

Urban Transport Institutions and Governance and Integrated Land Use and Transport, Singapore

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Introduction

Singapore is a City State. It was chosen for this case study because from the early 1970s it has been regarded internationally as an exemplar of ‘good practice’ in integrated land use and transport planning. It was the first city in the non-communist world to put into practice the concept of restricting the ownership and use of motor vehicles, and of charging for the use of road space.¹ These restrictions were an integral part of a land use and transport strategy designed to be space-efficient, with high-density development, low land take for roads, and a large role for space-saving public transport.

Singapore was also chosen as it has not always been the thriving economic hub that it is today. At the time of the birth of the nation in 1965, Singapore had a GDP per capita of US\$516; a large percentage of the population lived in slums and a poor quality transport system was in place. However, by 2010 the GDP had risen to US\$63,867 per capita.²

Singapore is also often regarded as a ‘special case’ because of its small geographical size and population, and single level governance structure. Many regard these as the key or even dominant influences in the successful integration of land use and transport in Singapore, rendering them inappropriate to be held up for emulation. Singapore’s transport and land-use policies have also sometimes been hailed a little too uncritically. This case study tries to distinguish which elements of Singapore’s model can and should be considered for emulation by others.

Singapore is now seeking to share and disseminate more widely its expertise. The Housing Development Board (HDB) has established consultants Surbana, while the Ministry of National Development has set up the Centre for Liveable Cities and the Land Transport Authority (LTA) has set up the LTA Academy to provide training and/or share expertise in the Singapore approach. Singapore is also offering a combination of expertise and investment to support innovative new town development. A prime example is the Sino-Singapore Tianjin Eco-City in China.

The case study starts with a brief overview of Singapore, including the governance structure, population and economic growth. This is followed by a brief history of the spatial land use and transport plans and policies.

The key issues identified in the case study are then presented, starting with the visions and the planning, policy and management instruments underlying these plans, and the role of urban sector governance. The successive land use and transport plans prepared in the period between 1971 and 2008 are then discussed in more detail. The transport modes relied on in the plans, and the extent of integration achieved on the ground are then analysed. The section concludes with suggested criteria for evaluating the extent and effectiveness of integration, and some performance indicators for Singapore.

The conclusions from the case study illustrate the strengths and weaknesses of the Singapore model, the current threats and whether Singapore’s policies and practices are readily applicable elsewhere.

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1. Prior to this cities had attempted restrictions on use through on and off street parking controls.
 2. Per capita GDP at current market prices, Department of Statistics, Singapore.

Background

Singapore is located on the southern tip of the Malay Peninsula, and is made up of a number of islands, with a total land area of 648 km² which had increased through reclamation to 712 km² by 2010 (Department of Statistics Singapore, undated). Singapore Island itself is 46 kilometres east to west and 23 kilometres north to south. Singapore has been a republic with a single level parliamentary system of government (on the Westminster model) since it gained sovereignty in 1965.

The population of Singapore increased from 2.07 million in 1970 to 3.01 million in 1990 and to 5.077 million in 2010 (Department of Statistics Singapore, undated). The number of residential dwelling units increased from 180,600 to 735,900 over the same period, while the urban area increased from 32 to 52 per cent of the area of Singapore Island. Meanwhile, urban densities fell from 11,000 persons per square kilometre in 1970 to 8,350 in 2000.³ Home (largely apartment) ownership has increased from about 25 per cent to 87.2 per cent in 2010, (Department of Statistics Singapore, undated) reflecting housing policy and the city's rapidly growing affluence.

The basic concepts underlying the urban development and transport plans and policies for Singapore have remained constant since the 1970s, even though updates have occurred at different times. A non statutory Concept Plan – incorporating spatial and transport planning elements – provides the development framework for Singapore within which more detailed Development Guide Plans (DGPs), consistent with the Concept Plan are prepared and implemented on an on-going basis. Adjustments, refinements and changes in emphasis in application of policies and plans have been made over time.

Box 1. Urban sector governance

The **Housing and Development Board (HDB)** established in 1960 is Singapore's public housing authority and a statutory board under the Ministry of National Development. It is the sole agency responsible for the planning, design, land assembly and construction of public housing. A high proportion of Singapore's home owners, own apartments in estates built and managed by HDB.

