INFRASTRUCTURE AND SUSTAINABLE URBANIZATION FOR THE 21ST CENTURY

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Report of Chairman of Focus Groups 1 and 3 On Roundtable Sessions:

The groups chose Mr Ching-Kuo Hsiao of Chinese Taipei to act as their Chairman and spokesperson in reporting on their deliberations in Terengganu on 23 April with respect to developing relevance for private sector participation in the various areas set out below. Paul Brennan from Indonesia assisted the Chairman in this task during the plenary session of the Workshop. The *rapporteur* was Mrs Heryanti of Malaysia.

Topics for Focus Group 1

Information Technology (IT) in Infrastructure Development
Requirements for IT to be successfully implemented in Infrastructure Development

Although the focus group was large and had many views, it was able to reach consensus in a number of important areas.

It was noted that there are many well-known "state-of-the-art" examples in the field of Information Technology (IT) and they are included in expressions like "Information Superhighway", the "InfoBahn", Singapore's technology corridors, Malaysia's "Multimedia Supercorridor" (MSC), as well as the Boston Corridor and Silicon Valley. These refer to the Intemet "backbone" which is a global network of very high bandwidth connections capable of handling massive transmissions of data at high speed.

Infrastructure initiatives of massive proportions, these and similar IT developments were essentially the result of two events of the early 1980s. One was the introduction of personal computers for business use; the other was the break-up of Bell Telephone. By the early 90s, computers entered the home. This was around the time the Intemet, which had actually been in use by the military, universities and large research corporations since the mid-60s became commercially viable.

Delegates were of the view that IT is a broad term and concepts concerning it were not difficult to develop. Practical implementation, however, was another matter. Another view was that until there is implementation, we do not really know what can actually be achieved.

Another view was that IT, as a concept, covers many areas including the "virtual" city. But there's a certain tension as between building "knowledge" centres and meeting the needs of those in rural regions. Moreover, it's clear that not everyone can be a "knowledge" worker.

It was also urged that the public sector should take the development initiative in establishing IT platforms as it simultaneously moves to abolish regional competition.

Because IT opens many avenues for development, there is an urgent need to establish and define priorities. Throughout the process, it is incumbent upon decision-makers to strike a reasonable balance between "urban" and "regional" interests.

Regarding the public and business/private sectors, it was noted that the former operates at the macro level while the latter is at the micro level. It's necessary that the public sector be proactive in consulting with the private sector in order to benefit from "reality checks".

Another group member likened IT to a vehicle which is moving into the "information age". As it approaches the superhighway, however, it will encounter both benefits and difficulties.

With respect to the first, there appears to be little doubt but that the information age holds many benefits for, and is supportive of, the various dimensions of sustainable development.

- With respect to the social dimension, the vastly increased ability to communicate will create new educational opportunities for people through distance learning, and further promote the popularization of best practices regarding sustainable development issues. In the field of university education alone, the increases in efficiency may be enormous. The curriculum may offer courses on demand, for example, rather than on a take what you get basis; the traditional academic calendar may be replaced by year round operations; and the one-time degree, or the earning of many such qualifications, may be overtaken by the concept of lifelong learning.

- Such a leap in communications efficiency may spur the growth of economies and influence a structural transformation–both of which are at the core of development. If IT is applied to all phases of infrastructure development, productivity will improve. The technology is there but it is often not used. This could be remedied through expanded training initiatives. As the investment in human capital rises, and organizations become more efficient, competition will increase. This economic dimension can result in a bigger economic pie and consequent higher standards of living worldwide.

- The environmental dimension of information technology infrastructure can be positive as the base of "knowledge" workers continues to grow worldwide. Similarly, consumers will be able to benefit merely by being appropriately "wired", and this will also use scarce resources wisely.

There is a significant difficulty, however, in that opportunities are directed toward the major players who can afford the high cost of entry–the initial capital cost outlay for equipment and substantial user fees. In the result, these superhighway networks, as currently envisioned, will be available primarily to only large business, major research institutions and universities. Medium-sized and smaller organizations with insufficiently high bandwidths will be less likely to be able to afford the relatively high cost of accessing the major Intemet hubs.

If the benefits are to extend to the general populace, and thereby have an impact in the aggregate on sustainable development, ways must be found to enfranchise all those who may be interested in participating.

The toll for accessing this superhighway ought not to be set so high as to exclude a major sector of the potential market. Policy formulations on best practices to remedy this shortcoming, whether by way of grants, tax write-offs or otherwise, should seek to be inclusive of the wider market rather than exclusionary – as now appears to be the case.

In the result, convening fora on best- and worst- practices with respect to financing information age IT seems to be an urgent requirement. Dealing with the most efficient ways to mobilize public/private capital and secure development aid for worthy projects in this field must be a priority. If SMEs are unable to afford the superhighway, the full benefits of IT will not likely be enjoyed by APEC economics.

Notwithstanding that companies strive to distinguish themselves from their competitors, the need for standardization of regulatory frameworks was acknowledged. As the global tendency to move toward decentralization continues, governments ought to be more focused on developing

regulations to define the “rules of the game”. The business/private sector should be encouraged to concentrate on delivering services.

Topic for Focus Group 3

Public-Business/Private Sector Interaction

It was the group's view that more cooperation between the Public-Business/Private sectors should be encouraged. The public sector, through its activities at the macro level, should be a facilitator of SME development activities.

The public sector has to map out a joint vision with the business/private sector. After establishing such a vision, they should then define roles. It was suggested that, subject to dealing with interim gaps in government regulation–when the business/private sector may engage in some self-regulation–the government should expand its role as regulator. The private sector should expand its role in the delivery of services.

Harmonization of roles is important to achieving these objectives and the building of a good IT platform to encourage education will serve this end through facilitating the exchange of views between the two sectors.

The business/private sector should be given more incentive to operate since it tends to be more creative than the public sector; creativity is the key to efficiently harvesting the benefits of the information age. The public sector should establish the “rules of the game” and apply them impartially; but the private sector should have more room to play,

With respect to the information age, APEC should create a huge database cataloging best and worst practices for infrastructure development. Government procurement information used to be available only to a limited few, but it's now widely available on the Intemet in an open and transparent format.

The APEC economies have entered an era of sharing information. It may not be necessary to reinvent the wheel if sharing information will forestall the need to build a new platform. Interested parties should review what's available on the superhighway, take what is appropriate and modify according to circumstances.

Due to time constraints, the group dealt with remaining issues only briefly. The issues and responses follow.

The Information Age will create new structures for public-business/private interactions. Can these be identified?

In Australia, there is a legal requirement for citizens to vote during elections. At present, people are herded into schools and other public places and not released until they've satisfied their statutory obligations. Perhaps information age technology could be used to allow them to vote through some particular application of their credit cards.

What changes or new development may be required to facilitate further this interaction?

Greater access to IT facilities should be promoted through public-business/private sector cooperation.

Are there possibilities of developing new concepts in public-private sector interaction given the revolutionary power of IT and, if so, can these be identified?

Yes. Various superhighways are now open or soon to come on stream. Access to all potential users should be actively facilitated now. As mentioned earlier, the Intemet has actually been around since the 1960s, having been developed primarily as a military-oriented network that eventually expanded to cover universities and research institutions that were doing non-military work. Until about 1994, it was not possible to access this system except through a university or research institution. The real revolution came, however, with the growth of Intemet Service Providers that offered dial-up connections on a commercial basis. Their numbers have since grown exponentially.

There ought not to be a similar 30-year wait with respect to open-access to the superhighways now operating. There will obviously be a multiplier effect with respect to the benefits to be gained through full participation in the information age and these benefits can accrue to all members of a given economy. The group view was that it's better that they begin accumulating sooner rather than later.

Are there new roles for the public sector and the private sector? Are there old roles to be discarded in the Information Age?

New roles are being identified as each sector does what it's best qualified to do.

Old roles are being discarded as, for example, in the case of the government that is no longer perceived as being "all knowing" or having a monopoly on truth. As decentralization spreads, the government will have more time to make the "rules" – regulations – and, in consequence, become better able to perform its tasks. The business/private sector will have a greater role in decision making as its participation in the delivery of services expands.

Report of Chairman of Focus Group 2 on Roundtable Sessions: Table A, B, C & D

The first question was to decide whether the group is talking about “sustainable” infrastructure or infrastructure support to sustain development. It was decided that the group was not talking here of sustainable infrastructure in the senses of “green” infrastructure but in terms of sustainable development.

