Paper 2 Week 1

URBAN FORM & TRANSPORT CONTEXT

In 2008, the world reached a particularly momentous milestone:

> For the first time in history, more than half its human population, 3.3 billion people, are living in urban areas. By 2030, this is expected to swell to almost 5 billion. Many of the new urbanites will be poor. Their future, the future of cities in developing countries, the future of humanity itself, all depend very much on decisions made now in preparation for this growth.
>
> (United Nations Population Fund, 2007, p. 1)
> (http://www.unfpa.org/swp/2007/english/introduction.html, Jan 2008).

This quote is taken from the opening words of the 2007 State of the World's population. By 2030, the United Nations forecasts are for the towns and cities of the developing world to make up 81 per cent of urban humanity, with much of the growth taking place in Asia and Africa. This population will live in a mixture of urban areas - from small towns to huge megacities.

Various United Nations reports emphasise that the world's economic system is increasingly an urban one, providing the backbone for national development. The 1992 United Nation's Agenda 21 identifies that rapidly growing cities, unless well-managed, face major environmental problems. The United Nations 1994 International Conference on Population and Development (ICPD) Cairo, Programme of Action (http://www.unfpa.org/icpd/icpd_poa.htm#ch9b, Jan 2008) stated that

> In 1992 there were 13 cities with at least 10 million inhabitants and their number is expected to double by 2010, when most mega-cities will be located in the developing countries. Continued concentration of population in primate cities, and in mega-cities in particular, poses specific economic, social and environmental challenges for Governments
>
> (clause 9.1.2)

In full awareness of the positive contribution that large cities make to national economic and social development, the Programme points out that large agglomerations also represent the most dynamic centres of economic and cultural activity in many countries and therefore it is essential that the specific problems of large cities be analysed and addressed. Paradoxically, cities also hold our best chance for a sustainable future. (http://www.unfpa.org/swp/2007/english/chapter_5/ broader_view.html, Jan 2008).

Government Response to the Challenge of Sustainability in Cities

On the European scene, the European Commission in the 1998 Urban Forum in Vienna, adopted "Sustainable Urban Development in the European Union: A Framework for Action" (http://ec.europa.eu/environment/urban/pdf/framework_en.pdf, Jan 2008) which set out objectives for urban areas in Europe, and a range of actions to address these, including:

- An overall policy aimed at reducing the ecological footprint of urban activities.
- Promotion of resource-efficient settlement patterns that minimize land take and urban sprawl.
- Protection and improvement of the built environment and cultural heritage and promotion of biodiversity and green space within urban areas.
- A policy line on the re-use of urban land.

In 1999, the Directorate General for the Environment reconvened an Expert Group on the Urban Environment to consider steps the Commission should take as a result of "Framework for Action" conclusions.

A working group on sustainable land use was set up in 2000 to review the state of policy and practice on key land use issues (reuse of urban brownfield sites, better use of urban infrastructure discouragement of Greenfield developments and remediation of urban sprawl), review or identify European Union instruments having impact on these issues and to recommend to the European Commission adjustments to policy instruments and other actions. This work was based on the "European Sustainable Cities Project (1994, 1996)" ecological, socio-economic and organisational principles. It is notable that this includes equity and efficiency in use of resources.

Adequate and efficient infrastructure is considered crucial for the economic, social and environmental sustainability of urban areas, underpinning economic competiveness and opportunities for households and enterprises to achieve more socially and environmentally desirable ways of living and working. Practical application of these principles and further development of sustainability approaches, have been carried out through the "European Sustainable Cities and Towns Campaign" (http://www.aalborgplus10.dk/, Jan 2008).

The European Sustainable Cities Project (Expert Group on the Urban Environment, 1996) produced a report which provides a framework for local action and sets out principles to use in setting goals, evaluating and monitoring progress towards sustainability in urban areas. (http://ec.europa.eu/environment/urban/pdf/rport-en.pdf, Jan 2008).

The United Nations Habitat Agenda and Agenda 21 are referenced by the Working Group in identifying the need for better management of land resources in achieving sustainability. The Report views the sustainability agenda as placing new emphasis on the interrelationships between the physical environment, human and economic systems. Environment, which was seen as an asset or amenity, is seen as a functioning system where there is a capacity beyond which the environment cannot sustain the activity levels (Section 7, p. 212). Some of the key insights into sustainable cities as seen in this report are listed below:

> Sustainable management of natural resources requires an integrated approach to closing the cycles of natural resources, energy and waste within cities. The objectives of such an approach should include minimising consumption of natural resources, especially non-renewable and slowly renewable ones; minimising production of waste by reusing and recycling wherever possible; minimising pollution of air, soil and waters; and increasing the proportion of natural areas and biodiversity in cities. (p. 10)

> Sustainability is strongly linked to socio-economic aspects of cities. There is a need to create the conditions in which businesses can profit by operating in more environmentally-sound ways. (p. 10)

> Authorities should strengthen the well-being of the population and promote equality and social integration by ensuring that basic services and amenities, education and training, health care, housing and employment are available to all. Resisting recent trends of ignoring environmental and social risks while

> concentrating on accumulating material wealth requires changes to the underlying values in society, as well as to the basics of economic systems. (p. 10)
>
> Achieving sustainable urban accessibility is a vital step in the overall improvement of the urban environment and maintenance of the economic viability of cities. Meeting environmental and transport objectives requires integrated approaches combining transport, environmental and spatial planning. (p. 10)
>
> Achieving sustainable urban accessibility requires the development of sustainability goals and indicators, target setting and monitoring, along with policies aimed at improving accessibility and not simply movement. Reconciliation of accessibility, economic development and environmental objectives should be the primary objective of a city's transport policy. An integrated multi-modal urban transport system is required, where complementarity rather than competition between modes is promoted. (p. 272)
>
> Spatial planning systems are essential for the implementation of city-wide policies for sustainable development. (p. 10)

Principles of urban management, policy integration, ecosystems thinking (see sustainability indicators in next sub section), cooperation and partnership are laid out in the Report.

The European Commission 5th Framework Environment and Sustainable Development Programme provided a working definition of urban land-use and transport system sustainability in the PROSPECTS study:

> A sustainable urban transport and land-use system is defined by, the provision of access to goods and services in an efficient way for all inhabitants of the urban area; protection of the environment, cultural heritage and ecosystems for the present generation and does not endanger the opportunities of future generations to reach at least the same welfare level as those living now, including the welfare they derive from their natural environment and cultural heritage.
>
> (cited in Black, *et al.*, 2002a, p. 186)

The three pillars of sustainable development, namely environmental sustainability, social equity and economic efficiency are seen in this definition. Notably, this definition adds to a more specific meaning of economy, specifically highlighting the objective of efficiency in the way goods and services are provided to the community. The majority of the 54 European cities' decision makers considered this definition quite appropriate. However, most also agreed there was room to improve the definition.

The three pillars of sustainability are also plain to see in the definition provided by the Organisation for Economic Co-operative and Development (OECD) Environmental Policy Committee's Task Force on Transport:

> Transport is sustainable when it provides for safe, economically viable and socially acceptable access to people, places, goods and services while meeting generally accepted objectives for health and environmental quality, protecting ecosystems and minimizing adverse impact on global phenomena such as climate change, stratospheric ozone depletion and the spread of persistent organic pollutants.
>
> Transport is environmentally sustainable if it does not endanger public health or ecosystems and meets mobility needs while using non-renewable resources below the rates of development of renewable substitutes and renewable resources below their rates of regeneration.
>
> (http://esteast.unep.ch/default.asp?community=est-east&page_id=9F063324-9BB8-4FDA-8B16-3D1EABF0BAA7, Jan 2008)

The 6th European Union Environment Action Programme of 2002 introduced the concept of Thematic Strategies. These Strategies are a modernisation of European Union environment policy-making, taking a broader, strategic approach. A particular outcome of these was an interim Communication “Towards a Thematic Strategy on the Urban Environment” (http://ec.europa.eu/environment/urban/towards_com.htm, Jan 2008) adopted in February 2004.

From this, an expert group was established to consider technical issues for sustainable urban transport plans. This expert group concluded that a sustainable urban transport plan should be embedded in an overall sustainable development strategy with a long-term perspective in the order of 20 to 30 years. This strategy should integrate transport and mobility planning with comprehensive planning and sectoral plans, especially for land-use and spatial development, environment, social inclusion, economic development, safety, health, education and information society technologies.