The **Urban Redevelopment Authority (URA)** has been Singapore's national land use planning authority since 1989. Prior to that date this responsibility rested with the Planning Department in the Ministry of National Development. URA was established in April 1974, from the former Urban Redevelopment Department of the HDB (which had existed since 1967). Initially it was only responsible for planning the city centre. URA prepares long term strategic plans, known as Concept Plans, as well as detailed local area plans, known as Development Guide Plans (DGPs) for physical development (and conservation). It then co-ordinates and guides efforts to bring these plans to fruition. It is also a statutory board.

The **Land Transport Authority (LTA)** established in 1995 is responsible for planning, policy and regulation of all urban (or land) transport modes, and their inclusion in the development of the Concept Plans. This made Singapore one of the pioneers of integrating so many urban transport responsibilities within one organization. The LTA also constructs and maintains road, MRT and other public transport infrastructure, in accordance with the provisions of the Concept Plans. It is also a statutory board.

Jurong Town Corporation (JTC) is a statutory board responsible for the planning and development of industrial areas. Initially its focus was the development of the Jurong area in the west, the location of a great deal of industrial development.

3. 2000 population of 4.028 million and an urban land area of 479 square kilometres.

The land use plans for Singapore have their origins in the State and City Planning Project (SCP) launched in 1967, which resulted in the first strategic development plan, the 1971 Concept Plan. Known as the 'Ring Plan', as development was planned in a ring around the central water catchment area, this was designed to guide the physical development of Singapore over the following twenty years (to 1991). It was based on a compact urban structure, with high density corridors containing housing, industrial areas and strong centres, in a ring around the central water catchment area, with a strong city centre/central business district (CBD). Public transport was to be steadily improved to meet urban movement needs, with restraint of motor vehicle ownership and usage. Whilst the plan anticipated the later introduction of a metro/MRT, the public transport system at this time was based on buses and a firm decision to build MRT had not yet been made. The Concept Plan did *not* provide detailed land use zoning and densities, nor was it a statutory plan – these two attributes were still vested in the Master Plan. The use of Concept Plans in Singapore represents a successful example of strategic planning.

Three initial important transport policy measures were implemented in the early 1970s. The first was a package of measures to improve bus services, including by government direction, the consolidation of eleven bus companies into three, and then just one. The second was the series of steps taken to slow the growth of car ownership by increasing taxes on the purchase and ownership of vehicles. The third was the introduction, in 1975, of the Area Licensing Scheme (ALS), for traffic within the city centre (Barter, 2008).

The next major transport development was the construction (starting in 1983) of the East-West and North-South MRT lines after a vigorous debate among policy-makers on whether it was justified over an upgraded bus system. A key argument in favour of the expanded MRT option was that without it and without the strong CBD it would support, higher order business and finance sector investments would *not* be attracted to Singapore (Phang, 2003). The initial sections were opened in late 1987.

A revised Concept Plan was produced in 1991 entitled: 'Singapore – Towards a Tropical City of Excellence'. This retained and refined the basic features of the earlier plan. The key difference was a proposed strengthening of four regional centres to reduce congestion in the city centre.

A further review and updating of the Concept Plan followed in 2001, and the broad strategies incorporated into the 2003 master plan. The aim of the 2001 plan was to make Singapore into a 'thriving world class city', with a 50 year horizon for a city of 5.5 million. This plan included a Key Proposal for a more extensive rail network and a stronger reaffirmation of the strong CBD strategy, slightly downplaying the role of regional centres compared with the 1991 plan. A review of the 2001 Concept Plan is scheduled for completion in 2011.

Following the setting up of the Land Transport Authority (LTA) in September 1995, a transport White Paper (Policy Document) was published in January 1996, entitled 'A World Class Transport System' (Republic of Singapore, 1996). In October 2006 LTA, in consultation with the Ministry of Transport, began a Land Transport Review, which culminated in the Land Transport Master plan entitled 'A People Centred Land Transport System in February 2008'.

Main Issues

The integration of land use and transport in Singapore is greatly fostered by the government having a clear vision for the future of Singapore, and well-articulated policies, planning and management instruments including a well-defined governance structure of institutions

responsible for key activities. It is also facilitated by these institutions working together to prepare and implement land use plans and transport strategies. While overall the strategic spatial planning and transport policy directives for Singapore are integrated, this has been largely achieved *without* the administrative and legal integration of institutions and governance of land use and transport. Instead, inter-agency committees ensure the integration of planning and implementation. This is contrary to a view that is often advocated that integrated plans can only flow from integrated institutions.