Sustainability was discussed in support that implies broader context of sustainability, which also accounts for economic, financial, environmental and social sustainability of the infrastructure service and its effect on the community. That leads us to the very view that infrastructure must serve long term ends and reflect local values and objectives. To make sure the infrastructure is sustainable is the transparency of the process, and a wider framework of judgement approach to the locality, whether local, provincial, national or regional. The long-term strategies or programs are needed, and the frame of reference also needs to be long termed. Those can be referred for subsequent judgement made at other times by other bodies or for specific project characteristic.

There are some preconditions needed to enable decision-makers to make appropriate choices for sustainable development. Firstly, the budgetary process that allow choices to be made across alternative technical, or sub sector solution, for instance road verses rail.

The decision has to be made close to the beneficiaries. It was noted that it was costly in term of time and resources to get all the views and inputs of stakeholders, including the business/private sector. A possible solution suggested was the project development funding facilities, which allow the government to invite in the private sector and other participants in the early concept stage. This is to ensure it is the right choice before the time, costs and process of planning have gone so far that the decision is irrevocable.

There is also a need to come up with a long-term finding tool that would have the local beneficiaries of the future fund the present expenditure. Some of the tools suggested were bank loans, bonds and "securities" revenue streams.

The maintenance factor of an infrastructure project should also be of a consideration. This is because the future maintenance is very important on the sustainability of the project, in order for the infrastructure to continue to provide service for the society. As yet, there is no clear financing and prioritizing method to allocate funds for maintenance purposes. As a result, the existing infrastructure would deteriorate and fall behind.

There are also concerns about the relationship of the collected funds and the development of a project, for example, how do we know that road taxes do not go into the general revenue, and are tied instead to the transportation or road development. The key to overcome misallocation is by localizing the decision making process, and the funding source. For instance, any taxes and levy imposed, or bonds raised, are made for a specific purposes as decided by the local community. Another approach is to raise levy or fees on indirect as well as direct beneficiaries of the project, such as Chinese Taipei’s approach to charging a fee that relates to the capital gains or other benefits to the businesses along the route.

As for the mega budget type of development that is deemed necessary, but has no clear pay off, or has a long term pay off, for instance after thirty to forty years, the question raised was how was the decision made? What steps should the government take, as to whether to mobilize the project, or opt to postpone it? In the past, we can see that some governments have taken brave steps in implementing these mega projects which pay off were not clear at the time the decision was made. This is because there is a vision at the protocol level. However, this is not possible to do all the

time, especially when there is limited funds. Under these circumstances, these projects are often delayed, and the community would have to suffer the social, economical, and environmental consequences.

For smaller scale projects, the support can come from the central government to the local government. Special purpose fund could overcome the financial shortage problem. In the Miyazawa plan, Japan has given Malaysia an environmental loan. This is one of the examples of the mega project type that seeks outside agency assistance.

When a project is difficult to finance, it will not only face delay, but also the opportunity to reexamine the objectives of the project. The government can refocus on alternate means to achieve the end result, and should take advantage of the technological changes, for example, they can now get a smaller and more efficient sewer system, and benefit from the advancement brought by information technology. Some advent of information technology are remote monitored and managed facilities, automated facilities that provide reliable services and ensure supply of professional and technical level personnel, and automated billing that improves efficiency and reduces corrupt practices.

It is important that the benefits of sustainable infrastructure be shown. Easy access to information is required to make the right decision. The information available has to be appropriate, and it is also important to give people the right decision making tools in order to allow them to choose between alternative solutions and priorities. It was agreed that incentives, too, are seen as a tool for bringing about appropriate decision at the government and household levels, though the group did not arrive to any conclusion as to which method of incentives is most effective.

Appropriate information would allow the people to see the economic, environmental, social and financial impacts of a particular project. The information technology can assist in deciding on difficult choices, for instance, choosing between a mega project with macro economic effects, or a micro project with a more immediate impact. Adequate available information does not mean that this will or should provide an even-spread application across society. It means that the strategic or mega projects that go ahead would be more carefully selected in balance with using resources to meet more immediate and locally determined needs.

The group's view was that, the points that can be distilled from the discussion, on how to carry out infrastructure projects in the light of the economic crisis, and how to improve the effectiveness of social safety net programs, should be put forward to ministers.

The Secretariat may also include material and improve the documentation of ideas through its website. There was also a suggestion for a further discussion agenda between member economies and by other party within and beyond APEC. It was also recommended that a report on the views, recommendation on approaches and future steps be compiled.

Officials and Delegates of the APEC Infrastructure Dialogue 1999,

Let me greet you with a very warm welcome to Malaysia, a country that has actively supported and participated in all APEC Infrastructure Dialogues from inception until today. We feel extremely honoured to be given the opportunity to organize this Dialogue and look forward to play the role of host, together with the state of Terengganu, to this auspicious event. We hope we shall be able to do everything possible to make your stay here a memorable one.

It was almost a year ago, in May 1998, that Chinese Taipei elegantly and successfully hosted the last Dialogue. We promised then, we would try to emulate Chinese Taipei in playing the role of the perfect host. So if there are shortcomings in our show please feel free to bring to our attention and we will try our very best to live up to your expectations.

Ladies and Gentlemen,

The last APEC Infrastructure Dialogue was conducted when the global economy was in the midst of the economic meltdown and financial crisis. At that session we addressed the issue of sustainable development in an economic climate that was clearly unsustainable. Now we are beginning to see some light at the end of the tunnel. Let us hope and pray it is not the headlight of a speeding train coming from the other side.

Ladies and Gentlemen,

The importance of infrastructure in supporting economic growth and alleviating poverty is well recognised. The challenge of the day is to provide infrastructure to serve these economic ideals in harmony with the environment whilst enabling sustainability. Notwithstanding the economic and financial turmoil, the demand for infrastructure amongst us is nonetheless huge and urgent. This has long been recognised by APEC in the Osaka Action Agenda, which included it as one of the priority areas for economic and technical cooperation leading to the establishment of this Dialogue.

Ladies and Gentlemen,

The financial turbulence of past years has brought pains to many of us if not all. But with the pain comes invaluable lessons that can be learned, not the least of which was to handle the issue of infrastructure with utmost care. If not for anything the importance of handling infrastructure with special care should have already been obvious by virtue of their magnitude and depth alone, both physically and in terms of capital required.

Infrastructure, in most cases is as much the victim as the cause. This dual role of victim and villain have highlighted and alerted us and many the need to manage the provision of infrastructure judiciously in order to prevent the two roles developing into a vicious descending economic spiral that can sapped nations off it energy and leave it utterly wilted. We have been forewarned of this at the last Dialogue. Privatisation was recommended but so was fair competition. Choosing one and neglecting the other is recipe for making infrastructure the spice for financial turmoil. This argument underscores the important role played by both the business/private sector as providers of infrastructures, and the public institutions as guardians of the public trust.

Ladies and Gentlemen,

The financial turbulence also highlighted the importance of having mature domestic capital market able to sustain what constitutes domestic needs for services. Such a provision at least remove one risk, that is, the foreign exchange risk. Ultimately, it cannot be denied that in the majority of cases, and by virtue of the long life-cycle of infrastructure projects, the major issues spirals down to that

Welcome Speech

by

Dato' Hj. Abdul Rahman b. Abdullah
Construction Industry Development Board (CIDB) Malaysia

of handling and sharing of risks between public sector as the policy making body, private sector as the providers of service and the public as consumers.

Ladies and Gentlemen,

What better forum can there be other than this Dialogue for us to share our experience and perception on the lessons learned from our bitter encounter with the financial problems of the past years? What better forum can there be for us to chart our course, collectively to put right where we went wrong? What better forum can there be where we can help each other and reassert out commitment to reflect the concern of the broader public?

Malaysia, this time around have added a new layer to infrastructure development by suggesting that the needs for the Information Age that is surely coming be addressed now. Urbanisation should take cognizance of the onslaught of information and communication technology and make provision for their presence in future. We propose to do this by sharing our experience in developing a whole city that banks its relevancy on the information and communication technology. APEC itself has committed to making the Asia Pacific region one that is an information society by the year 2001. We, therefore, see this year's Dialogue as being the watershed for the incorporation of the needs of the Information Age into urbanisation. This, we are quite sure will instill interests in many of the APEC economies. After all the world of tomorrow will belong to the Information Age and APEC members will surely not want to be left behind.

With that, I respectfully and humbly welcome all of you. May we all gain something from this collective effort. Thank you.

The Chairman for APEC Infrastructure Workshop, Officials and Delegates

Let me foremost extend my warmest greeting to all of you and welcome all of you to beautiful Malaysia and, in particular, to Terengganu. In Malaysia we say 'Selamat Datang'. I will not try to convince you of the beauty of Terengganu as a reflection of the rest of Malaysia but urge all of you to see for yourself if you can wrangle some time from your busy schedule. I am sure those who do not take this opportunity to see the state of Terengganu; and the seas and lakes that forms a harmonious part of the land, are really missing the chance of a lifetime.