The 2004 Report of the Expert Working Group on Sustainable Urban Transport Plans (http://ec.europa.eu/environment/urban/pdf/final_report050128.pdf, Jan 2008) under the 6th European Union Environment Action Programme of 2002 reaffirms a definition adopted by the European Union Transport Council 2001, and gives an insight into the elements of sustainable urban transport in the form of the following definition of sustainable transport:.

> Allows the basic access and development needs of individuals, companies and societies to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations;
>
> Is affordable, operates fairly and efficiently, offers choice of transport mode and supports a competitive economy, as well as balanced regional development;
>
> Limits emissions and waste within the planet's ability to absorb them, uses renewable resources at or below their rates of generation, and, uses non renewable resources at or below the rates of development of renewable substitutes while minimising the impact on the use of land and the generation of noise.
> (p. 17)

The Report clearly sets out the minimum objectives of a sustainable urban transport plan as:

> Ensuring the accessibility offered by the transport system to all categories of inhabitants, commuters, visitors and businesses, in line with the objectives below;
>
> Reducing the negative impact of the transport system on the health, safety and security of the citizens, in particular the most vulnerable ones;
>
> Reducing air pollution and noise emissions, greenhouse gas emissions and energy consumption (including contributing to meeting legislative requirements on air quality and environmental noise e.g. EU directive 2002/49/EC);
>
> Improving the efficiency and cost-effectiveness of the transportation of persons and goods, taking into account the external costs;
>
> Contributing to the enhancement of the attractiveness and quality of the urban environment.
> (p. 17)

The Expert Working Group pointed out that the sustainable urban transport plans require concrete targets based on realistic analysis of problems and objectives, and furthermore that the targets need to be based around indicators that are able to be monitored during the life of the plan. As a basic requirement, the targets should be few, representative of the objectives, technically measurable, covering long-term and short-term objectives - including qualitative targets if they can be assessed and reflect the integrated nature of sustainability issues.

Five basic components are suggested that together establish an efficient and recurring mechanism through which the plan’s implementation can be ensured. In the logical order of the process (although steps can be taken in parallel), these components are shown in the right hand side of Figure 2.2.

The Expert working Group recommendations specify what a directive regulating sustainable urban transport plan in urban agglomerations across Europe should contain, and how it should be structured. It has become clear that a directive should comprise a definition of minimum requirements concerning the approach and the instrument.

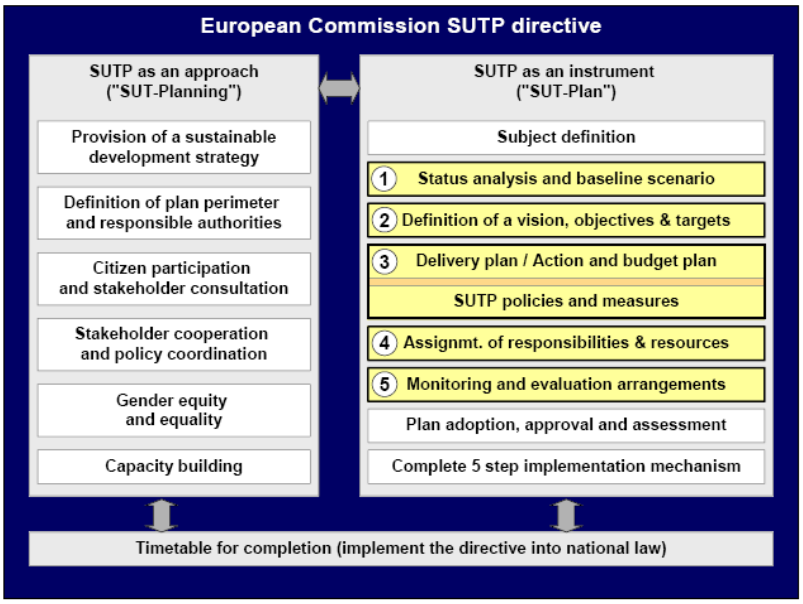
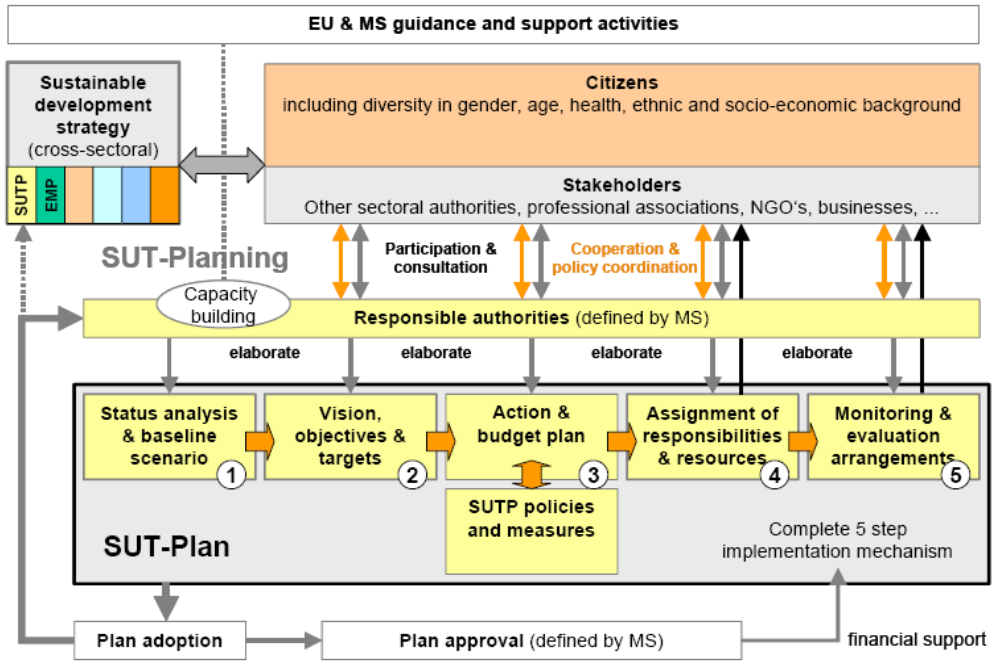


Figure 2.2 Components of a European Commission directive on sustainable urban transport planning
(source: Expert Group on Sustainable Urban Transport Plans, 2004, p. 26)

These elements and the relationships are shown in the Figure 2.3 Participation and consultation of community along with stakeholders is included at every stage of the process (see top block in Figure 2.3). Notable also is the systems type approach to the plan, with the establishment first of the baseline, followed by definition of vision and goals and then by actions to address the gap. Involvement of community and stakeholders in the monitoring and evaluation stage reinforces the need for indicators (or metrics) to be meaningful but simple enough to convey the performance to people who are not experts in planning (see Black, 1981; Chadwick, 1971).

Urban form and transport have been identified as two fundamental aspects of sustainable cities by the European policy makers and practitioners. The spatial arrangement of land-use is considered to provide as large an influence as the character of the transport system itself.



notes: 1. European Union (EU)
2. Member states (MS)

Figure 2.3 Overview of sustainable urban transport (SUT) plan process & implementation mechanism
(source: Expert Group on Sustainable Urban Transport Plans, 2004, p. 25)

The European Sustainable Cities Report notes that cities actually function as a series of interlocking systems in a hierarchy of urban settlements. In this context, the interrelationships between the environment, human and economic systems exist. The Report's authors note that urban form (seen as the pattern and density of development within and between settlements) is widely accepted as influencing travel patterns.

The "compact city" urban form is considered by the 1990 Green Paper on Urban Environment (http://ec.europa.eu/environment/urban/pdf/rport-en.pdf, Jan 2008) as energy efficient with social and economic advantages, while loss of open space and biodiversity from "town cramming" are seen as negatives. Other urban forms include the social cluster city, decentralised concentration, and linear bands. The Report concludes that 'the urban form which is most sustainable or least unsustainable is not clear' (Section 7, p. 218). A common characteristic shared by urban forms aimed at sustainability, is that they all focus on increasing urban densities around points of high accessibility, and especially points of high accessibility to public transport. The Report

concludes that the development of a monocentric city structure or the development of a polynuclear (polycentric) structure depends on the scale on which this principle is applied and on the characteristics of the local settlement pattern (Section 7, p. 218).