This section sets out the vision, and describes the policy, planning and management instruments, including the governance structure. The evolution of the vision, key policies to support the vision and key instruments through the land use and transport plans listed in urban sector governance section from 1971 to the present day is then laid out. Then follows an assessment of the results, for example in the importance of public transport and the extent of integration being achieved on the ground. The section concludes with a discussion of the evaluation criteria that should ultimately be employed to judge the success of the integrated plans.

Underlying visions

Starting with the 1971 Concept Plan, the integrated land use/transport plans are all driven by a clear vision for the socio economic and urban development of Singapore. In the 1971 Plan this vision included:

- An urban structure based on mass transit spines, radiating out from a strong CBD, with the centres of ‘new towns’ located at stops along the spines;
- A land use plan for each new town based on a grouping of neighbourhoods which were relatively self sufficient in terms of local commercial, educational, health, social and recreational facilities;
- Decentralization of population from poor quality and overcrowded (‘slum’) housing in the city centre to new multi-storey housing in the new towns;
- Promotion of movement by public transport, with restraint on car ownership and use;
- Limited road construction due to constraints on land availability; and
- Creation of heavy industrial areas separate from the new towns.

The vision of spatial development in this plan, and the role of public transport within it, is influenced by European urban planning thought of the 1950s and 1960s – but the restraints on car ownership and usage were newer and their application together has not been adopted before outside Singapore. The 1971 vision sought to separate heavy industrial and residential areas, and assumed that many people would travel outside the new towns to work in the CBD or the industrial areas – by the high quality public transport system that was to be provided. Early new town planning sought to mitigate this by including light industrial development within new towns.

By 1991, the vision had expanded to create a ‘Tropical City of Excellence’ for 4 million people by 2030. While the basic vision of urban development from the 1971 Plan was retained in the 1991 Plan, this plan also incorporated some refinements. One key refinement in the new vision was to seek to decentralize more of the growth in economic activities to four regional centres. At the same time the vision of a strong CBD was retained by a proposed extension of the CBD to Marina South.

In the 2001 Concept Plan (Republic of Singapore, 2001), the visions in the previous plans were again refined. The emphasis is for Singapore to become ‘a city that is dynamic,

distinctive and delightful, as well as enhancing the quality of life'. The key new vision is to establish a global business centre, and allow greater flexibility to business, which are required to ensure sustainability of employment in a globally competitive business environment. The expansion of the CBD was re-emphasized more strongly than ever. The regional centres (one fewer in number) were retained but with lower expectations for their importance, reflecting a slower than anticipated market response to their development.

Policy, planning and management instruments

Achievement of the visions for Singapore is facilitated by a set of planning, and policy instruments applied within the urban sector governance structure outlined in the background section by agencies with clear roles and responsibilities. The key instruments are:

- Concept plans prepared by the URA as the agency responsible for spatial planning;
- Development guide plans (DGPs) also prepared by the URA which together form what is known as the Master Plan;
- Transport policies and plans prepared by LTA; and
- Detailed plans for the development of new towns prepared by HDB, and for industrial areas, prepared by JTC.

The mechanism for the preparation of the Concept Plan is notable as a good example of a strategic planning approach, adopted to overcome the problems associated with the preparation of 'master plans' - in particular the time needed to prepare them, the long drawn out process, the amount of detail of such plans and their lack of connection with key levers of influence over urban development, such as infrastructure investments. The Concept Plan lays out the vision for development over at least a 20 year horizon, and the key actions to achieve the vision. It shows the main land uses (residential, commercial, and industrial) and the MRT and main road networks. The Concept Plans in Singapore are now reviewed and updated every 10 years.

The Concept Plan is not a statutory plan but provides the framework for the preparation (also by the URA) of the statutory land use plans – known as Development Guide Plans (DGPs), which together form what is known as the Master Plan. There are DGP for 55 areas, which together form the 2008 Master Plan. These DGPs contain details of land use zoning, plot ratios, building heights as well as conservation areas and other controls on development. They are accompanied by a 'Written Statement' which explains the various items included in the DGP. This approach has its origins in the Development Plans of the mid 20th century British planning system. The DGPs are used to control what development is implemented by private developers or government agencies.

Transport: The Concept Plans incorporate transport policies and the major transport infrastructure networks and facilities, and provide the framework for the formulation and implementation of more detailed transport strategies, policies and programs by the LTA in support of the Concept Plans. Transport elements were an integral part of the 1971 Concept Plan – with policies on restricting car ownership and use and promoting public transport, limited road infrastructure and spatial development based on public transport spines. While this approach was retained in later Concept Plans, more specific transport policies and plans were also developed separately from them. The Concept Plans and the DGPs together influence all development and provide the framework for the preparation of detailed plans for the development of new towns by the HDB. Construction of the transport infrastructure and new towns is then undertaken by these same agencies.