Ladies and gentlemen of the APEC economies,

Many of us, not unlike Malaysia, have emerged from our financial battle and are currently licking our wounds. It was a tough battle since we have not seen the like of it for some time. Battle scarred as we are now, we still need to look at the stark reality in order to be prepared for future economic turmoil or to avoid it if avoidance is possible. It is at this time that all our past assumptions must be questioned and reviewed; there can be no stones left unturned as we search for solutions that will guarantee the future of our children's children. If there is anything to learn from the past two years' experience it is that our financial system is not perfect and fundamental weaknesses lurks in areas we were not looking. On the other hand we could have been lulled into believing that the financial system was perfect as we gloat over our 'economic success' then. We may even need to question the role of regional groupings such as APEC and the role she has played in alleviating the economic crisis recently including the effect of intertwining the economies of regional grouping and liberalization on spreading the contagion effect of the financial turmoil. These are unpalatable but real issues that need to be addressed now so that weakness can be eliminated and strength nurtured to chart the future path of this forum. In particular, the effect on and the contribution of infrastructure projects to the financial crisis must be fully understood and dealt with not only because infrastructure forms a sizeable chunk of a nation's budget but more so because of the permeating effect of infrastructure development on all other economic activities. Infrastructure, being long term in nature, faces long term risks and thus can ill afford to either face fragility in the financial systems or be exposed to unmanageable systemic risks.

Ladies and gentlemen,

Notwithstanding the financial crisis, social needs cannot be held in abeyance whilst economies heal themselves. If any, the crisis has but magnified the need for social safety nets in these dire times. With this comes the need to provide adequate infrastructure able to support basic quality of life. Social needs are not and cannot be made beholden to economic vagaries and, as such, the need for sufficient infrastructure to support reasonable quality of life is a social and political responsibility of any government. In this context reviewing the manner in which infrastructure are brought to realization can go a long way in helping APEC economies cope with the perpetually rising demand for public services.

Malaysia, even before the onslaught of the financial crisis, has evolved the concept of viewing Information Technology as one dimension of infrastructure and had stressed that the future needs of Information Technology should be incorporated in the urban planning of today. That IT and everything electronic will in no small way affect the lives of people is an accepted fact. If that is so the case then urban planners have a duty to include the needs of IT in future urbanisation exercise and to consider the moderating and sometimes revolutionary impact of IT on the population in general. The technology of the future will undoubtedly change the life style of the consumers of technology and these changes will demand new approaches to urbanisation. The mobility of information transfer will put less demand on the need for mobility of the population except at points where decision calls for execution. Surely this alone calls for a review of some of the principles of urban planning.

Ladies and gentlemen,

The Information age is the age of speed. With information moving at the speed of electricity it is expected to impact tremendously on the speed at which decisions are made and, hopefully, implemented. This has always been the dream of many entrepreneurs. However, the ability to be able to produce things faster is not without its own sets of problems. Among those considered urgent is the ability to generate as fast real demand as supply. Failure to achieve this can produce development that cannot be sustained over long periods. Further, the ability to produce faster will put a strain on the supply of resources. Pursuit of economic goals in this instance can jeopardize the environment; a trade off that can result in permanent damage. Sustainability, therefore becomes a major consideration to contend with. In the age of information, when time is measured in nano seconds, there is not much time left for contemplation. If right things can be distributed fast so can wrong things. Yet there cannot be room for erroneous decision-making notwithstanding the shortage of time. The answer lies in judicious planning and standardization.

Ladies and gentlemen,

As we approach the new millenium that is the 21st century we realised that we are now equipped with the tools to achieve many things which we could only dream of in the past. But with these new tools that give us this new power comes the possibility of us misusing it and putting to danger the quality of life of our future generation. Our biggest mistake will be to capitalize the powers of today at the expense of the future. There appear to be a mismatch between our ability to utilize resources given the development in the ITC field and our ability to replenish depleted resources which are subject to the laws of nature. This we should realize and take steps to address. In reality our real needs are quite basic and simple. If we consume beyond our needs then we taking what is due to our future. This noble value we must take cognizance and entrench it in the principles of urban design lest we succumbed to our weakness and forget that the resources of today is there to serve those coming after us.

Ladies and gentlemen,

I have to admit that Malaysia embarked in our "Multimedia Supercorridor" project, the manifestation of our commitment to IT, with the objective to put Malaysia in the forefront in this region. We saw the need for sufficient and up-to-date Information Age infrastructure as a prerequisite to competitiveness of the future. We envision Malaysia to be the hub for information on the world map. And we created a whole city not only to handle it, but to be a test bed for the latest in Information technology. Not many will the have same opportunity as us. Those that do not have similar opportunity must now contend with the issue of how to make their cities Information-savvy at minimum cost. Otherwise, we predict the future will spiral to those who recognise that information is the right of every citizens and such rights are addressed by the city managers and harmonize into the city planning agenda.

Recognising the important role information is and will be playing in our life opens a host of opportunity at enhancing the capacity of nations. Through capacity development productivity can be increased. A simple correlation to this is that in times of economic setback investing in productivity enhancing exercise can produce delightful results. Malaysia, whether by design or otherwise, was lucky to have this foresight to invest in information infrastructure, which, among others saw insignificant dent in its operations during the economic crisis.

Ladies and Gentlemen,

Economies, as we all know, evolves around infrastructures and infrastructures, in turn, shapes cities and landscapes. Incorporating the needs of the Information Age as an agenda in infrastructure planning and development will undoubtedly influence the shapes and landscape of cities of tomorrow. But, of greater concern, the Information Age has already prominently affect

lifestyles and will tend to be more influential in the future. To take this into account and to capitalize on this change of trends, urban planners must first of all be aware of these changes and to allow for it in their planning.

At the micro level, the introduction of, say, Intelligent Building in an Intelligent City plan will surely lead to a lifestyle that correspond to this technological development. The introduction of electronic commerce and virtual merchandising will alter the horizons of business and provide new approaches to security issues. More use of the Global Positioning System for peaceful purposes and new usage of Geographical Information System including Remote Sensing opens exciting opportunities in managing intelligent transport system. Routes for public transport must address and take into consideration these new technological inputs and can no longer suffice by just providing point-to-point transportation. The Information Age will call for better management of logistics to facilitate merchandising as the public become increasingly home-based with the advent of small office and home office (SOHO) concept. Leisure time may increase as menial jobs succumb to automation imposing new challenges to urban planners on how to handle this new found free time productively. The future seems to be without bounds for the urban planners as the Information Age comes into maturity.

Ladies and Gentlemen,

APEC itself has taken cognizance and responded to the global explosion of Information and included it as one of the five intended outcomes for APEC's work on infrastructure. Other fora are already forming consultative groups addressing the issues regarding information highway and integrated transportation system. In support of this, one outcome that was included in the *Declaration on an Asia-Pacific Economic Cooperation Framework for Strengthening Economic Cooperation and Development* was the grand ambition "to make the Asia Pacific Information Society a reality by the tear 2001". The paper called for the establishment of a global information infrastructure. In this context the information infrastructure included not just the hardware and their applications but also the institutional framework which supports the use of both application and hardware. Malaysia, has taken proactive steps to address this issue by establishing our Mutimedia Supercorridor (MSC) in which all three elements have been addressed. It is envision that the MSC will be the test bed for everything that is within the ambit of information and communication technology and shall profoundly benefit from the enabling effect of telecomunications and information infrastructure as key elements of the overall infrastructure initiatives are implemented. The deliverables by APEC in the paper were:

(i) To develop human capital,
(ii) To develop stable, safe and efficient capital markets,
(iii) To strengthen economic infrastructure,
(iv) To harness technologies for the future,
(v) To safeguard the quality of life through environmentally sound growth,
(vi) To develop and strengthen the dynamism of small and medium enterprises.

If these are the deliverables in the quest to make APEC an information society obviously designing cities to cater for the needs of an information society will similarly need to contend with these output and make provision for it. It is our contention that the need is urgent enough for us to begin including these needs in our future urbanisation exercise now.

Ladies and Gentlemen,

We hope through this forum we shall be able to share some of our success stories among APEC members and provide avenue to further improve on what we have embarked. We also hope that our APEC friends will be able to avoid some of the pitfalls and reduce the teething problems that comes naturally with any pioneering venture and, in so doing, be able to identify standardization needs and best practices in this area to act as guide for future urban planners.