In 2002, the European Conference of Ministers of Transport conducted a Round Table on transport and spatial policies (European Conference of Ministers of Transport, 2004). This Round Table conference examined the relationship between urban form and transport, including the differences and similarities between monocentric and polycentric structures and their dynamics. The outcomes showed a complex set of drivers behind location decisions coming from firms' and households' attempts to balance transport costs and land rents. The strength of the relationship was linked to agglomeration economies.

It was observed that this balancing of land cost with transport cost has seen monocentric cities expand their geographical spread with large increases in vehicle kilometers traveled (VKT) and congestion and general loss in sustainability. These cities have also tended to develop a polycentric nature with sub centres, driven by the congestion dis-economy and availability of car transport. A notable conclusion of the Round Table was:

> If these sub centres were to replicate the economic structure of the traditional centre, we could expect a decrease in travel demand, as consumers and workers might live shorter distances from the newly-emerging sub centres. The phenomenon that the sub centres are often highly specialised, i.e. that specific service supplies and employment opportunities relocate to sub centres, implies that accessibility problems multiply and overall transport demand increases.
>
> (Conclusions Summary, p. 2)
>
> (http://www.cemt.org/online/conclus/rt124e.pdf , Jan 2008)

Commuting behaviour in each of the city structures is not well understood. Empirical studies of urban structure have been at odds with the thinking on the mono- and polycentric developments of cities: residential locations of households are not radially distributed around traditional city centres, balancing the effect of decreasing land rents and higher transport costs. Actual commuter travel was reported to the Round Table as seven times as high as predicted by the monocentric model and three times as high as would be expected using the polycentric model. The theorised explanation for these results is that the heterogeneous idiosyncratic tastes of individuals and specific localised

supplies of public amenities, which might cause and drive a social segregation of the urban population. Employment was even locally dispersed.

One of the introductory reports to this Round Table emphasises that a multifunctional, dense and compact city systems approach to urban form, as well as polycentrality and decentralised concentration, create the preconditions needed for an economic transport structure. The report further emphasises this as the only hope for transferring significant volumes of traffic onto more environmentally friendly means of transport. A clear preference for a particular structure was not identified as the dynamics need to be better understood and take into account the particular characteristics of the city and its communities – an important area for further research.

However, in Germany there is a broad acceptance of the polycentric settlement pattern, compact city as the objectives to be pursued in regional development. A balanced, diverse and polycentric settlement pattern is seen as the aim for urban spatial form. The model at the local authority level is the compact city with mixed use, well developed city centres and settlement/development forms that can easily be served by public transport (http://www.cemt.org/topics/urban/Washington03/Winkler.pdf, Jan 2008).

The European Union Commission's European Spatial Development Perspective adopted in 1999 resulted in the establishment of the European Spatial Planning Observation Network (Nordic Centre for Spatial Development, 2005) (ESPON 111Project, 2005 http://www.espon.org.uk/projects.htm, Jan 2008) which is focused on polycentric development in Europe. Polycentricity in Europe is applied at scales from Europe as a whole, down through national, regional and at intra urban, or city level. This project reviewed city level polycentricity in a comparison with polycentricity at larger scales. It suggested that city level polycentricity does not determine a city's capacity to participate in wider scale polycentric integration. However, there would seem room for further research into this relationship.

A workshop held on the next stage in ESPON, noted that definition of metropolitan areas and data on these areas, along with urban sprawl dynamics versus "compact city" approaches were two spatial issues needing to be addressed. (http://www.espon.eu/mmp/online/website/content/seminars/106/1339 /1340/file_2996/workshops_report_bonn-final-20-7-2007.pdf, Jan 2008).

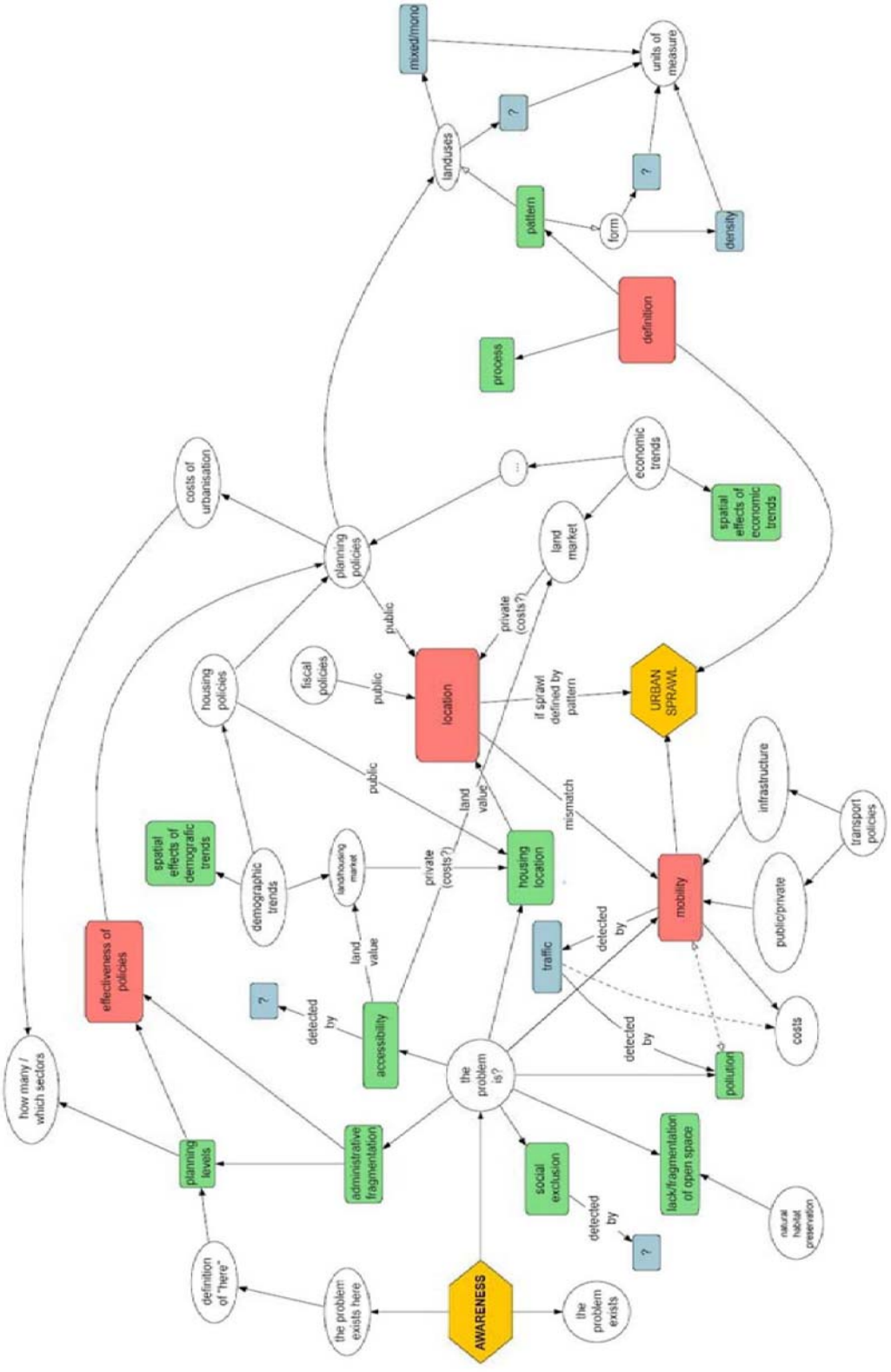


Figure 2.4 Dynamics of urban form and transport interactions leading to urban sprawl (source: Gayda, *et al*., 2005, summary, p. 48)

European attention to the importance of urban spatial layout of cities, and its interrelationship with the transport, is testimony to the role of urban form and transport characteristics in providing the outcome of sustainability in cities.

It is also notable that the type of urban form that provides the best sustainability outcome may or may not be polycentric in nature and depends very much on understanding the specific dynamics of the interactions between residential, industry and opportunities provided by other forms of land-use. Figure 2.4 illustrates some of the complexity in the dynamics of land-use and trip behaviour, which can form the basis of a research design into the dynamics of employment change and transport.