This division of planning and policy making into three levels – i.e., strategic, detailed/tactical and operational/implementation – is highly effective as it separates out the three stages of the process for the creation of urban environments, which require different skills and mind-sets. The Concept Plans covers aspirations, what the community wants to achieve, and confronts major strategic trade-offs and dilemmas – quite deliberately without getting bogged down in details. The DGP and the Transport Plans (TPs) take the concepts as a starting point and provide the details of how the aspirations are to be achieved. The operational plans then bring the concepts to fruition. The periodic review and updating process in all the levels provides feedback loops that allow adjustments to be made in response to changing aspirations and circumstances.

Role of urban sector governance

The effectiveness of the integration of land use and transport developments in Singapore is greatly assisted by having two key agencies for planning and policy, namely: the URA for spatial development and land use, and the LTA for all modes of transport. It is often argued that integration can *only* be achieved if the agencies responsible for land use and transport planning are themselves integrated into one overarching agency. In Singapore, the mechanism of cross-agency committees is used instead, which works effectively in part because the Singapore Government as a whole is relatively integrated, with less of the departmental silos culture frequently seen in other national and city governments.

Another factor contributing towards integration is the large percentage of land in government ownership. The government uses land release strategically as a proactive means to guide the implementation of the Concept and Land Use Plans. The Land Acquisition Act was also important. This was crucial in allowing HDB and JTC to get access to land affordably and expeditiously. It was amended in 1966 to greatly broaden the legal basis for government acquisition of land. Land can be acquired for any use deemed to be in the public benefit. The Act allowed the land around most MRT stations to be acquired before construction, so that it was usually the government which reaped any windfall in land values from the MRT investments.

Integration of land use and transport – strategic and statutory plans

The 1971 SCP – Ring Plan

The 1971 Concept Plan was the first in a series of Concept and Transport Plans produced for Singapore which set out the ways in which land use and transport are to be integrated. This plan decentralized population into HDB new towns away from the city centre, and connected them by an efficient transport system of roads, expressways and public transport, with corridors planned for MRT.

This plan was structured around mass transit spines, with the centres of satellite ‘new towns’ being integrated with and located around mass transit stops. The centres contain local shopping and other commercial and community services commensurate with the population envisaged in the new towns (i.e. between 20,000 and 40,000 families; or 60,000 to 120,000 people). Up to seven residential neighbourhoods (each containing 4000–6000 families) are grouped around the centre. In addition to housing, these neighbourhoods contain schools, community and recreation facilities. A system of pedestrian routes link the neighbourhood

centres to the town centre and the MRT stop (Cervero, 1998). A bus interchange in the centre provides for longer distance trips from residential areas out of walking distance.⁴

The plan also provided for some 24 industrial ‘estates’ spread around the island, with a major concentration in the western part of the island where the port is also located.

While the plan aimed for self containment to some extent, in practice major employment centres were originally missing from the new towns. As a result, up to 80 per cent of employed residents travelled outside their new town to work to jobs in the CBD, the major industrial areas – or to other new towns. Unfortunately this arrangement – not without its critics (Willoughby, 2000) – reflected at the time a classic lack of integration between the distribution of housing and employment opportunities which has been rectified in later plans. It should be noted that a simple balancing of job opportunities with employed residents would *not* eliminate out commuting, but would reduce the necessity for people to commute.

The policy objectives of the plan were for a public transport orientated compact urban structure, with restraint on both motor car ownership and usage. The background studies to the Plan made it clear that the limited land available in Singapore could *not* accommodate the extent of the road network required to provide the anticipated travel demand if the travel was undertaken primarily by private car. This realism about the constraints faced in land use and transport planning is perhaps something other cities could emulate. The whole planning and design approach was therefore directed towards facilitating the use of public transport, with public transport investment becoming a clear policy objective. Notwithstanding this, it was argued that a good quality free flowing arterial road network was *also* vital for the economic efficiency and growth of the city. The concept of ‘free flowing’ traffic has perhaps been overemphasized in the design and management of the network as it has resulted in travel by car being quicker than travel by public transport.