May all of you gain as much insight from this exercise as Malaysia had in venturing into this area as we approach the new millenium. I wish you all the success.

Thank you and once again, welcome to Malaysia and enjoy Terengganu.

Business/Private Sector Participation And Infrastructure Investment in Asia: The Impact of the Currency Crisis

by

Mr Sean M. O'Sullivan
Public/Private Sector Specialist
Asian Development Bank

Private Sector Participation and Infrastructure Investment in Asia: The Impact of the Currency Crisis

1. INTRODUCTION

1. The currency crisis has created the largest and deepest shock to Asian economies since World War II. In terms of infrastructure investment, hundreds of transactions have been cancelled or delayed, sponsors and developers have lost millions in development fees and hug swathes of value have been wiped off stock markets. The syndicated loan market has become very difficult for sovereign borrowings and almost impossible for non-recourse project finance. The paper reviews the demand for infrastructure in light of the Asian crisis, highlights some of the shortcoming of present models for business/private sector participation and suggests improved approaches. The challenge is to learn from the experience of the crisis and to benefit from the important contribution that can be made by the adoption of best practices in the various infrastructure sectors.

II. INFRASTRUCTURE INVESTMENT IN EAST ASIA

A. Project Finance – Opportunity and Volatility

2. To better understand the nature of the Asian crisis and its impact on infrastructure investment, a project finance series for the last four years was compiled and analyzed in the paper representing non-public funds flowing into infrastructure project development. The summary in Table 1 highlight both the opportunity for, and the volatility of, project finance. The pre-crisis figure of nearly US$41 billion for 1996 contrasts sharply with the lower figures estimated at the end of the 1980s when the total market for funding projects was less than US$5 billion per annum, as well as with the post crisis figure of US$12 billion for 1998. Clearly in the 1990s prior to the crisis the importance of the private sector in infrastructure development was rapidly increasing. As a result of the crisis telecommunications sector has showed the most dramatic decline, reflecting the fact that such projects are typically purely privately funded, and bear demand risk in a newly open environment The energy projects appear more resilient, likely because they hare had some form of government support.

Table 1: Project Finance Data - Infrastructure Projects by Sector

	1995		1996		1997		1998	
Sector	**$M**	**No.**	**$M**	**No.**	**$M**	**No.**	**$M**	**No.**
Water	560	7	1,375	8	0	0	246	1
Transport	8,060	31	15,168	30	10,813	29	1,230	5
Telecoms	1,502	13	7,090	27	3,406	13	359	2
Energy	11,017	44	17,269	43	11,399	27	10,238	21
Total	21,139	95	40,902	108	25,619	69	12,073	29

3. Table 2 shows the same data by country and highlights the varying impact of the Asian currency crisis. Indonesia was the worst affected, with a large number of project renegotiations, postponements and cancellations.

Table 2: Project Finance Data - Infrastructure Projects by Country

	1995		1996		1997		1998	
Country	**$m**	**No.**	**$m**	**No.**	**$m**	**No.**	**$m**	**No.**
Indonesia	5,066	15	8,299	18	7,965	20	866	4
Malaysia	3,948	10	4,971	6	1,510	4	717	1
Singapore	0	0	377	3	812	2	217	2
China	6,270	41	8,334	46	3,526	12	4,670	10
Chinese Taipei	212	2	17	1	0	0	2,215	3
Hong Kong, China	1,780	4	12,974	11	1,995	6	330	1
Philippines	2,433	6	1,281	10	4,568	14	1,929	3
Rep. of Korea	64	3	45	2	367	3		
Thailand	1,367	14	4,605	11	4,877	8	1,129	5
Total	21,139	95	40,902	108	25,619	69	12,073	29

Source. Capital Data Project Financeware, Capital Data Limited London

B. Changing Roles of the Public and Business/Private Sectors Before the Crisis

4. Views on infrastructure development changed markedly in the first half of the 1990s. It became apparent that investment requirements for infrastructure in East Asia were on a scale that dwarfed earlier projections and experience. East Asian "tiger" economies were growing rapidly, demanding massive investments in power, roads and telecommunications. In most East Asian economies there was also a sense that development was being hindered by bottlenecks in power (e.g., the Philippines), transport (e.g., Thailand), water (most of East Asia) and telecommunications in general. Government infrastructure spending, international aid and official sector lending could not be on a scale sufficient to meet requirements. The infrastructure investment requirements were estimated by the Bank to be in the order of US$1,000 billion for the 1990s. Subsequently, they were estimated by the World Bank to be of the order of US$1,500 billion for the decade 1995-2004. These projections were useful to focus or, the level and structure of the huge infrastructure requirements of a growing and increasingly prosperous and urbanized Asia. They helped make clear the need for a major shift of focus towards private sector participation in infrastructure – to some extent motivated by efficiency considerations, but mainly reflecting the view that public sector financing for this scale of infrastructure requirements was not feasible.

5. There had also been a shift in view as to the comparative advantages of government and the private sector in performing the various roles related to the provision of quality infrastructure services. increasingly, an expanded regulatory and structuring role was seen for governments, with investment, construction, financing and management seen as best opened to competitive business/private sector participation. Risks should be assigned to the parties best able to mitigate them, and here this meant a greatly expanded role for the private sector. Additionally, there was recognition that while many private sector investments of the build-operate-transfer (BOT) type were being completed, and indeed the expression BOT was becoming a shorthand for privatization, the assignment of risks in many of these BOT projects left much to be desired. Government guarantees of bulk take-or-pay contracts indexed to exchange rates meant that the currency and market exposure of utilities and governments became a fundamental problem, as the Asian crisis has shown.

6. The emerging new approach, while often including the BOT model as a starting point, was one that demanded more, not less, acceptance of risk by the private sector. But this would only be possible if governance, including transparency, enforcement of contracts and commercial tariff structures became a reality. The challenge is that the privatization model

does not mean a retreat by governments, but an upgrade of their planning, structuring and monitoring roles. This is a key to understanding the point that without greatly improved governance in East Asian countries, the shift to increased business/private sector participation could just mean monopoly powers being shifted to the well connected in the business/private sector. What is more, without improved governance, business/private sector participation would eventually flounder and the projections would fail to materialize, as risks would become unacceptable.

C. Future Demand for Infrastructure Investment

7. The currency crisis that started in mid-1997 has caused some dramatic revisions both to economic growth projections and to the investment program of the public and private sectors. The paper presents new projections for China, Indonesia, Republic of Korea, Malaysia, the Philippines and Thailand for the period 1996-2005, adjusted to allow for both the phase-in of private sector market disciplines/best practices and reduced growth in East Asia. The revised projections are 23 percent below the pre-crisis (baseline) projections. They are based on establishing the value of the capital stock of infrastructure in each country and projecting infrastructure-investments with varying GDP growth assumptions and varying infrastructure-to-output ratios. A summary is given in Table 3 and presented in Figure 1. The pre-crisis projections are based on the 1996 GDP growth forecasts. Case 1 is based on the current GDP growth forecasts while Case 2 adds the impact of a transition to a lower infrastructure-to-output ratio and assumes a gradual 25 percent increase in efficiency in each sector in each country. An important factor to note in the projections for this region is that PRC is assumed to maintain its relatively high GDP growth rate, thus accounting for more than one half of infrastructure spending in the region.

Table 3: 1996-2005 Infrastructure Investment Projections

Scenario	$ trillion	%
Pre-crisis	1.78	100
Case 1	1.53	86
Case 2	1.37	77

8. As can be observed, the difference between the pre-crisis projections and Case 1 is 14 percent of the former. If PRC is excluded, the reduction is 33 percent. Case 2 assumes a transition to best practices to change the underlying infrastructure-to-output and efficiency parameters, and the corresponding impact this would have on further reducing the level of needed investments. While the various projections of the Bank and other agencies may differ due to base assumptions and the time slice period, the analysis clearly shows the relative impact of lower growth and the potential benefits of moving to best practice models of infrastructure development.

Figure 1: Comparison of Estimates for Total Infrastructure Investment

D. The Challenge for Infrastructure Investment

9. The post-crisis challenge, is to learn from the experience and to move towards best practices. Not all countries or infrastructure sectors have performed in the same way, and there are lessons to be learned. A shift from a focus on quantity to that on quality of investment will not only deliver better outcomes for consumers and facilitate increased growth, but it will also conserve scarce public and private capital. Simply increasing infrastructure investment should not be seen as a panacea for economic development in East Asia. After all, it is typically in the state-owned infrastructure entities where overstaffing and inefficiencies have been most substantial. A higher priority should be attached to restructuring – eventually including tendered asset sales – which creates market-based incentives to adequately maintain assets and maximize their utilization, and to prevent, for example, the substantial water and electricity losses that are typical for many state-owned utilities in East Asia. New investments, by taking pressure off poorly performing assets and their public sector institutions, may be the wrong approach. Even where jobs are created in the short run, and where power, water or transport shortages are removed through extra investment, this may not mean such investments are desirable or optimal allocations of scarce capital.