The importance of planning in Asian Cities has long been recognised, as evidenced by Rimmer (1983) in a paper with the emotive title of "battle for the streets of south east Asia". This work illustrated the emerging sustainability issues, including inequities between various societal groups in Asian cities. Rimmer, *et al.,* (1982) analysed a case study of Sapporo, Japan to understand characteristics of the city in terms of accessibility as a contributor to the dynamics leading to travel behaviour. Japan has often been a neglected source of information but as one of Asia's first developed countries, it offers well developed case study cities for comparison with many still developing Asian cities.

Particularly important are outcomes associated with innovation in urban technology taken by Japan. Unlike many Asian cities, Japan has very good statistical data on transport and census data, yielding descriptive spatial patterns of social and economic activity back to the 1970's.

There is evidence of strategic thinking in the formulation of city visions in the path towards sustainability (Kuriyama, *et al.*, 2004). For example, according to Sapporo Mayor Nobuo Katsura, the fourth long-term comprehensive plan entails a partnership in which Sapporo citizens, businesses and local authorities are asked to trust and co-operate with each other (Sapporo Municipal Government, 2000; cited in Black, 2006). There are three themes.

- Formation of an urban environment in harmony with the rich natural environment.
- Reinforcement of urban functions making the most of the unique characteristics of this northern Japanese city on Hokkaido.
- Encouragement of creative urban activities that connects Sapporo to the world.

The Japanese cities that give innovative leadership in forming coalitions of government, business, universities and citizens are those at the leading edge of stakeholder involvement. Consultation is implicit in the development of a collective vision for Japanese cities. There is emerging evidence that travel demand management is being supported as a transportation policy tool. Kyoto City has a long association with applying this type of policy. Currently, the main objective of this policy in Kyoto is for the city to become a 'Walking City: Kyoto, ARUKU-MATI KYOTO' (http://www.city.kyoto.jp/tokei/trafficpolicy/tdm/index.html , Jan 2008). An imperative in all cities of Japan is to create more compact urban development patterns. Kobe is one example. Other cities in Japan place reliance on future urban development being attracted in a more compact way around nodes of good public transport services.

Australian approaches to sustainability in the urban context have also continued to develop over the past 15 years. In 1995 the NSW Government formulated a metropolitan plan consisting of twin strategies for integrating transport and land-use planning in Sydney (see NSW Government, 1993a; NSW Government, 1995). The strategies were strongly based on sustainable development goals drawing freshly from the approaches beginning to be applied in the northern hemisphere cities in Europe and North America, to drive the quest for more livable cities.

A 1993 discussion paper entitled Sydney's Future (NSW Government, 1993b) provided the basis for the 1995 Cities for the Twenty First Century strategy (NSW Government, 1995). The paper related the three pillars of sustainable development in terms of goals of environmental quality, equity and efficiency. The strategy unpacked the meaning given to each of these as:

> 'Equity: (equitable availability of urban resources; opportunities for all sectors of the community; equitable access to employment, housing, education, health services and recreation).
>
> Efficiency: (a dynamic, adaptable and competitive metropolitan region; efficient spatial metropolitan structure in relation to location of activities, employment, recreation and human services; well managed metropolitan region).
>
> Environmental Quality:(ecologically sustainable development within the region; improved public health through reduction of exposure to harmful environmental pollutants; protection, restoration or enhancement of the quality of environmental resources)'
>
> (NSW Government, 1993b, p. 24)

A number of these were recognised as objectives of sustainable development, however "a well managed metropolitan region" was not as apparent and "improved public health" seemed better placed as social equity. The strategy also identifies the following fourth goal which has also become synonymous with sustainability in many developed world cities:

> 'Liveability: (urban form which provides security, identity and historic continuity; sustainable, comfortable and healthy environment with good accessibility; diversity, choice and affordability in housing; opportunity, diversity and choice in employment; opportunities for people to enjoy happy and fulfilled lives).'
>
> (NSW Government, 1993b, p. 24)

In many ways, livability appears to be a repackaging of the objectives of sustainability without the emphasis on the intergenerational and also extends beyond the basic needs into the aspiration goals of community. The Integrated Transport Strategy 'the companion strategy' (NSW Government, 1993a), gave equal credence to environmental protection, economic efficiency and social equity and provided objectives, policies and frameworks. The 2005 Sydney "City of Cities" Metropolitan Strategy (NSW Government, 2005) identifies eight criteria for sustainability in urban land release as developed by the NSW Government's Sustainability Commissioner, shown in Table 2.1. Amongst the criteria are those relating to environmental stewardship, (Criteria 1, Criteria 2) and social equity (Criteria 3, Criteria 4, Criteria 6 and Criteria 7).

Table 2.1 Sustainability criteria 2005 Sydney Metro Strategy

Criteria 1	Natural Resources – to live within natural resource limits and minimise the ecological footprint.
Criteria 2	Environmental Protection – to protect and enhance biodiversity, air, water and agricultural land.
Criteria 3	Quality Places – to provide quality places to live and play
Criteria 4	Housing Diversity – to provide a range of housing choices to ensure a broad population can be housed and which can be adapted over time.
Criteria 5	Jobs - Economy - to provide employment opportunities through growing Sydney's role in the global economy and in regionally-based jobs.
Criteria 6	Access - to provide sustainable accessibility between homes, jobs, services and recreation.
Criteria 7	Quality and Equity in Services – to ensure quality health, education, security, community development and other Government services are provided equitably across the Greater Metropolitan Region.
Criteria 8	Governance - to establish effective, fair and efficient planning and decision-making.

(Source: NSW Government, 2005, Section 10, p. 1)

The third pillar of economic efficiency is included through Criteria 5, Criteria 6 and Criteria 8. The nine criteria provide a number of themes; however do not provide any clear goals or means of measuring in a quantitative way against goals (http://www.metrostrategy.nsw.gov.au/dev/uploads/Growth_Centres_Plan-7.pdf, Jan 2008).

The Western Australian Government model of sustainability is framed not only in the three pillars of environment, social (termed social advancement) and economics, but also the importance of their integration. In their strategy they emphasise how synergies can be found, providing mutually reinforcing solutions to sustainability (The Government of Western Australia, 2003).

A key idea is that by decoupling resource use and wealth it is now possible to increase wealth while decreasing resource use. For most of the past two hundred years it has been assumed that as wealth increases then so will the consumption of resources such as energy, minerals, water and land.

Figure 2.5, illustrates the three key objectives and illustrates a number of overlap areas.

Figure 2.5 Western Australian Government principles of sustainability

(Source: The Government of Western Australia, 2003, p. 24)

Ecological economics, sense of place and community health are each the overlaps between any two pairs of objectives. Sustainability is the overlap of all three objectives with an equal attention to each.

The State of Victoria has also been actively responding to the call for sustainable development. In 2002 a strategic framework was produced creating visions for 2030 that established the principal characteristics of a sustainable city. The strategic framework titled "Melbourne 2030: Planning for Sustainable Growth" (http://www.dse.vic.gov.au/melbourne2030online/content/strategic_framework/03a_compact.html, Nov 2008) was backed by strategies for minimising fringe growth, maximising redevelopment within existing areas and increasing the opportunity for transit orientated development. The strategic framework was a concerted effort by the State of Victoria to respond to the community sustainability expectations.

- Sustainability comprises at least three pillars: environmental, social and economic
- The three pillars are interrelated
- Sustainability strives for equity within generations
- Sustainability strives for equity between generations
- Sustainability uses the precautionary principle (i.e. caution in the use of resources to avoid potential overuse)
- Sustainability conserves biological diversity.