The 1991 Revised Concept Plan

In the 1991 Plan, transport considerations resulted in two key refinements to land use planning strategies for Singapore:

- The decentralization of some growth in commercial and other economic activities from the city centre (in addition to housing), through the development of regional, sub-regional and fringe centres at MRT stations; and
- The location of employment areas (such as industrial estates, business parks and commercial centres) near to residential areas, with the intention of reducing the need for vehicular travel to work. In particular, more homes were to be built in the western part of the island, while more employment centres would be created in the east.

Despite these refinements, many plots of land close to the stations on the original MRT network opened in 1987 were only developed by 2010, and some cases still remain vacant. This allows flexibility in the location of still to be identified land uses, but also leaves the new towns with unfinished town centres.

4. This is a classical layout that physically integrates land use and transport facilities.

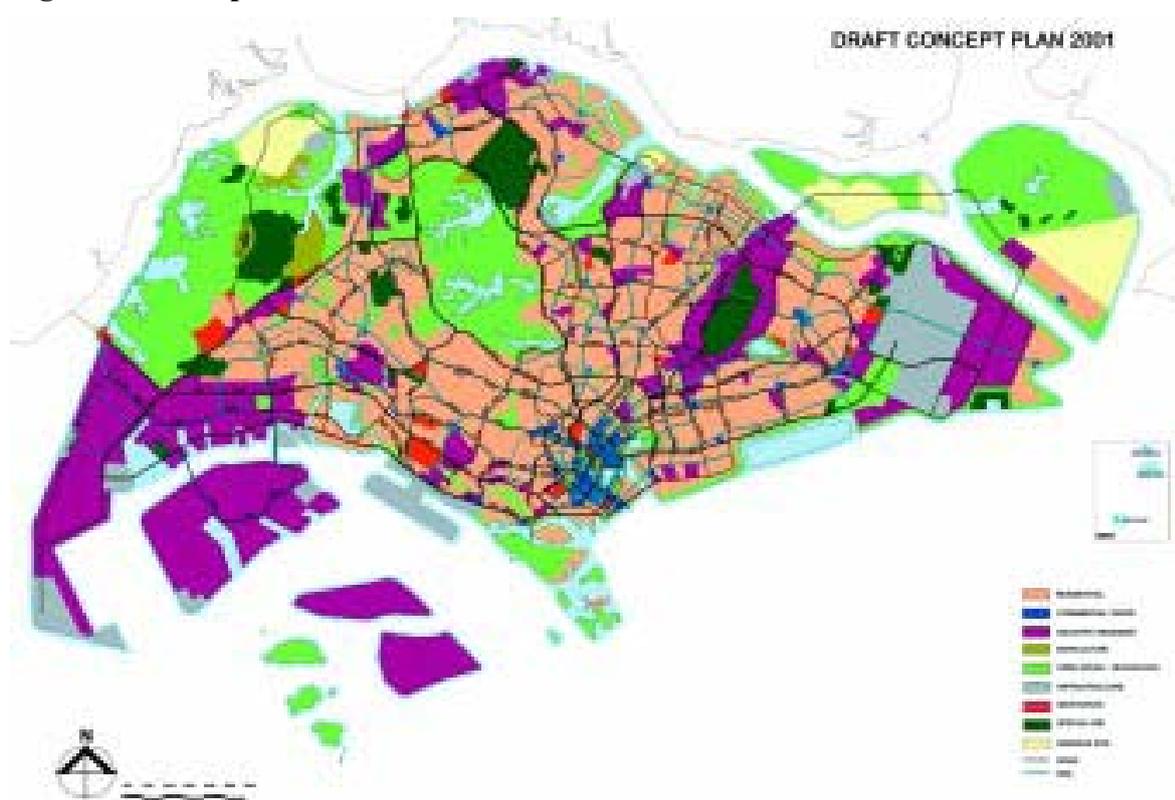
2001 Concept Plan

This supersedes the 1991 Plan. The vision set out in the Concept Plan for 2001 is to develop Singapore into a thriving ‘world-class city’ in the 21st century based on a population scenario of 5.5 million. The key proposals of this plan are:

- Providing more new homes in familiar places – which places an emphasis on increasing the population in the central area and in older inner areas;
- Introducing more high-rise city living;
- Offering more choices for recreation;
- Allowing greater flexibility for businesses;
- Establishing a global business centre;
- Building an extensive rail network; and
- Focussing on identity.