1. Best Practice Templates

10. Current best practice is to create independent infrastructure providers such as power generators, expressway operators and ports concessionaires. The recent evidence is that vertically or horizontally integrated systems are not the optimum approach in most areas of infrastructure and certainly not in power generation, expressways and ports. There is a powerful case to unbundle network industries through the sell-off of such infrastructure within a customer friendly model. In countries as diverse as China, Indonesia, Australia and the Philippines, the governments are obtaining major funds from asset sales, which allow them to maintain, or invest in, other assets (i.e., the sale of generation assets within a competitive market to fund transmission expansion). This strategy of financing maintenance or expansion of existing assets through funds provided by selected sale of other assets, within a competitive structure, is an example of one of the win-win options that can emerge from the Asian crisis.

2. Limitations of BOT Projects

11. There is substantial evidence that the initial move to attract the private sector through the BOT modality has promoted new investment, but this has not always helped economic development or even the consumers. The prevalence of government guarantees and the absence of product market competition and discipline have meant that substantial excess capacity has been contracted. This situation principally arose from the way in which the energy crisis was addressed in the first half of the 1990s

12. The Philippines is the classic example, brownouts in 1992-3 happened on most days of the week, often for 5-10 hours. Private power contracts to sell power to the grid relieved the crisis by 1995, but left expensive US dollar-indexed contracts in place, with the power utility and thus the Government was exposed. Another problem was that many of the outages were not because of inadequate capacity, but due to poor maintenance and equipment breakdowns. Incentives were not in place to induce efficient management or maintenance. In this sense the BOT projects allowed problems to be deferred rather than be dealt with. Many countries have come to realize that government guarantees of power purchase agreements are often far from being the preferred solution – even if they relieve a short-term crisis. The process in many countries has just converted a power deficit into a surplus, and the currency crisis has meant that such surplus has become even more serious. In Indonesia, this situation has left the power utility with contractual obligations to buy power in US dollars well in excess of its capacity to charge customers at the new exchange rates and, hence, technically bankrupt. There is now widespread acceptance of the need to create competitive markets in electricity generation. This is being actively supported by the Bank.

13. One reason the investment opportunities looked so large back in the first half of the 1990s was that the BOT, take-or-pay and government guarantee nature of most infrastructure deals meant that the private capital and product market discipline was not being comprehensively applied. All sorts of non-viable projects looked good, but only because the risks resided with governments. Investors sought comfort in official sector backing rather than assessing the fundamentals of the market place. In theory, the fundamentals of the investment market for infrastructure services should be good – since they are typically monopoly and essential services in rapidly growing economies – but they will not be converted into reality if there is weak governance. Weak governance in this context includes failures to allow and enforce commercial tariff regimes, promote a competitive market, and to conduct tenders in an efficient and transparent manner, following clear project objectives.

3. The Role of Capital Market Reform

14. Business/Private sector funding of infrastructure usually brings the risk of foreign currency mis-matches in the financing package. Such mismatches that occur when the sales are in local currency but investor liabilities are in foreign currency, have been exposed during the Asian crisis. No infrastructure provider can withstand exchange rate depreciation of 40-50 percent, never mind the 80 percent decline experienced in Indonesia. Given that domestic capital markets are often thin, short-term or non-existent, there is a need to develop them to reduce the currency risks for private infrastructure provision. In principle, the bulk of debt funding of infrastructure services such as transport, water supply, electricity and other urban services should be in local currency. In the absence of the necessary capital market reforms, it is hard to see how business/private sector provision of infrastructure can proceed given the record of experience. International development agencies such as the Bank have to facilitate the development of domestic capital markets in Asia, in particular for bonds.

4. Need for New Infrastructure Regime

15. One reason successful economies do not need official projections or infrastructure master plans, is that the cost of capital applied to projects automatically adjusts to the risks and alternatives involved. Projects rule themselves in or out by their market fundamentals. However, with a heavy involvement of government in infrastructure decision-making in the developing countries, long lists of "feasible" projects are prepared. While there is some value in such lists and aggregations, the much more important point is the need for a combination of: (i) capital market deepening and reforms; (ii) competitive private sector approach to infrastructure provision (market-driven); (iii) implementation of incentive-based regulatory regimes for the natural monopoly services (networks, grids, pipelines).

III. CONCLUSIONS

16. On the positive side, the currency crisis also presents major opportunities. The current financial stress in East Asia and the increased scarcity of, and alternative uses for, capital mean that investors are now far more demanding of sound structures and predictable regulatory regimes. While East Asia's demand for infrastructure is still huge, there are now more supporters of regulatory and other reforms. The projection for the year 2000 has to be scaled down but the number is still very high (about US$140 billion). However, the world capital market has a tremendous financing capacity and a relatively small diversion of major international portfolios to East Asia would be needed to meet the projected demand. For any such diversion of funds into East Asia infrastructure, the structures and incentives must be right, and a shift to best practices must be embraced.

ATTACHMENT

ASIAN DEVELOPMENT BANK
Technical Assistance for Developing Best Practices for Promoting Private Sector Investment in Infrastructure

In late 1997, regional technical assistance was approved by the Bank for US$600,000, which aimed to develop sector specific best practices for promoting private sector participation (PSP) in key infrastructure sectors in the Bank's developing member countries (DMCs), namely power water supply, expressways, ports, and airports. The best practices were to cover: (i) sector policy issues related to pricing and competition; (ii) conducive legal and regulatory frameworks; (iii) the unbundling, mitigating, and management of risks; and (iv) mechanisms to reduce transaction costs. Five individual consultants were engaged to undertake the study, and their final reports will be published soon. A two-day regional workshop was held at the Bank in December 1998 to present the findings of the consultants and to discuss them with an invited group of experienced public and business/private sector officials.

The review of best practices in each of the five sectors identified some common features such as the importance of competition, transparent tendering and effective regulation. There was broad agreement that:

(i) Governments should limit their role to planning, structuring, and regulation while the business/private sector should be involved in management, investment, construction, and financing;

(ii) Commercial risks should be assigned to the business/private sector but other risks should be assigned according to which party is able to best mitigate them;

(iii) The transfer of responsibility to the private sector should be accomplished through deregulation and open competition or well-established contractual arrangements including management contracts, capital leases, concessions, sale of assets and rights to operate; and

(iv) Economic regulation should be applied where there is insufficient competition but it should be transparent and predictable while still accommodating the concerns of the affected parties.

There are significant differences among the infrastructure sectors concerning the appropriate balance between private and public participation in ownership of assets and provision of services. Only some of the sectors have well defined models for private sector participation. Other practices are still evolving and the menu will continue to develop as experience grows.

The decisions on which infrastructure components should be transferred to the private sector are of strategic nature. They depend not only on the characteristics of the sector and the market it serves but also on government objectives. The primary objective should be to benefit consumers, but there are a number of additional objectives which governments should consider, including:

(i) Reduction in national debt.

(ii) Stimulation of domestic capital markets.

(iii) Reduction in capital and operating subsidies.

(iv) Investment in new infrastructure or rehabilitation of existing infrastructure

(v) Improvements in the quality of service.

(vi) Increased range of services.

(vii) Reduced prices for services.

(viii) Client-oriented operations.

(ix) More effective marketing.

Governments have at their disposal a number of means for effecting the transfer of infrastructure components to the private sector and the sequence of such a transfer depends on the following:

(i) Size and complexity of the network.

(ii) Rate of growth in demand and the competitiveness of the market.

(iii) Options for unbundling by function or geography.

(iv) Legal regime regarding ownership of land and other critical assets.

(v) Capacity for economic regulation.

The established mechanisms, which range from management contracts to unregulated competition are not new and have proven effective. The key is to have a vision of where the sector is going, and to carry through the reforms as quickly as possible so as not to allow the interim change to become the final state of affairs. Brief summaries of the best practices identified for each sector are attached.

There are a number of ways identified in which the Bank can assist in the reforms associated with increased PSP in the infrastructure sectors. The most obvious is to provide technical assistance to define policy objectives, develop network master plans, identify and evaluate projects, define the role of new regulatory institutions and train regulators to handle their new responsibilities, prepare contracts and negotiate with the business/private sector. The Bank's efforts to promote financial reform and develop long term capital markets will also remain important. This would include efforts to improve the bankruptcy laws, and the regulation of domestic debt and equity markets.