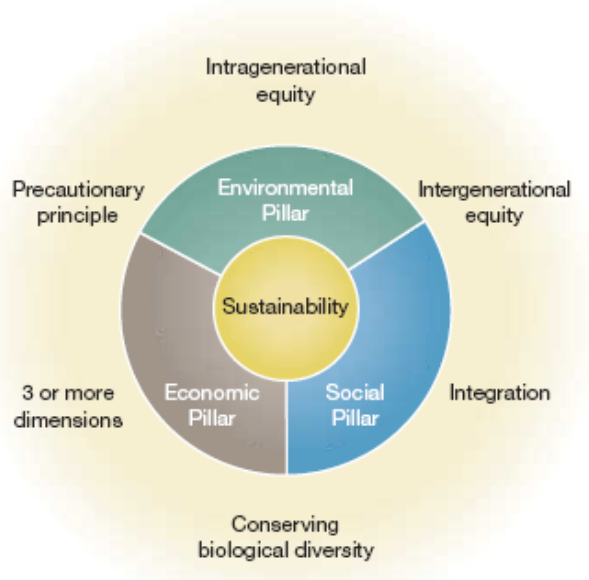


Figure 2.6 Victorian Government principles of sustainability

(Source: Auditor General Victoria, 2004, p. 13; http://www.audit.vic.gov.au/op01_sustainability.pdf, Jan 2008)

The Auditor General Victoria in 2004 produced a report titled “Beyond the Triple Bottom Line, Measuring and Reporting on Sustainability” (Auditor General Victoria, 2004). The report was intended to familiarise parliamentarians, and chief executive officers of organisations, with the concepts of sustainability. The definitions put forward (Figure 2.6) relate strongly to the three pillars of sustainable development identified in the United Nations Agenda 21.

Community Response to the Challenge of Sustainability in Cities

The translation of community awareness into proactive effort has continued to build from the 1970’s and 1980’s in the form of environment groups and various professional groups. Contribution of many of these groups has been to raise the level of discussion in the community and to foster political debate over environmental and social issues (see Australian Conservation Foundation, http://www.acfonline.org.au, Jan 2008 ; Total Environment Centre, http://www.tec.org.au Jan 2008 _; Acorn http://www.acorninc.org, Jan 2008; 10000 friends of Sydney, http://www.10000friends.org.au, Jan 2008;Greenpeace, http://www.greenpeace.org/australia/issues, Jan 2008 ; World Council of Churches, http://www.oikoumene.org/en/programmes/justice-diakonia-and-responsibility-for-creation, Jan 2008 and so on). Many groups have grown to become non government organisations (NGOs).

Other responses through NGOs are the provision of compassionate support in communities where unsustainable practices have impacted on communities and environment and hands on implementing of more sustainable practices into communities at risk (see World Vision, http://www.worldvision.org, Jan 2008; Peace Builders International, http://www.ppbi.org.au, Jan 2008; Red Cross, http://www.redcross.org.au , Jan 2008 ; see World Wildlife Fund, http://www.wwf.org, Jan 2008; One planet living principles and Masdar targets, http://www.wwf-species.org/about_wwf/where_we_work/asia_pacific/where/united_arab_emirates, Jan 2008 and so on).

As the United Nations frameworks and programmes have developed, they have continued to partner with NGO's as well as government. NGO's have participated actively to provide advice in these forums and participate into communities through programmes such as Local Agenda 21 initiatives. The World Conservation Union is an example of a coordinated response of NGOs under an umbrella agenda. (http://www.iucn.org/en/about/, Jan 2008).The Union brings together 83 States, 110 government agencies, more than 800 NGOs, and some 10,000 scientists and experts from 181 to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable. The Union also has the official status of Observer at the United Nations General Assembly.

The priorities and work of the Union are set by members every four years and subsequently coordinated by a professional secretariat in many countries. The priority of the Union's current Programme (2005–2008) is to build recognition of the many ways in which human lives and livelihoods, especially of the poor, depend on the sustainable management of natural resources.. Six Commissions of networks of volunteer scientists and experts implement the Union's work programme. Three of the Commissions are Ecosystem Management :Guiding the management of natural and modified ecosystems (http://www.iucn.org/themes/cem, Jan 2008), Education and Communication: Promoting sustainability through education and communication (http://cec.wcln.org, Jan 2008), Environmental, Economic and Social Policy: Advising on economic and social factors that affect natural resources http://www.iucn.org/themes/ceesp, Jan 2008).

This definition by the World Conservation Union in 1991 'Sustainable development means improving the quality of life while living within the carrying capacity of supporting ecosystems.' (cited in Expert Group on the Urban Environment, 1996) helped shape the view that sustainable development is more than simply environment protection. From this definition the European Commission's Expert Group on the Urban Environment concluded that:

> sustainable development is a much broader concept than environmental protection. It implies a concern for future generations and for the long-term health and integrity of the environment. It embraces concerns for the quality of life (not just income growth), for equity between people in the present (including the prevention of poverty), for inter-generational equity (people in the future deserve an

> environment which is at least as good as the one we currently enjoy, if not better), and for the social and ethical dimensions of human welfare. It also implies that further development should only take place as long as it is within the carrying capacity of natural systems. Clearly, addressing the sustainable development agenda provides new challenges for urban policy integration within holistic frameworks.
> (section 5.3, http://ec.europa.eu/environment/urban/pdf/rport-en.pdf , Jan 2008)

Another example of participation is in national and international forums such as the European Eco-Forum (http://www.eco-forum.org, Jan 2008), a platform of environmental citizens' organisations throughout the United Nations Economic Commission for Europe region in the Environment for Europe process (http://www.unece.org/env/proceedings/files.pdf/Item%2014$15/14Speeches/14.NGO.EcoForum.E.pdf, Jan 2008). In the Asia Pacific region the Asia Pacific Roundtable for Sustainable Consumption and Production fosters dialog among industry, government, academia, and non-government organisations in the region to address sustainable consumption and production issues. (http://www.aprscp.org, Jan 2008).

Professional organisations have also been active in establishing industry forums and networks for sustainable industries (see World Business Council for Sustainable Development, http://www.wbcsd.org, Jan 2008; Ecosustainable Hub, http://www.ecosustainable.com.au , Jan 2008, UITP, http://www.uitp.com, Jan 2008).

Academic Research on the Challenge of Sustainability in Cities

It is pointed out that while there is considerable discussion about the meaning of sustainability, particularly in academic and professional circles, that the concept has not come from academia or the professions but has come from global politics as a way of asking the world to resolve a fundamental tension that has developed between environmental, social and economic improvement. The resolution of this tension is the challenge for sustainability.

Newman and Kenworthy (1999) provided a defining publication on city sustainability, with a comprehensive discussion of the patterns of car dependence in global cities. Based on early research of more than 30 cities around the world, they produce insights

into the relationship of car usage and energy usage per capita that shows high usage in cities that typify the USA and Australia compared with cities that typify Europe and Asia. Relationships to urban form and transportation form, leads them to conclude that only with a reduction in car dependency will society successfully accommodate all elements of the sustainability agenda. Including discussion on visions, ethics, spirituality and community in the reality of and desire for sustainable cities, their work on cities has provided essential principles for city sustainability.

An observation from the work on world cities is that land use density correlates with lesser car dependency. This has become a particularly strong tenet in the mechanisms for city sustainability. However, healthy discussion continues on whether this is the only urban form that is capable of contributing to sustainability.

Black, Páez and Suthanaya (Black, *et al.*, 2002a), based on literature they reviewed, determined hierarchical diagrams describing the principles of both unsustainable and sustainable transport. These are shown in the Figure 2.7 and Figure 2.8.

The diagrams differ significantly as a result of the sustainable environment objective driving down sub objectives for system performance in contrast to the unsustainable approach where environmental sustainability is largely an unplanned outcome of the transport.

The relationship between urban form and transport sustainability is examined by Black, *et al.*, (2002a). They describe the steps in how urban form influences transport patterns through both local and regional urban form configurations. Figure 2.9 depicts these steps.

Individual behaviour influences local/neighbourhood travel patterns which influences regional travel patterns. They note that travel patterns at the local and regional scales each need urban form solutions at their respective scales. Black, *et al.*, (2002a) reveals the connection between urban form/transport characteristic dynamics and travel patterns which drive the environmental sustainability of the transport system.