This plan reaffirmed the importance of the CBD and placed less emphasis on the regional centres and sub-regional centres. It is interesting to note that the publicly available version of Plan includes only one reference to transport. While this proposal does not refer to integration, the more extensive rail network consists of two orbital lines one of which links five sub regional centres, the other which links the three regional centres.

Figure 1: Concept Plan 2001



Source: Lim and Tang 2001

The 1996 Transport White Paper ‘A World Class Transport System’

This document was produced following the creation of the Land Transport Authority (LTA) in 1995. It sets out the vision of the Singapore Government to build a land transport system that would meet the needs and demands of a dynamic and growing city. One of the four key strategies to realise this vision was integrating land use and transport planning. The White Paper states ‘The importance of an integrated land use and transport planning approach cannot be overemphasized.’

The 1996 White Paper emphasizes the importance of planning at a ‘micro level’ to integrate land use around MRT stations. It advocates concentrating the highest density (plot ratio) developments around major public transport nodes such as MRT stations and dispersing less compact developments further away from these modes. It then discusses the progressive release by URA of land around MRT stations for development – not just commercial development – but also high rise residential developments. It also talks of aiming for a proper mix of residential, industrial and even institutional developments and the highest plot ratios at and around MRT stations. This is seen as a way of providing good accessibility to key centres providing employment, housing, leisure and other activities.

The 2008 Transport Master Plan – A People Centred Land Transport System

This continues the approach to land-use and transport integration in the 1996 White Paper, but with some refinements, including:

- Increased commitments to provision of more covered pedestrian linkways and pedestrian (covered) bridges linked to developments and pedestrian networks in developments in order to enhance the accessibility of public transport;
- More PT interchanges ‘co-located’ with retail and commercial development; and
- Continuation of the reduction in parking requirements per square metre in new developments that had been started in the 1990s.

In addition new road infrastructure was to be built to serve new development areas, or to increase the capacity to existing areas. There are also proposals to expand the Rapid Transit System (RTS) network from 138 kilometres to 278 kilometres, and a new North-South Expressway.

Walking and cycling were both included under the heading of ‘Supporting Measures’, but without any strong commitment to their potential roles. This limited coverage of walking related to recommendations to promoting walking through better pedestrianization and town planning, and building cycle facilities at MRT and bus interchanges away from the city.

Transport modes relied on in the plans

As noted above, the plans in Singapore rely heavily on public transport as the means of transport for people, and in particular place emphasis on rail transport, both metro (MRT) and LRT. Even so, far more trips are made every day on buses than by rail. Until recently, not as much attention was paid to improving this mode of public transport, in terms of service coverage, operations and infrastructure, as was paid to MRT; a phenomenon that is *not* unique to Singapore. The 2008 Land Transport Master Plan recognized this to an extent by announcing that the LTA would take over bus route planning from the franchised bus operators as part of a renewed push for even stronger integration of the public transport network.

While steady improvement of the city's public transport has been a major commitment, with significant investment in supportive high quality infrastructure, there has been less focus on public transport service delivery and on the quality of service to users. In the government's recent transport strategy there is some recognition of this fact – reflected in the stated need to improve public transport by making it a 'mode of choice'. The strategy also recognizes the need to improve the bus system more rapidly – with more extensive on-road priority measures, a shift to contestable bus route tranches at some point, and the LTA taking over the planning of bus routes.

More surprisingly, little attention has been paid to cycling and walking as a means of transport – either stand alone, or as access modes to MRT and bus services. This is beginning to change but much remains to be done. Pedestrian routes are provided in new towns, but are rather spartan. Early MRT-bus interchange designs sometimes required overly long walks between platforms and bus boarding and alighting points. Recent rail – bus interchanges have been reducing these distances and improving the quality of connections greatly. There is a new program to improve conditions for cycling as an 'intra-town' mode.

Given the restrictions on car ownership and use, roads are *not* planned as the main means of transport of people. However, a high quality free flowing road network is considered critical to support the economic activities and efficiency of the City State. Goods within Singapore are transported exclusively by road. While the lack of space, rather than lack of finance was the driver for limiting the provision of additional road space over the years, this has not prevented the construction of roads per se or a highly sophisticated road network.

Although not intended as structuring elements in plans, by their overall width the arterial roads and expressways do act as such. The density and scale of the road network is however a function of the private car travel demand in the peak period, which in turn is a function of the price, put on car ownership and use, rather than a reflection of road freight transport needs.⁵

This balance between the supply and demand of road infrastructure is *not* static and has been reassessed at the review of the Concept or Transport plans. This has even included consideration of a Singapore Underground Road System (SURS) to provide extra road space that would permit a significant increase car ownership and use.⁶

The informal public transport sector has *not* made any contribution to meeting the transport demand in Singapore since the early 1970s, at a time when the formal public transport was not providing an adequate quantity or level of service. Given the circumstances, the government subsequently stepped in to reform the formal public transport and at the same time largely erase the informal sector.