In order for the Bank to have a significant role in promoting PSP, it should link this promotion with on-going project lending. The Bank can provide support for business/private sector investment, either individually or in syndication, through its private sector window. More importantly, the Bank should provide sovereign loans to complement but not compete with private sector investment. Where possible, the Bank should provide these funds in stages, upon the satisfactory achievement or fulfilment of government actions that will promote PSP, enhanced efficiency and consumer benefits. This linkage will ensure that the Bank can exercise sufficient leverage on government decisions and actions. This, in turn, will ensure that the Bank can exercise sufficient leverage on government decisions for extending PSP. Country strategies should address which areas of development are to be financed by government using sovereign loans, general revenues and government bonds and which are to be financed by private investment. For the infrastructure sectors, project lending can be used to finance basic infrastructure that cannot be packaged into financially viable investments and provides significant secondary economic benefits.

Power

Key Aspects of Best Practice

- Create an enabling legal and regulatory environment to support competitive markets in electricity
- The power sector should be completely unbundled into separate generation, transmission, distribution, and possibly retailing sectors to achieve the maximum benefits for customers
- Operate the generation and distribution/retailing markets competitively, with many generators selling into a wholesale electricity market at prices which balance demand and supply throughout the day, and with distribution/retailers buying bulk power transmitting it via the transmission and distribution network to supply to customers
- Operate the transmission network as a concession on the basis of competitive tender, or privatize it within a tight regulatory framework, controlling rates of return, prices or gross revenue.
- Establish an independent regulator that controls the wholesale electricity market, prevents cross ownership of generation, transmission and distribution/retailing assets or ensures access to the monopoly transmission and distribution networks
- Privatization should include the sale of power distribution utilities as well as generation, using a transparent process
- Open access to transmission and distribution lines, and the ability to trade power between buyers and sellers in an open market, are critical to achieving a competitive framework
- In a competitive market, the independent regulator should mainly oversee prices and incentives for the transmission and distribution businesses
- Restructuring should proceed gradually to allow the development of the infrastructure to operate the unbundled system

Water Supply

Key Aspects of Best Practice

- The benefits of private business/private participation in the water sector must be explained to win public acceptance.
- The starting point in any reform process for water supply is to form a high-level reform unit to drive and manage the process. It would be responsible for coordinating and facilitating the entire reform and private sector participation process. The reform unit may be a cross-sectoral unit.
- The introduction of tradable water rights while not essential to commence reform leads to efficient use of water particularly when it is scarce and has alternative uses.
- Water sector should be unbundled to the extent possible. The business/private sector concession model is most likely to achieve the greatest benefits to the community and the

economy as a whole. The Government continues to own the network while the private operators lease the long-term right to use the assets and collect revenue from service delivery. The benefits accrue due to strong financial incentives to reduce water losses and expand service.

- If politically difficult then the next best strategy is to use BOT, BOOT and ROT arrangements to bring expertise and finance to a water supply project required in a tight timeframe. The procurement procedure should be carefully managed to ensure reasonable cost and the contractual arrangements should not constrain subsequent progression to more competitive models. Careful attention is required to the design of tender documents.

- Commercialization/Corporatization of water supply utilities together with tariff reform is advantageous if the introduction of private sector participation is to be phased.

- Tariff reform to achieve full cost recovery is essential for private sector participation. Cross-subsidies for the poor can still be considered in a transparent manner.

- Critical to the success of private sector participation in the water supply sector is for Government to install sound and independent regulatory regimes, catchment management policies and enforceable laws on tariff setting and collection.

Roads

Key Aspects of Best Practice

- Government must take a new, high-level role, for which institutional change is necessary and new skills required. A high Levels PSP unit is desirable.

- Government must plan, identify and prepare PSP projects within a Transport / Roads Strategy – this needs to focus on: public sector affordability, serving overall development objectives, and use of the right PSP options

- Prepare feasibility studies for PSP Projects focusing on: implementability, traffic and tariff policy, project staging, network integration issues, risk allocation and financability.

- BOTs have more limited application in developing countries than is widely thought due to the need for large funding support. The main BOT prospects are: (i) estuariail river crossings, and (ii) interurban projects, where they are relatively easy to identify and implement, their costs are modest and traffic is relatively robust.

- Other (non-BOT) private sector participation modalities exist, and should be applied widely as they can tackle many of the sector problems, e.g. O&M contracts (paid by government or through tolls), ROT, corridor management, turnkey contracts

- Sector funding requires both PSP and an earmarked Roads Fund from a user-charge supplement on fuel (and maybe road vehicles).

- Tariff policy should be determined by transport policy requirements, and constrained by financing requirements. There is a conflict between financing requirements (which dictate high tolls early, and low toils later) and economics (the reverse – with high tolls avoiding congestion in the later years). Current practice is driven by financing requirements with tariffs an output of the bidding process. Tariffs are the key factor in attracting traffic, hence determining benefits. An alternative approach would be to define tariffs as an input, with

government defining the maximum extent of its support. The winning bidder would require the lowest level of government support.

- Traffic risk is the major issue. Best practice is likely to be that risk is shared, the core risk being taken by the business/private sector, with Government taking both a share of the upside (a super profit-sharing) and providing a downside guarantee, in the event of low traffic.

- Government must define its support up-front, and avoid distortions in the provision of support.

- Transparency and competitive bidding are essential in the procurement process – the requirement is to maximize competition almost to the point of signature

Port Sector

Key Aspects of Best Practice

- Effective port operations and investment require the unbundling of port networks to produce more client-oriented autonomous ports. The tendering process should encourage unbundling not only for the network but also for the services within the ports. Where ports are not financially viable ports, they should not be bundled with profitable ports but rather treated as stand-alone facilities that are turned over to local government or put under management contract using a competitive tender

- The landlord port is the best structure for promoting private sector participation. It is more robust than the traditional resource (tool) port or operating port because it accommodates different forms of public-private partnership while recognizing that the only fixed responsibility of the public port is the ownership of the site

- The most effective and efficient procedure for promoting private sector participation in the port sector is to lease existing facilities with relatively short-term lease agreements that allow for reorganization and improvement in productivity to occur. Subsequently concession agreements can be used to encourage private investment in additional capacity. Where this capacity is required immediately or labor problems make it difficult to lease out existing facilities, then concessions might precede lease agreements

- Continued public investment will be required since it is difficult to recover the costs for basic infrastructure in a period that is reasonable for the private sector. Public investment may also be required to reduce the barriers to entry. This is important where a new entrant would otherwise have to make a large investment before competing with existing service providers.

- Reforms in the port sector often require changes in legislation which consume a considerable amount of time. These reforms are of limited value because they change the institutional structure and assignment of responsibility but often leave the people and corporate culture unchanged. Transactions that involve the transfer of specific facilities and services to the private sector are faster and should precede this reform since it introduces a new management and a new culture into the port.

- The best form of tariff regulation is market regulation. Failing this, the second best is through the terms of the contract that identify the non-competitive services requiring regulation, state the maximum rates, the formulae for escalating these maximums over time,

and the arbitration procedures for discriminatory behavior in excess of that justified by commercial pricing. The third best is the establishment of a regulatory agency outside of the port which would apply a pricing formula related to cost recovery. All of these are preferable to a vague procedure for negotiating future changes in tariffs.

- The critical element in any effort to promote private sector participation is competition or at least the potential for competition. This can be provided through direct competition between private sector service providers, between public and business/private service providers or between bidders in the case of a tender for an activity-with only one competitor.

Airports

Key Aspects of Best Practice

- Airport privatisation will be encouraged by the existence of legislation in the form of a BOT law or similar. It is also important to ensure that government is able to demonstrate that any projects offered to the private sector are economically viable.

- Form of business/private sector participation; "full" privatisation based on asset transfer or acquisition through very long-term leases is preferable to more restricted forms of PSP (but is also more demanding in terms of legal and regulatory frameworks).

- Airport industry restructuring; no evidence of significant scale economies in airport operation other than those associated with increased traffic density at a particular location. Hence PSP can be based on individual airports (although facilities may need to be "bundled" to assist financing of major new developments or extensions to capacity).

- The existence of unprofitable airports does not justify the maintenance of a highly concentrated industry structure to facilitate cross-subsidy.

- Some sharing of traffic and revenue risk (between the business/private sector partner and government) is justiflable in airport BOT or concession contracts.

- Denomination of some or all airport charges in US Dollar is an effective way of hedging against currency risk and may significantly reduce the risk premium required by private investors.

