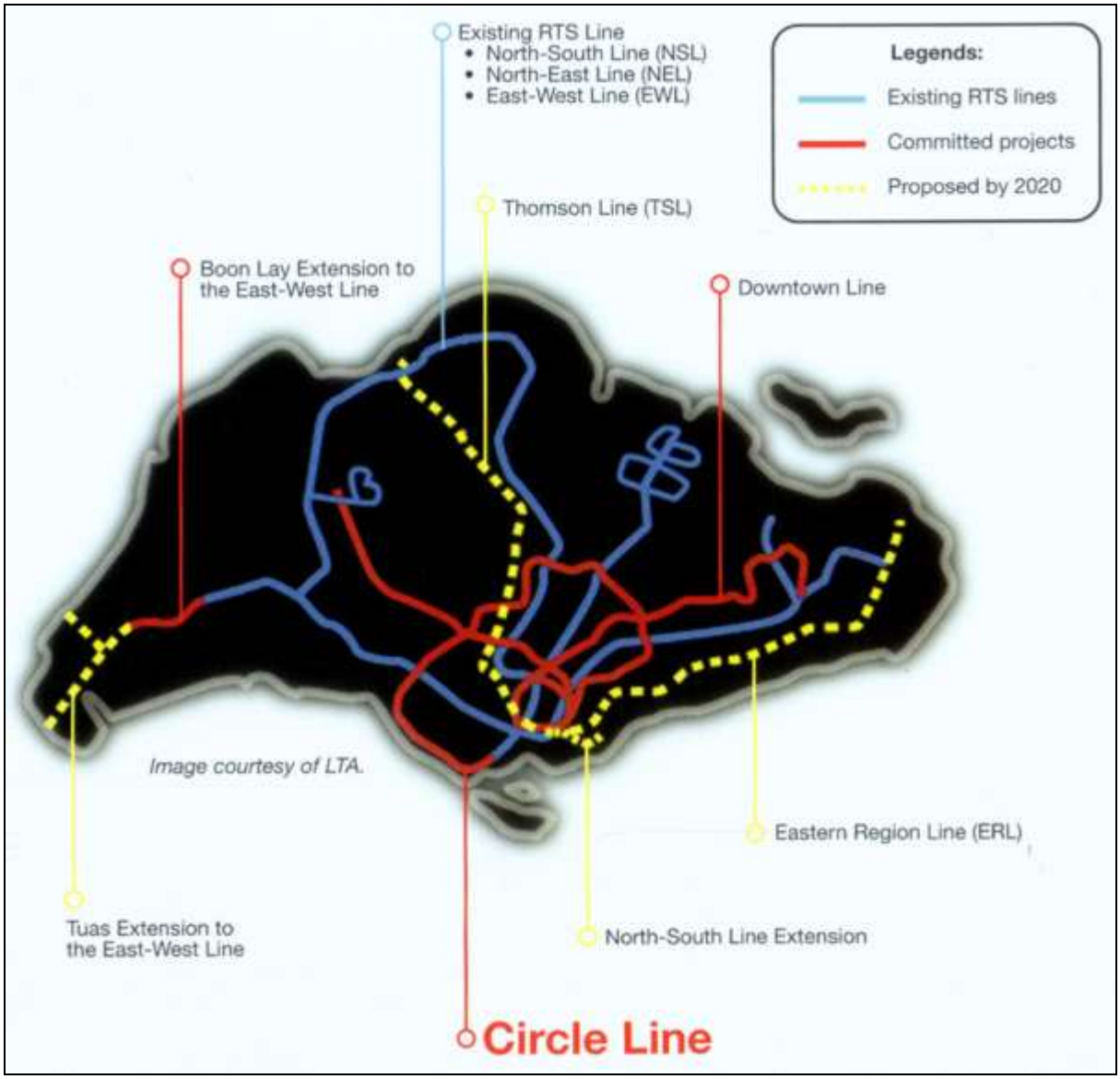


Figure 15

Singapore:

Singapore has been the pioneer of driverless high-capacity metro networks (starting with the North-East Line in 2003). Absence of drivers means shorter intervals between trains, higher capacity and higher safety levels. Most of the staff interface with passengers, rather than just sitting in a cabin. This network has set the standard for future metros around the world. Nuremberg, Brussels and other cities are retrofitting existing lines to make them driverless and increase their capacity (Source: Land Transport Authority, Singapore).