Extent of integration being achieved on the ground

Overall, a high degree of land use/transport integration is being achieved on the ground in Singapore. At a city level, this is *not* surprising given the integrated spatial planning of land uses and transport networks, and implementation of new towns and rail infrastructure programmes in accordance with these plans. There are of course some exceptions – for

5. Although some projects along the west coast corridor – such as the new 'semi-expressway' road viaduct along Pasir Panjang Road/West Coast Highway – clearly reflect freight transport priorities.

6. There are two long-standing tunnel sections of the Central Expressway (CTE) and the new Kalland Paya Lebar Expressway (KPE) has 12 kilometres underground. Underground sections are planned for the North South Expressway.

example the construction of the Bukit Panjang LRT was conceived *after* the new town was developed and so it was difficult to integrate the line well with the land uses.

At an overall city level also, adjustments have been made over time in the distribution of residential and commercial/industrial land uses in order to reduce journey to work travel demands and produce more balanced two way flows on the network.

At a more local level, locations around MRT stations have been safeguarded for types of development that would benefit from the enhanced accessibility and transport capacity provided by the MRT. This approach allows flexibility in the location of still to be identified land uses, but has also left many of the new towns with unfinished town centres for a surprising length of time (since the late 1980s when the first MRT lines opened).

However, at a more detailed human scale, it could be argued that the integration of land use with transport in Singapore is not entirely satisfactory. The arterial roads by their design, scale and land-take are wide and *not* integrated with the surrounding areas, but instead act as barriers to pedestrian movement. Most major road junctions have large radius slip lanes for turning vehicles, which causes detours and hazards for pedestrians and cyclists. Given the space constraints, a surprisingly generous amount of space is devoted to large intersections. Design guidelines resist the building of anything like a traditional street. Instead residential areas, consist of large superblocks of apartments in parkland with car parking (in a Modernist style reminiscent of Le Corbusier). While HDB housing areas are highly permeable for pedestrians and their internal traffic is low-speed, they lack ground-level interest.

The integration of local area planning and transport has not focused on creating a human scale built environment, supporting local area movement networks, and providing user friendly access to public transport to the extent that might be expected given the wider strategies. This is reflected in the limited attention that appears to have been given to walking and cycling, while most pedestrian facilities are adequate but basic. On a more positive note, a high priority given to tree planting over several decades provides crucial shade and there is a large program to provide covered walkways throughout the new towns. Most new town centres have pedestrian oriented designs and pleasant car-free areas in their cores.

The Orchard Road shopping area perhaps illustrates the tension between traffic priority and the pedestrian realm in Singapore's approach. Pedestrians are provided with quality space but it is segregated from vehicles so as not to interfere with the traffic flows. There are exceptions, including the renovated riverside areas of Boat Quay, Clarke Quay and Robertson Quay, with their mixed-use developments, re-use of old buildings, and quality pedestrian space.

Role of size of Singapore and single level of government in Singapore

The small size of Singapore facilitates the integration of government policy formulation and decision making and could be considered as one of the most significant explanatory variables for successful integrated development. However, it can be argued that the relative absence of departmental silos, and use of cross agency committees make a greater contribution – and one that can be replicated elsewhere given the will of technical staff and leadership by departmental heads.

Similar arguments can be applied to the unitary structure of the Singapore Government. This removes the policy, planning and design mismatches and demarcation disputes than can arise between two levels of government. But such mismatches can be minimized and managed if the roles and responsibilities of the different levels of government are reasonably clearly

defined – and if a political (or technical) process is put in place for dispute resolution. It is accepted that creating such well structured and functional institutional arrangements may be asking a lot in many developing cities – but are not beyond the bounds of what is possible and achievable. But mismatches that affect integration are not likely to occur unless responsibility for urban development rests with a different level of government to that for transport infrastructure. (It is accepted that outside Singapore charging for use of road space may be seen as affecting national taxation policy as well as local transport policy, and so take time to introduce while the different levels of government sort out their differences.)