- The benefits of private sector participation in airports are likely to be maximised by regulatory frameworks based on good regulatory governance practice (independent regulator etc.). The price cap approach to constraining airport charges is likely to encourage better performance outcomes than one based on rate of return regulation.

- Competition for the market (whether through sale or leases, or BOT/concessioning will be maximised by transparent bidding/sale processes.

Experience and Success in Undertaking Monetary Control and Its Impact on Infrastructure Development

by

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Experience and Success in Undertaking Economic Recovery Measures and Their Impact on Infrastructure Development

1. National Economic Recovery Plan (NERP)

Malaysia's Recovery Strategy

- Relax the tight fiscal policy and provide fiscal stimulus
- Ease monetary policy
- Reform the financial and corporate sectors
- Selected Capital Control Measures

2. Fiscal Stimulus

Strategies

- From budget surplus of 3.2% of GNP (1998) to deficit of 6% (1999)
- Additional development expenditure of RM7 billion for agriculture, low and medium-cost housing, education, health, infrastructure, rural development and technology
- Infrastructure Development Fund (RM5 billion) directed at essential infrastructure projects

3. Easing of Monetary Policy

Strategies

- Lower Statutory Reserve Requirement
- Reduce lending rate
- Cap the lending spread to 2.5%
- Loan growth target of 8%
- Reclassification of NPL

Statutory Reserves Requirement (SRR)

Gradually reduced:

February 1998	=	13.5%
October 1998	=	4%
Additional liquidity	=	RM38.3 billion

Base Lending Rate (BLR)

Gradually reduced:

June 1998	=	12.3%
April 1999	=	7.65%

4. Financial and Corporate Sectors Restructuring

Establish:
- DANAHARTA
- DANAMODAL
- Corporate Debt Restructuring Committee

Asset Management Company (DANAHARTA), established June 20, 1998

Objectives:
- Acquire NPL from banks
- Banks can focus on new loans
- Acquisitions is based on market principles and international banking practices

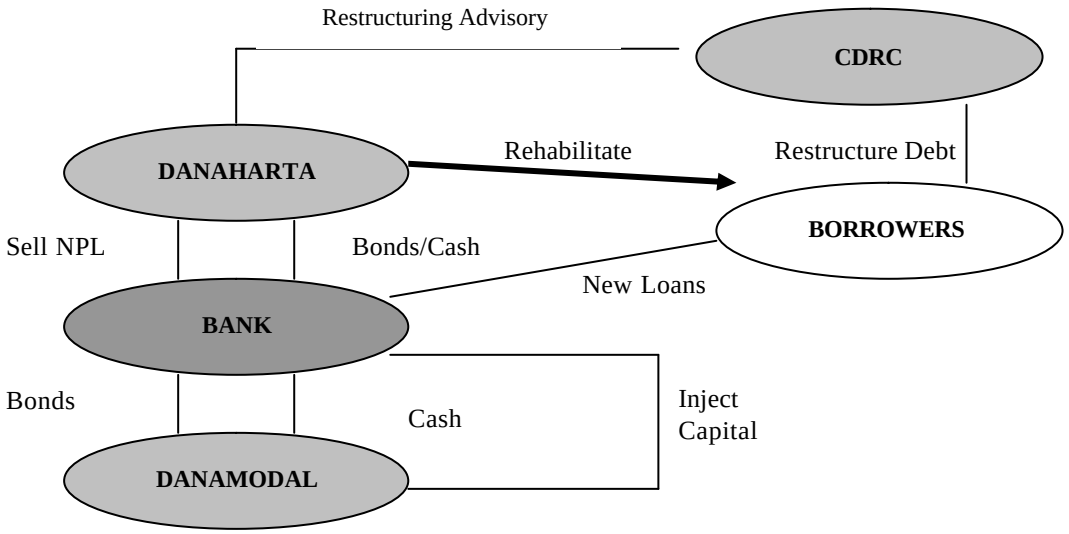
Special Purpose Vehicle (DANAMODAL), established August 4, 1998)

Objectives:
- Injection of capital into local banks so as to strengthen the banking system
- Increase bank capacity to grant new loans

Corporate Debt Restructuring Committee (CDRC)

Objectives:
- To attend debt problems of corporate sector
- Avoid placing viable companies into liquidation
- Debt workouts on a voluntary basis 39 companies with RM20 billion debt

FINANCIAL SECTOR RESTRUCTURING



DANAHARTA Funding and Progress

Funding Requirement: RM25 billion

Progress:
- Acquired and managed RM22 billion in NPL
- NPL purchase discount – 61%; 37% excluding large loan

DANAMODAL Funding and Progress

Funding Requirement: RM16 billion

Progress:
- Injected RM6.2 billion in 10 financial instituitions
- Raised bond: RM7.7 billion

5. Capital Control

Exchange Rate Control
- Ringgit pegged at RM3.80 to US Dollar (effective from 1st October 1998)
- Ringgit non-tradable outside the economy
  Aim:
  - To stablise the ringgit
  - To lower interest rate
  - Reduce speculation on the ringgit

Selective Capital Control
- All settlement of exports and imports must be made in foreign currency
- Travellers are allowed to import and export ringgit not exceeding RM1,000/person
- Export foreign currencies by residents travellers up to RM10,000
- Proceeds in ringgit received by non-residents from sale of any security must be retained in external account and can be converted into foreign currency after one year.

Repatriation Levy

Levy on repatriation of principal capital (before February 15, 1997)

30% for maturity period of 7 months
20% for maturity period of 9 months
10% for maturity period of 12 months
No levy for maturity period more tha 12 months

Levy on repatriation on profits (After February 15, 1999)

30% for period less than 12 months
10% for period more than 12 months

6. Impact on Infrastructure

Impact of Financial Crisis on Infrastructure Projects

- Capital-intensive and long gestation period caused serious financing and liquidity problems
- Projects rescheduled and reduced in scope
- Implementation of new projects delayed
- Collapse of equity market crippled financial resources of infrastructure companies
- Launching projects through IPO's not attractive
- Difficulties in raising fund through international bonds
- Consumers reluctant to pay

Reviving Infrastructure Projects

- Fiscal stimulus
- Selected sub-sectors
- Preference for projects with high local products
- Lower cost of funding
- Exchange rate stability
- Increasing demand-house ownership campaign

Future Directions

- Selective infrastructure projects
- More active consumers participation
- Financing structure – reducing public sector contingent liability

Options for Sustainable Cities In APEC Economies

by

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Options for Sustainable Cities in APEC Economies

1. World's Largest Cities in APEC

CITY	POP million 1995	POP million 2015
Tokyo	27	29
Shanghai	14	18
Manila	9.3	15
Jakarta	8.6	14
Bangkok	6.5	9.8

2. Conconts of Sustainable Cities

- Economic Efficiency: resources are used efficiency
- Environmental Sustainability: wastes are minimized and recycled
- Social Sustainability: benefits to all sectors of the community

3. Technology Foresight as a Strategic Planning Tool

- A set of plausible futures instead of a single one
- Maintain a balance between S&T push and market pull
- Emphasize process rather than product, that is, participation of stakeholders in decision making

4. Definition of Technology Foresight

"Foresight involves systematic attempts to look into the longer-term of science, technology, the economy, the environment and society, with a view to identifying emerging generic technologies and the underpinning areas of strategic research likely to yield the greatest economic and social benefit"

5. Objectives of APEC Center for Technology Foresight

- Promote adoption of technology foresight
- Provide a means for comparison in APEC and the world
- Conduct technology foresight on an APEC-wide basis
- Improve technology-related planning and development
- Develop technology foresight research capability

6. Activities of APEC Center for Technology Foresight

- Research Study on:
  - Water Supply and Management (1998)
  - Technology for Learning and Culture (1999)
  - Megacities (1999-2000)
- Training Workshops
- Public Seminars
- Website (http://apectf.nstda.or.th)

7. Most Significant Technologies Identified in Water Supply and Management Project

- Information Technology
- Membrane Filtration
- Lining Materials for Storage and Distribution
- Ground Water Storage Technologies
- Trenchless Technologies
- Leak Detection Technologies
- Water Transport by Barges
- Recycling in a plant or apartment block

8. Concepts of Sustainable Transport

- To be economically and financially sustainable, transport must be cost-effective and continuously responsive to changing demands
- Major problems of air pollution, global warming, leaking tanks and oil spills must be minimized
- Affordability and accessibility must be built-in achieve social sustainability

9. Sustainable Transport Project Plan

- Issues Paper by VUT
- Experts' Meeting 27-29 July 1999 in Melbourne to define issues and develop scenarios and plan future studies
- Development of the Report (August to November 1999)
- Meeting of Experts to critique Report in Bangkok, December 1999
- Distribution of Report in March 2000