Figure 16

The university town of Louvain-la-Neuve (New Louvain), is a prime example of a sustainable, liveable development. It is centered on a new railway station and is entirely pedestrian, parking space being provided outside the town or underground. It has many ecological features and has a current population of 40.000. Photo: Wilhelm and Co.

All storm water is led to a reservoir landscaped as an artificial lake, with a stable water level

Figure 17

Louvain-la-Neuve:

View of the entrance to the railway station which is below this pedestrian street combining university buildings, shopping and residences. Photo: P. Laconte

Figure 18

Louvain-la-Neuve:

View of one the numerous small piazzas on the pedestrian streets network. Cars are parked underneath. Photo: P. Laconte

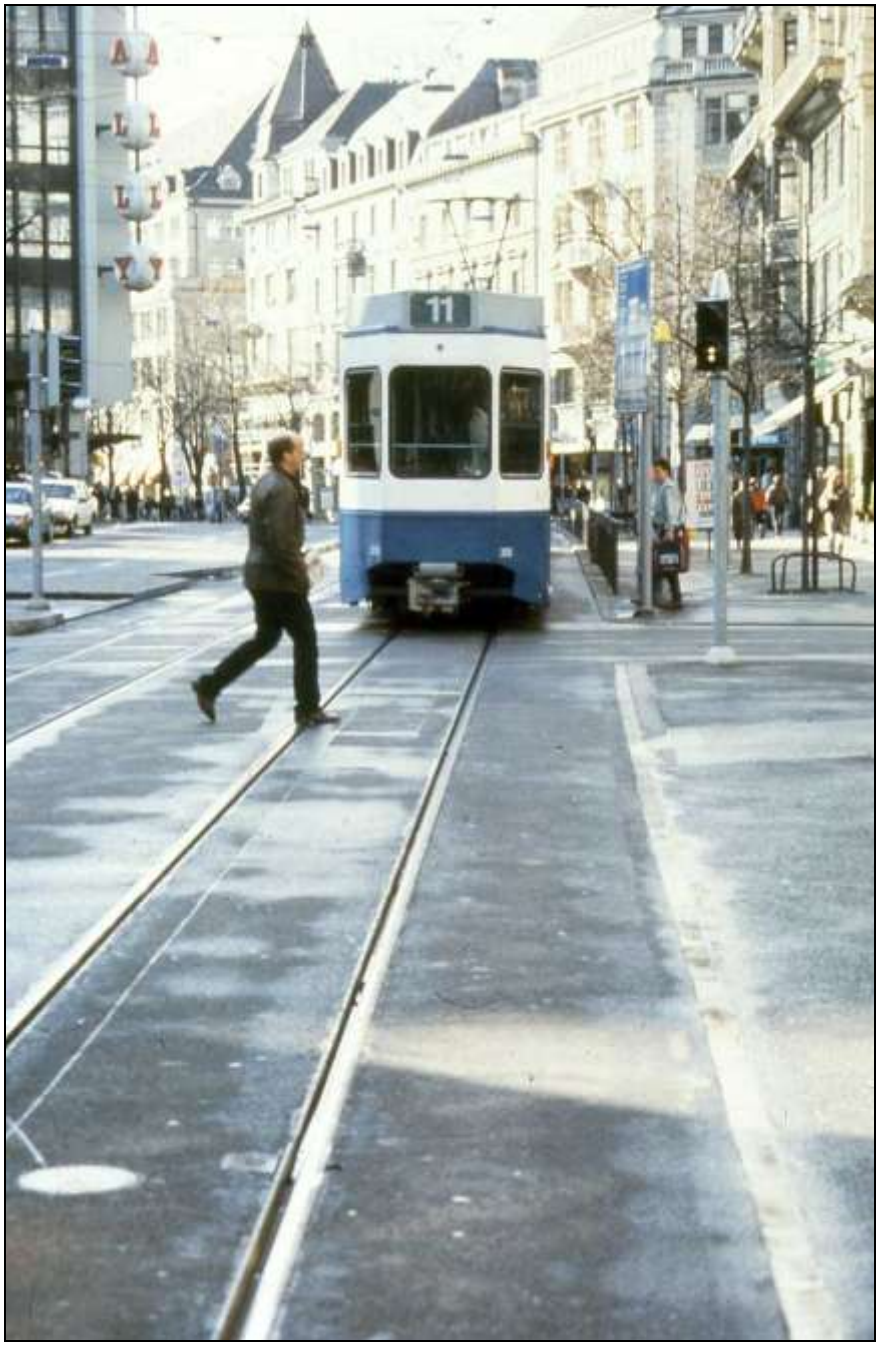


Figure 19

Excellence in public transport – the city of Zurich, Switzerland

In Zurich, trams and buses enjoy absolute priority on street. When approaching a traffic light the sensor shown on the lower left ensures they have a green light at any time of the day. The city's modal split is around 80% in favour of public transport. Photo: City of Zurich Police Department.

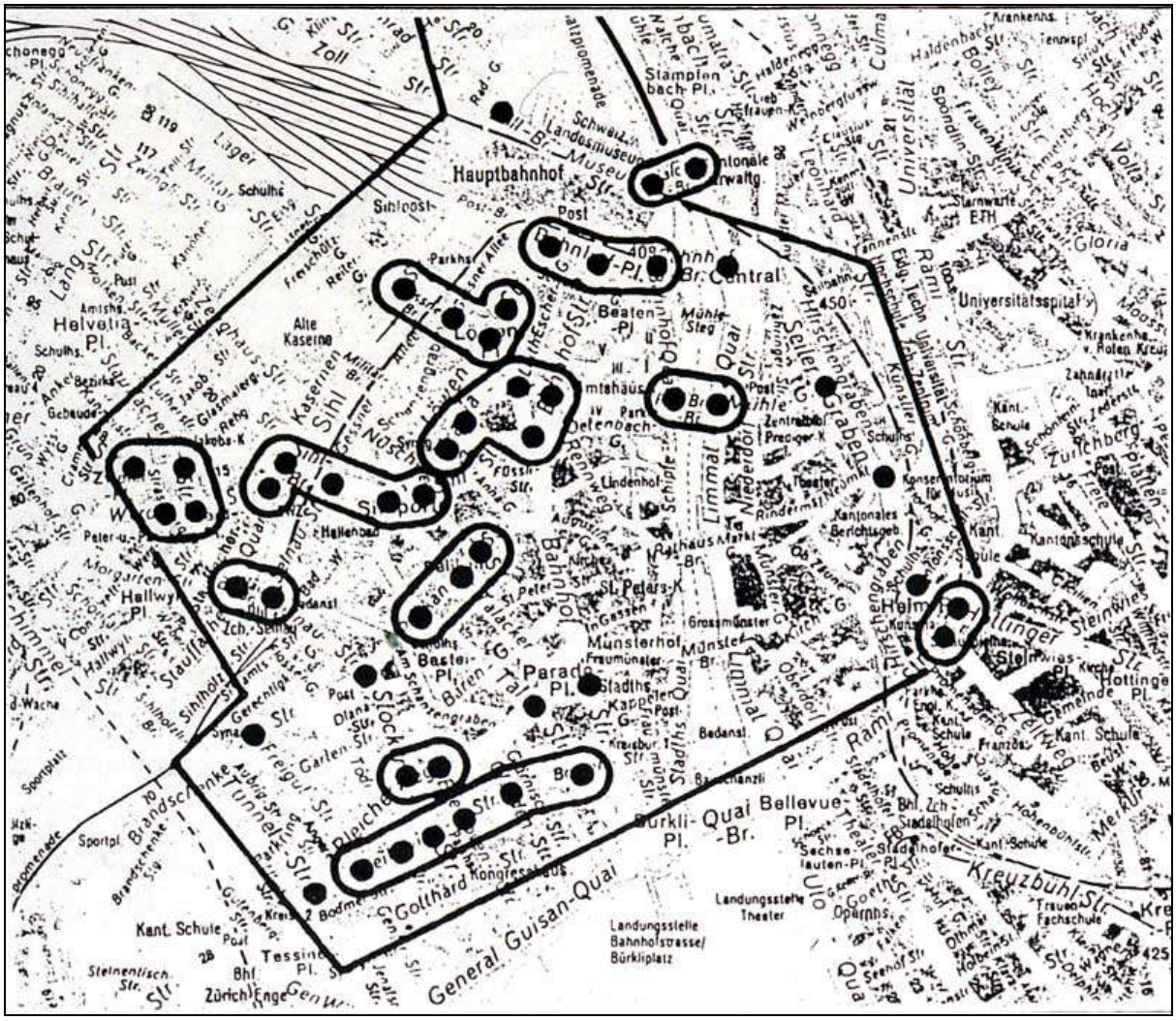


Figure 20

Zurich's - automobile traffic calming through traffic light cycle control:

Traffic-calming is ensured by adapting the traffic lights system (a much shorter cycle favour pedestrians, cyclists and public transport). Source: City of Zurich Police Department.