Critical evaluation and appraisal criteria

The criteria to assess the extent and effectiveness (i.e. success) of land use/transport integration should include concern for:

- Reducing at the city level the overall demand for motorized travel, through the spatial distribution of population and job opportunities and the spatial distribution of shops, education, health and community facilities.
- Ensuring at the city level that the catchment area and/or trip generation of land uses is matched by the catchment provided by their location on transport infrastructure. For example, are land uses with a city wide catchment located at a PT hub with city wide access?
- Ensuring that higher density residential development have been located close to PT routes and interchanges (Transit Orientated Development).
- Ensuring that industrial/warehousing areas have been located close to major interchanges on the road network?
- Designing residential and other areas to create a pleasant urban environment by removing traffic through the layout and design of the road networks?
- Designing local areas with walking and cycling as the primary means of mobility to access local facilities?
- Refraining from requiring excessive amounts of vehicle parking space (Singapore does have minimum parking requirements but they are now modest and relatively realistic in light of the actual demand for parking which is almost always priced) (ADB, 2011).

Provided the data (and modelling) is available, quantitative values can be put on a number of these criteria. However for most cities, a qualitative assessment by urban planning professionals may be all that is possible. In the case of Singapore, through trial and error (and the post implementation monitoring of plans and taking corrective actions), it is considered that five out of the above six criteria have been fulfilled – with the result that much of what has been achieved could be judged a success. Only with regard to designing local areas could Singapore be considered as ‘work in progress’.

Conclusion

Singapore was chosen for a Case Study as it has long been regarded as an exemplar of integrated land use and transport planning (and also of the development of good urban transport institutions and governance). The overall lesson is that while the small population and geographic size contribute towards the successful integration of urban development and transport in Singapore, the policies and practices are replicable elsewhere in larger cities, and where two levels of government are present. However this does require adequate institutional capacity and a good governance structure – two of the key strengths of the Singapore model.

The other strengths of the Singapore model are:

- A set of visions, objectives and policies for land use/transport integration that have remained consistent from 1971 up to and including the 2008 Master Plan.
- Any plan or policy update or amendment has been based on a clear technical review and analysis of experience, as well as changing circumstances.
- Creation of the LTA which has played a key role in the integration of land use and transport developments by providing a long term vision, clear policy objectives and a comprehensive policy, financial and regulatory framework for transport.
- Use of infrastructure investment as a means to facilitate the implementation of Concept and Master Plans. This is not a new concept, but in Singapore it was applied within the framework of an agreed Plan, and after due analysis of the desirable timing of investment. MRT infrastructure was built as a catalyst to corridor development, but only *after* a vigorous debate on the value of investing in the first two lines. More recently, road investment was also used to support development, particularly commercial and industrial development in specific areas.
- A well planned and designed road network to facilitate/support the economic functions of a city in addition to a well planned and designed public transport system, and restrictions on vehicle usage. Road space provided was designed to be adequate to provide a good level of service based on the vehicle population (and in return for high costs of use). This lesson is perhaps one of the more surprising, but logical lessons from Singapore's transport policy.

These are all lessons that can be applied on other cities.

The weaknesses are:

- A focus on strategic concepts and detailed master plans, with insufficient attention to integration at the local or neighbourhood level, where a human scale is required in designs.
- Limited support for non-motorized movement (walking and cycling).
- Integration was used to achieve a single strategic land use objective. The 1971 SCP sought to reduce density in the CBD, and to improve housing conditions through the creation of new towns, and was very effective in doing so. However, these were in effect 'dormitory towns'. The later plans sought to make these towns more self sufficient to reduce the need for commuting out – and balance the flows on the network.
- The difficulty of improving sufficiently the quantity, quality and level of service of public transport to keep up with demand and rising aspirations, especially in the bus system. The lesson here is that *even* with motor car restraint measures in place, public transport *must* be continuously improved to be an attractive mode of choice – especially in affluent societies/among high income groups.
- While many aspects of LTA policy and practice would be recognized as contributing to visions of sustainable transport, this has *not* been stated as a formal objective of LTA policy until quite recently.

These are weaknesses that should be avoided in other cities.

The current threats to integration in Singapore are:

- Continuing growth in car ownership and use, despite the restraint measures that are in place. Proactive management (coupled with continuous investment) is needed to make the most effective use of available road space. Growth in car ownership is a

threat globally. The threat in Singapore is if despite restraint, it starts to seriously exceed supply of road space, leading to pressure for further road widening.

- Slow implementation of the proposals to make LTA responsible for overall bus network planning and introduction of greater competition in the supply of services.

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