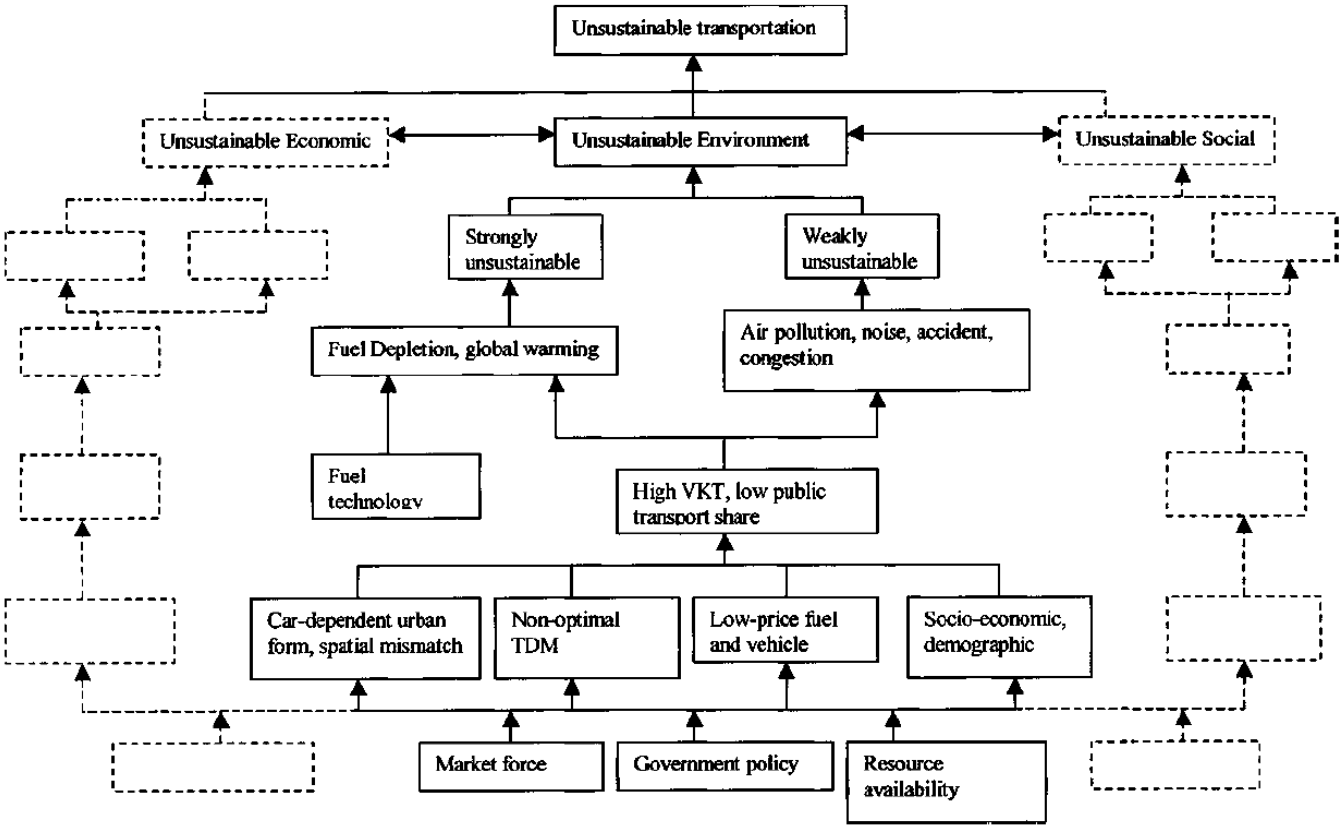


Figure 2.7 Hierarchical diagram for unsustainable transportation principles of sustainability

(Source: Black, *et al.*, 2002a, p. 190)

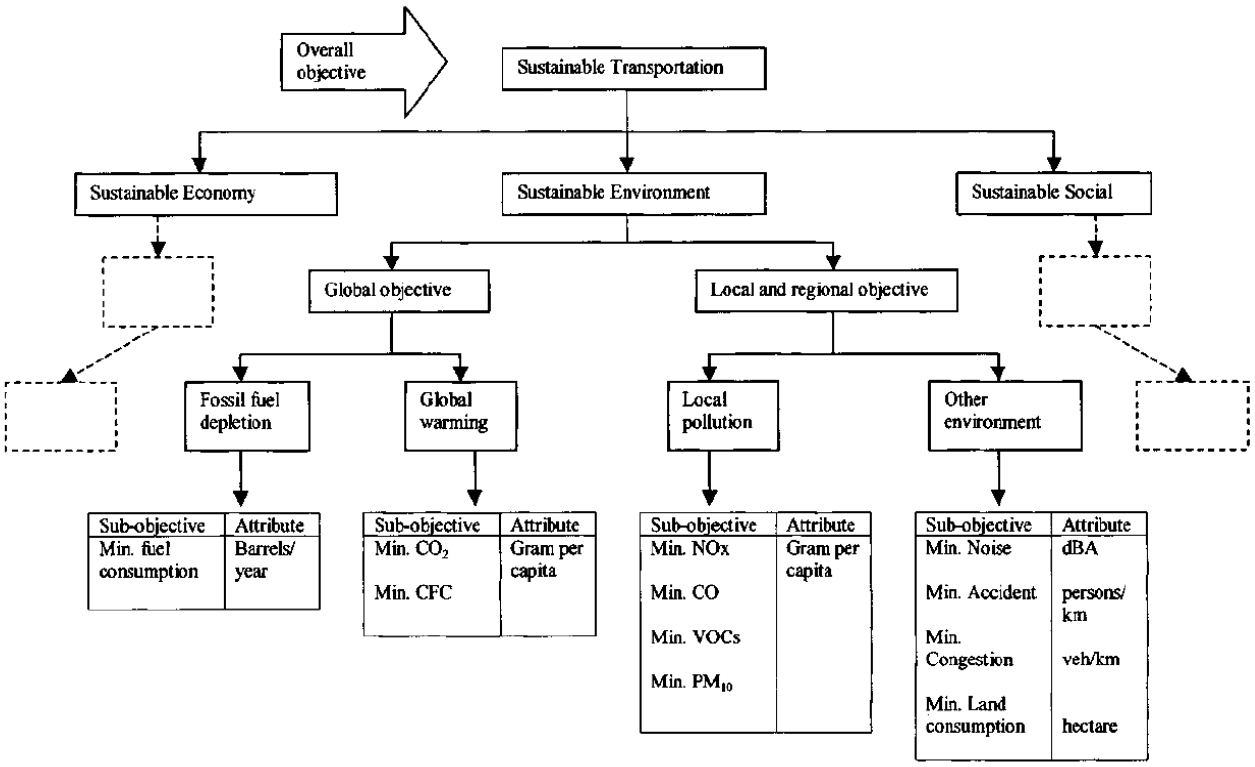


Figure 2.8 Hierarchical diagram for sustainable transportation principles of sustainability

(Source: Black, *et al.*, 2002a, p. 191)

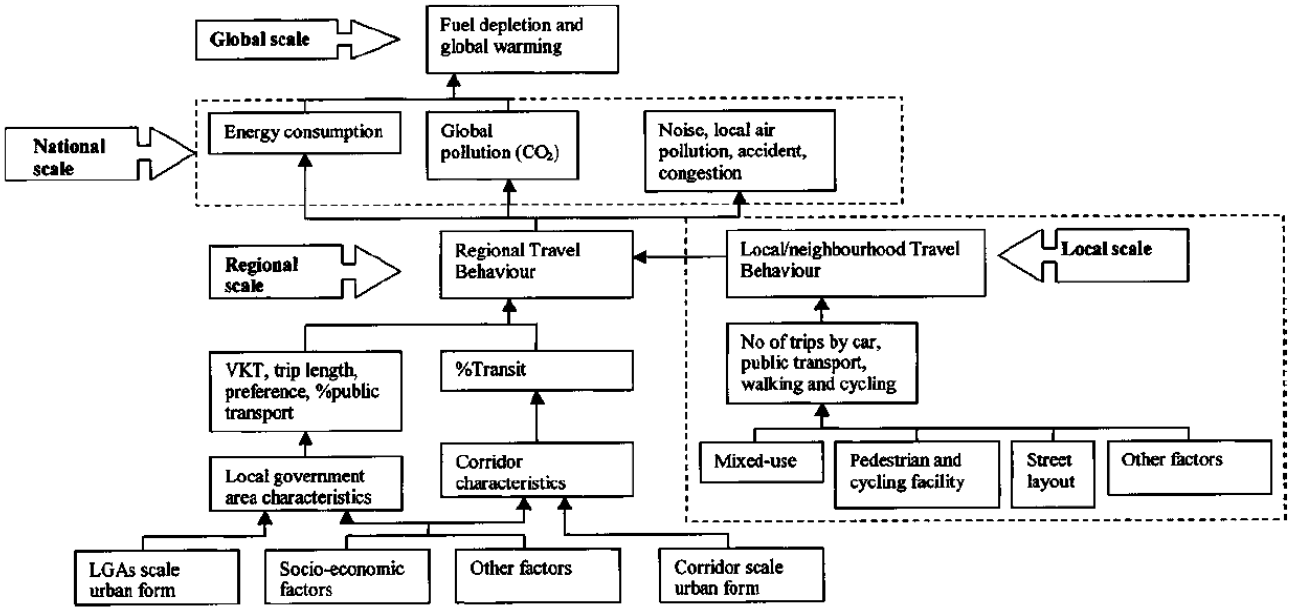


Figure 2.9 Urban form and sustainable transportation

(Source: Black, *et al.*, 2002a, p. 191)