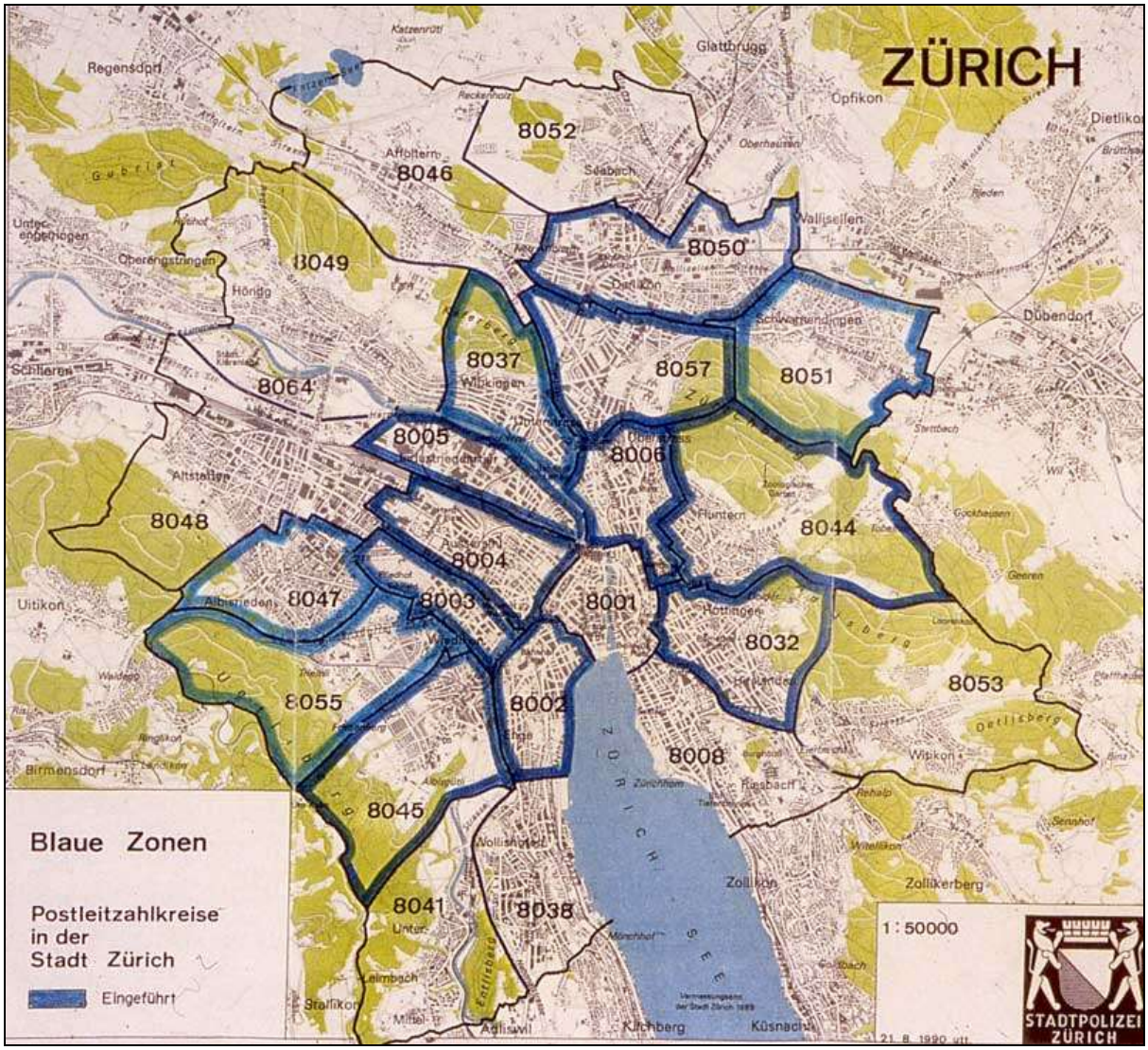


Figure 21

Zurich parking management: Unrestricted on-street parking is exclusively reserved for Zurich-registered residents, while car commuters entering the city from other municipalities are subject to limits on their parking time. Conversely, rail commuters have benefited from an increased service. The parking measure has brought a return of inhabitants to the city (who are able to park), and has been politically rewarding for the city fathers, while suburban rail travel has been made easier. Source: City of Zurich Police Department.