In 2003, the Warren Centre for Advanced Engineering, University of Sydney completed a project partly funded by the NSW Government, titled "Sustainable Transport in Sustainable Cities" (Warren Centre for Advanced Engineering, 2003), which was a study and proposal for Sydney's urban form and transport into a sustainable future. The project team found that there were many different definitions of sustainability, however a common aspect of all views is the notion of intergenerational equity. Another way of putting this notion is that we should be living off our resource income rather than the resource capital (including ecological capital), keeping the options open for future generations.

If a wider view is held of sustainable transport, the definition would also include accessibility (for people to activities as a right), equity (in social and spatial terms for all sections of the community), economic opportunity (contribute to improving opportunity), social well being (maintain or improve quality of life in local communities), environmental quality (from the perspective of maintaining or improving public health and safety) and public participation in decision making.

According to this wider view, a vision of sustainable transport for a sustainable city would include: an integrated transport system, transport planning which addressed equity , social well being and public participation; travel habits changed to achieve more sustainable travel behaviour, technology which reduces the adverse impacts of travel yet improves accessibility; travel habits changed to achieve more sustainable travel behaviour.

The project team also detected a debate in the relative importance of environmental, economic and social aspects of sustainability, if environment or economy is the central concern, and whether the other aspects are merely supporting the main pillar. Martin Wachs, a visiting Fellow for the Project, highlighted that sustainability was in danger of becoming a widely used term for anything good and wise in transport (address by Wachs titled "Perspective of an outsider"; cited in Warren Centre for Advanced Engineering, 2003, pp. 1 -12, section 0). Wachs disputes that past and current practice of land development and transport planning are on the whole putting the world at risk. He makes the point that sustainability does not need to be justified on the basis of

averting an impending crisis coming from depleted resources needed for our communities as crises have always been averted in the past through a mix of market pricing, political actions and technological change. He disputes that sustainability is synonymous only with anti-automobile and higher density approaches to cities.

Wachs sees the improvement in quality of planning as the great benefit of the sustainability approach to planning and with it, improvement to the quality of life in complex cities. He points out that sustainable development has moved communities concerned with the environment from a position of conflict with development agencies (e.g road building agencies) to a position of co operation and partnership and that this is a major milestone of the sustainability movement. Increasing 'connectivity between complexities of transport and natural environment, placement of transport within the broader context of technological change, and the shifting of policy focus from facilities to the broader strategies of mobility and environmental improvement' (p. 5), are the benefits Wachs sees of a sustainability approach to planning.

However, Wachs also sees that the most important contribution of sustainability development is its focus on equity and distributional issues which are 'the most pressing dimension in current transport policy debates in cities' (p. 5). Wachs, while being skeptical about the depletion of resources imperatives of sustainability, and his strong belief that development to date has improved social capital, is a strong proponent that development has also widened the gap between the "haves and the have nots"- social inequity. Wachs draws attention to the policy puzzle for cities in the developing world with the question 'should access to cars be a response to inequity with the developed world, or should we be striving for better accessibility in these cities using less intrusive means and to be consistent with current patterns of living and working?' (p. 10).

The purpose of transport investment, according to Wachs is as a response to the environmental goals of society, where environment is viewed as a combination of social, economic and natural contexts within which we live. Therefore the sustainability approach is seen to be about aiming for these goals which have a close affinity to the three pillars of sustainable development - environmental stewardship, social equity and economic efficiency, seen in the United Nations Agenda 21 (http://www.sidsnet.org/docshare/other/Agenda21_UNCED.pdf, Jan 2008) and Millenium Development Goals (http://www.un.org/millenniumgoals, Jan 2008).

The sub section on government response earlier in this paper observed that urban form, transport and interactions with community, shape the sustainability performance of cities. Research on Japanese cities has included a focus on these interactions to attempt a better understanding of the driving forces behind them.

The cities in Japan provide some different experiences in urban spatial form contribution to sustainability, compared with many western cities, particularly the North American but also the European city form. Tokyo for example was a monocentric city structure in 1956, experiencing high stress in the city centre, including congestion in the rail system. By 1986, policies for "suburban development area" around the existing built-up areas were in place in order to develop balanced and well-designed hierarchical urban centres. Notably, the plan was also not only limited to industrial and satellite cities but also academic, recreational and cultural facilities.

Suburbanisation and the emergence of the edge cities in many western countries when coupled with outer highways and expressways, has contributed to urban dynamic (interaction with community) outcomes that have both stabilised and in some cases reduced travel times as cities have expanded (see Garrison and Ward, 2000; cited in Black, *et al.*, 2007a). A number of urban dynamics studies have examined impacts of poly-centrism on residential location choices and commuting patterns, where the issues are mode share at the employment destination, and the mean trip lengths (journey times) of those workers. There are two contrary arguments and empirical findings.

With a decentralised employment and spatial mismatch, cross commuting increases, resulting in more wasteful, or excess, commuting in terms of longer distances traveled. Black, *et al.*, (2007a) citing Dubin (2007), comments that as cities get larger in terms of area and population, they might produce more cross commuting for mono-centric cities than in polycentric cities, as the workers will possibly tend to reduce their commuting time by taking opportunities provided by a multi-centric structure.

Black, *et al.*, (2007a) cites that :Gordon (1986) found similar results for Los Angeles as did Dubin (2007), while Cervero and Wu (1998) showed that for San Francisco between 1980 and 1990, the average trip distance and time increased. However, Gordon (1991) identified a shortened automobile commuting time for 20 USA cities.

Tokyo in contrast to San Francisco's pattern of increasing commuter trip times associated with monocentric to polycentric shift in urban form has remained stable over time (see Black, *et al.*, 2007a).

To understand the difference between commuter trip times in cities such as Tokyo and many North American cities and implications for sustainability, requires a better understanding of the dynamics of the interactions between the urban spatial form, the transport systems and the particular characteristics of the communities.

In a study on Sapporo Japan, Rimmer, *et al.,* (1982) discuss the analysis of the dynamic interactions that lead to a person's choice of activity destination and journey to reach it. Chapin's approach (Chapin, 1974) is cited as a framework that provides meaningful understanding of the mechanics of these dynamics. It is framed around the concepts of the total physical opportunity available (accessibility), the environmental perception based on an individual's accumulated experience together with retention of knowledge of the surroundings.

Understanding of urban dynamics was the focus of the "Asia Poly-centric Employment Collaborative – Transport (APEC – TR)" which explored for example the Tokyo metropolitan area, its rail network development as its representative character and the relationship to decentralised concentration of employment (Alpkokin, *et al.*, 2007b). The cities that were in the research study are shown in the Figure 2.10

Black, *et al.,* (2007a) observed that 'the processes of urban development that shape a city's size, and density, are the products of the decisions and interaction of a number of key agents, such as government instrumentalities, planning agencies, statutory government agencies, households, and businesses' (see Neutze,1977;1987; cited in Black, *et al.*, 2007a).

Over the years, attempts have been made to interpret outcomes from the processes of urbanisation, and to make a macro classification of city types (for example see "global city" Sassen, 1991; the "fractal city" Batty and Longley, 1994; the "edge city" Garreau, 1991; and so on; cited in Black, *et al.*, 2007a). However, it is the micro detail of the internal spatial structure of cities that was of particular interest to the APEC –TR collaborative.

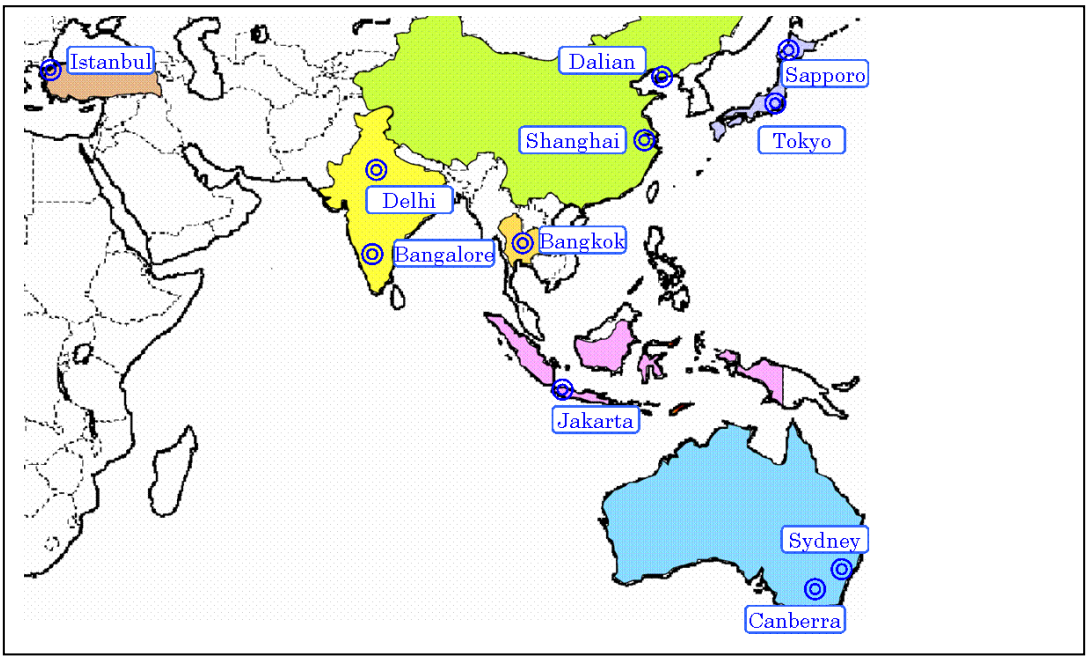


Figure 2.10 APEC _TR collaborative case study cities

(Source:Black, *et al.*,2007a, p. 8)

Of particular relevance to the APEC –TR collaborative research was the recent classification of 25 mega cities into “emerging cities”, “transitional cities” and “mature cities” as archetypes. Black, *et al.,* (2007a) records that interviews with stakeholders (elected politicians, city government employees, private sector infrastructure providers, and community leaders) found that 81% of stakeholders stated the economy and employment as the most important issues driving decision making and that transportation was the most serious challenge facing the city’s infrastructure.

All very large metropolises, whether in developing or developed countries, either do or will face the problem of spatial re-organization from mono-centric structure to multi-centric structure (see also Hall and Payne, 2006). The processes of urban development results in the relocation (decentralisation and further de-concentration) of firms and houses outside the CBD in particular to emerging employment centers (see Falk, 2006). Poly-centric, or multi-centric, employment is defined as the decentralised, but clustered, formation of work agglomerations in sub-centres rather than employment concentrating in one central business district, or sprawling randomly over the whole metropolitan region.

Poly-centric dynamics have been extensively explored in American cities. Black, *et al.*, (2007a) notes that since the 1980's, a substantial amount of empirical work has appeared, particularly regarding large North American metropolitan areas where a severe poly-centrism, with a number sub-centers rapidly emerging outside the old city, was observed in the 80's and 90's. Importantly, it was noted that the employment tended to decentralise more than population. At the centre of the dynamic American city of 1945 was a downtown with a centripetal transport system basic to its circulation system. Effectively reconstituting core functions, the emerging multimodal metropolis demonstrates a major change since 1975 in how the suburbs were spatially organized (see Beauregard, 2006, p.36; cited in Black, *et al.*, 2007a). In North America, the single focus metropolis with a single CBD disappeared and was replaced by an amorphous sprawl of population without a unifying hub. The book "Metropolitan Revolution: The *Rise of Post-Urban America"* (Teaford,2006; cited in Black, *et al.*, 2007a) explains how the central city has declined and describes the boom in suburban business districts sprouting from previously undeveloped greenfield sites around thriving shopping malls.

However, while a body of knowledge exists on outcomes of urbanisation process, far less is known about the role of urban policy in the decentralisation process as a driver of urban dynamics. Many researchers (see for example, Hall and Pfeiffer, 2000; cited in Black, *et al.*, 2007a) draw attention to policies supporting multi-nucleated structures, both at the metropolitan and regional level in numerous empirical and theoretical studies. Research on the multi-centric urban policy-making experience is however limited, with the presence of only a few exceptions (see for example Hall and Pain, 2006, cited in Black, *et al.*, 2007a; The European Spatial Development Perspective, 1999).

Black, *et al.*, (2007a) comment that little is known about the poly-centric dynamics governing growth in the cities of the developing world. Characterised by metropolitan areas that are economic cores where public transport is usually road based and of limited service availability in many parts of the city, the poly-centric employment growth and its impacts on trip profiles appears poorly understood. However, Black, *et al.*, (2007a) concludes that spatial form of urban growth presents an important topic for policymakers because all the cities examined in the APEC –TR collaborative research are expanding and urban planners are all too often put in the position of intuitively proposing metropolitan structure plans (or spatial plans) which place the location of

future employment nodes and transport improvement plans on a map without resort to a rigorous form of analysis.

The APEC–TR collaborative has examined the outcomes of urban dynamics through various analytical techniques. At the same time the researchers have made interpretations identifying the driving factors in these urban dynamics. Klug, *et al.*, (2007b) noted that the urban dynamics and spatial restructuring that has taken place in a number of global cities, especially during the last half a century is such that in most regions, polycentric development policy is necessary to guide existing market forces that otherwise would lead to inefficient development of the cities and employment not located in the right places. While traditionally the Central Business District, in terms of economies of scale, was a strong location for employment, there are several driving factors, weakening the CBD and favouring other locations. Klug, *et al.*, (2007b) notes that this began in the developed countries, in both the east and west, post Second World War and was characterised by rising land prices in CBD; lack of space; and rising traffic congestion that disadvantaged employees and goods traffic. Economies decentralised and populations suburbanised, partly driven by more land and a better residential amenity.

Expansion/growth of land used for residence, work, shopping and leisure, multiplication of traffic (especially road traffic), gradual dissolution of fixed time structures towards flexible timing, and regionalisation of business and private activities are identified as consequences and further driving factors.

Locations outside the central business district (CBD) have become more attractive with suburbs forming new agglomerations from reconcentrated firms. These emerge in different forms depending on their size, distance to the old city, and proximity to a transport node. Klug, *et al.*, (2007b) found the strongest centre remains the CBD, but as it reaches its physical capacity it looses its share of relative metropolitan employment and growth which shifts into either dispersed, scattered employment or locally-centralised employment locations. Economic activities cluster into either sub-centres or along major transport corridors (railway or highway). A second driving force supporting polycentric development is agglomeration economics.

The APEC –TR collaborative noted many fast growing cities in both the developed and developing world are affected significantly by poly-centric urban dynamics, irrespective of planning policy. The urban spatial structure and the location of major employment centres are being shaped by market forces as a result with planning policy only one of the determining factors.

The centrality of urban form, transport and the interactions with communities, to the question of sustainability in cities, is demonstrated in the responses from governments, non government organisations and the academic researchers over the past 15 years. These various responses have been to further the understanding of sustainability as an objective in cities. Governments have initiated various programmes to provide frameworks, requirements, implementation support and methods of monitoring progress towards sustainability. Non government organisations have been actively participating in government frameworks, bringing another voice from community and supporting communities at risk. Academic researchers have been supporting these efforts by critiquing approaches by government and striving to further develop suitable analysis processes and indicators. Understanding of interaction between urban form, transport and community has been shown to be essential for meaningful interpretation of performance of the three pillars of sustainability.