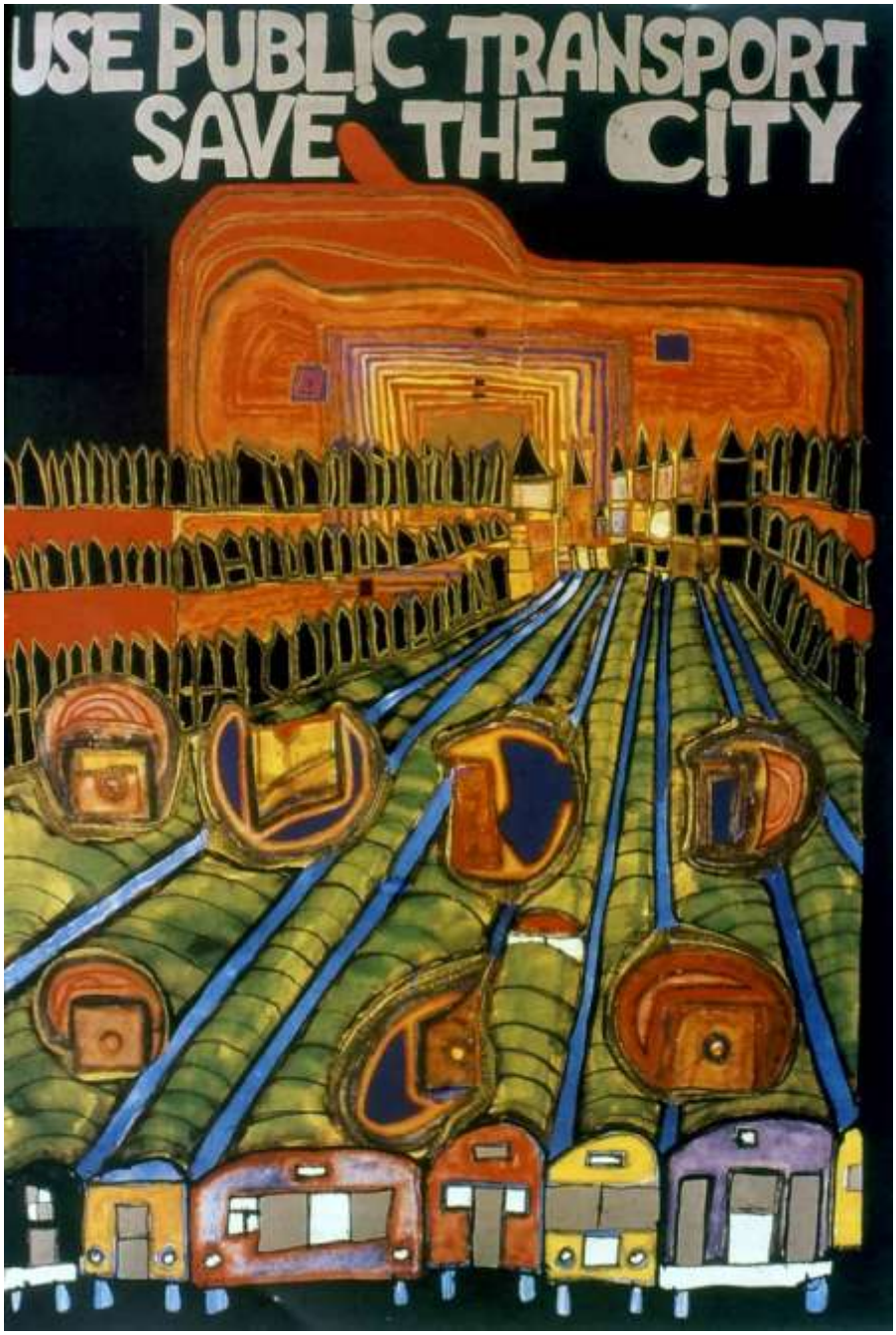


Figure 22:

Mobility and Liveable Cities – the transport network irrigating the city. Poster by Friedensreich Hundertwasser (1928-2000) for UITP (1991)

Figure 23:

Mobility and Liveable Cities - the compact city – poster by Friedensreich Hundertwasser for UITP (1993)

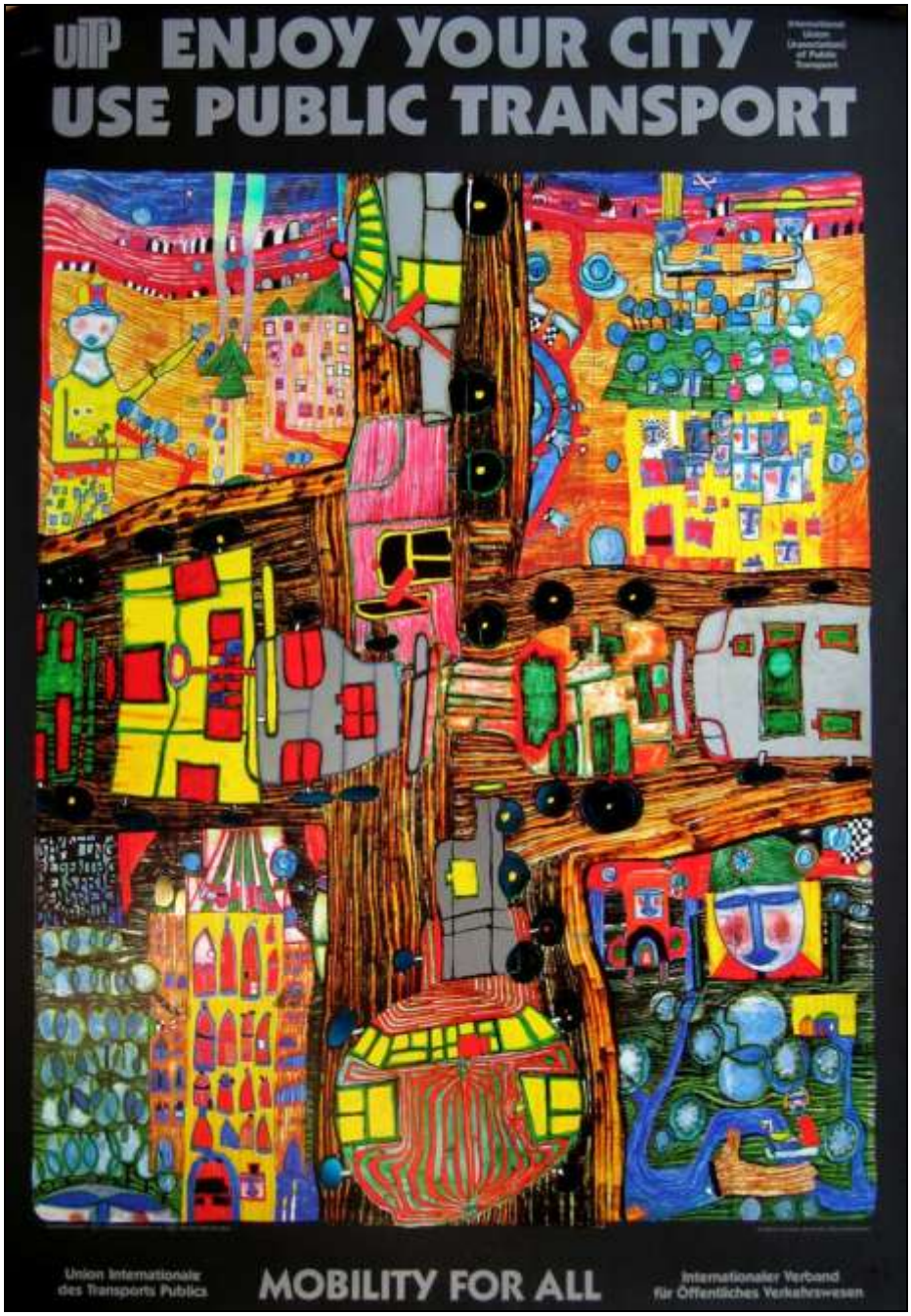


Figure 24:

Mobility and Liveable Cities - enjoyment as a key to liveability – poster by Friedensreich Hundertwasser for UITP (1995)