10. Concepts of Healthy Cities

- Work – Economic growth
  (Urban-rural balance, Entrepreneurship, Health care, Competitiveness)
- Action – Politics, government and community
  (Governance, Dispute resolution, Public-business/private partnership, Welfare programs)
- Culture – Values and behavior
  (Creativity, Arts, Education, Ethics, Will)

11. Healthy Cities Project Plan

- Issues Paper by UNC
- Experts' Meeting 23-24 August 1999 in North Carolina to define issues and develop scenarios and plan future studies
- Development of the Report (September 1999 to May 2000)
- Meeting of Experts to critique Report in Bangkok, June 2000
- Distribution of Report in September 2000

Attachment A

APEC Center for Technology Foresight
"Healthy Cities"
(Under Megacities Project)

Background

The World Health Organization (WHO) in its program on "Healthy Cities" has characterized its goal as balance in and among the "physical, emotional, mental, and spiritual" aspects of life. This goal is applicable to individuals and communities alike. Observation of cities around the world shows that imbalances exist everywhere, leading to costly burdens and costly efforts to alleviate them. It may be much less costly to generate a healthy city than to cure an ill one. The generation of a healthy community also depends on at least an adequate concept of the goal to be achieved and some exemplary individuals. It may not be necessary to have a majority of the citizens with this balanced health to achieve an healthy community, but the leadership must have the vision and be able to form the institutions and structures that open the opportunity for all individuals and groups to pursue that vision.

Generation of healthy cities is a systemic problem–all aspects of individual and community life are involved. If a significant portion of the city is poor, excluded, or disadvantaged, the city cannot be healthy. Health will not exit while large segments are uneducated, lack opportunity, or remain unemployed. A healthy city does not exit when children are undernourished, abandoned (at any age), grow up in a physically polluted environment or do not receive moral and ethical guidance. This project seeks to assess the situation in Megacities in APEC economies and to draw out the central issues to be addressed by policymakers, educators, administrators and community leaders.

Project Plan:

The project plan is as follows:

Event	Remarks
Issues Paper	To stimulate discussion This is being prepared by the Kenan Institute of Private Enterprise at the University of North Carolina at Chapel Hill
High Level Meeting North Carolina, USA Mid to late August after 17th ISTWG Meeting (1 ½ - 2 days)	To discuss issues and identify topics for detailed analysis
Preparation of Sectoral Papers September 1999 – April/May 2000	Expert groups will be formed in APEC economies to tackle separate issues
Preparation of Report April/May 2000	
Public meeting to launch Report followed by distribution to interested parties throughout APEC Bangkok May/June 2000	High level invitees plus experts and community leaders

Attachment B

APEC Center for Technology Foresight
"Sustainable Transport"
(Under Megacities Project)

Background

The combination of population and rising incomes has had a profound effect on the demand for transport, both of people and of goods, in Megacities. The transport modes consist of land-based, such as cars, trucks, railways and tramways; of sea-based, such as ferries, container vessels; and of air-based, such as passenger and freight aircraft. The rapid growth in demand has led to major problems in congestion on roads and at airports and to consequent economic costs, both in delays in delivery of people and goods and in health costs of air (and water) pollution. In extreme cases, cities have been brought to standstill by vehicle congestion.

A major concern is that significant growth is anticipated in many of the cities in APEC economies which are already experiencing difficulties and this technologies need to be identified to cope with the projected transport problems. The concept of "Sustainable Transport" has been developed to describe the notions of economic efficiency, environmental sustainability and social sustainability. The project seeks to assess the situation in APEC Megacities and to draw out the critical technology thrusts needed to attain sustainable transport systems in 2015.

Project Plan:

The project plan is as follows:

Event/Activity	Remarks
Issues Paper	To stimulate discussion This is being prepared by the Center for Strategic Economic Studies of Victoria University of Technology, Australia. It will be made available on our website.
Experts' Meeting Melbourne, Australia 27-29 July 1999	To define issues and develop scenarios and plan further studies
Development of the Report August – mid November 1999	This will involve inputs from experts in APEC economies as an interactive process by email
Meeting of Experts to critique Report Bangkok, Thailand Late November – December 1999	This will provide an opportunity for final discussion and comments in a face-to-face situation
Distribution of Reports to interested parties throughout APEC February/March 2000	Presentation of results at ISTWG Meeting in Thailand in March 2000 and inputs to APEC Transport Ministers' Meeting in Thailand in early 2000.

Sustainable Urbanisation:
Implications of Information Technology on Urban Growth

by

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Sustainable Urbanisation:
Implications of Information Technology on Urban Growth

INTRODUCTION

Rapid growth of urbanisation all over the world, particularly in the developing countries like Malaysia has put pressures on urban economy, facilities, infrastructure and environment. The impact of urbanisation on our living environment depends very much on the management of urban change by local government and other parties involved in the development process. Therefore, sustainable living environment can only be achieved through a sustainable development process. Let us remind ourselves the meaning of 'sustainable development'. It was defined by the World Commission on Environment in the Brundtland Report (1987) as "*meeting the needs of the present, without compromising the ability of future generations to meet their own needs*." In other words, in order for us to progress we need to pursue economic growth without exceeding the environmental limits. It is a matter of balancing economic growth and environmental protection. We have to change the way we conduct many aspects of our daily life. We have to find ways to continue to pursue economic growth without exceeding the real needs of the people. We have to determine the real priorities of development of our towns and cities.

In this paper, we would like to limit our discussion on the implications of some aspects of information technology on urban activities that have implications on sustainable living environment. It starts with, a broad framework of sustainable urbanisation approach in urban development, pattern of urbanisation and urban growth, impact of information technology on urban development, suggests various research agenda to better understand the city of future.

SUSTAINABLE URBANISATION: A FRAMEWORK OF ANALYSIS

As a basis of our discussion on sustainable urbanisation, I would like to refer to the issues and problems discussed at Global Forum '94 in Manchester, England. The forum was a follow up of the Earth Summit in Rio de Janeiro in 1992 which adopted Agenda 21 – a blueprint for global partnership to meet the dual needs for a high quality environment and a healthy economy. The following issues and problems of sustainable development were deliberated at the forum.

Urban Poverty

- Satisfactory accommodation
- Adequate income
- Safe and secure employment
- Safe and sufficient water supplies
- Adequate sanitation and drainage, waste collection, healthcare, emergency services and education
- Guaranteed civil and political rights
- The right to participate in decisions which affect their lives

Urban Employment and Livelihoods

- Policies to promote economic stability and growth
- Self-help initiatives - including support for household enterprises through community-based credit schemes
- Funding initiatives which combine employment creation for poorer groups with improving infrastructure and service provision
- The conservation of resources

- Trade unions establishing
  - Employment right
  - Minimum wages
  - Health and safety
  - People's rights to make decisions

Governance and Partners hips
- Support for initiatives from citizens and entrepreneurs
- The importance of partnerships to extend the scope and effectiveness of initiatives
- Strengthening institutions to help collective decision-making
- Formation of new alliances and partnerships
- Popular participation and democratisation of society

Urban Environment and Health
- Challenging sections of the medical profession to change their priorities, away from curative strategies to preventative ones
- The influence of major drug companies in the development and continuation of inappropriate health policies
- The hazards to community health poverty, poor sanitation etc
- The provision of community level health centres
- Establishing appropriate comprehensive preventative health care strategies

Resources and Land
- Better management of resources within the city and its surrounding region
- Waste management
- Minimising the use of non-renewable resources and fossil fuels
- Reducing waste generation
- Land tenure problems in rural areas
- More equitable access to land and other resources
- Ensuring title deeds for poor communities to protect vulnerable groups from being forcibly removed from land

Markets and Finance
- Innovative loan systems
- Development assistance focusing on poverty
- Trade issues-improving access to markets covered by international restrictions on trade
- Improving prices paid to producers
- Promotion of fair trade and self empowerment of local producers
- Ensuring that environmental costs are included in the pricing of products based on natural resources
- Present levels of debt repayment

Transport and Communication
- Substituting the movement of people and goods with telecommunications
- Balancing free-following traffic, citizen access and minimum use of private cars
- Promotion of fuel-efficient developments which minimise movement
- Possibilities for working at home or away from major cities.

The above aspects of development can be used as a framework of analysis of activities towards sustainable urbanisation.

URBANISATION AND URBAN DEVELOPMENT

We are living in an increasingly urbanised world. It is estimated that more than half of the world's population will live in urban areas by the turn of the century. The United Nations 1996 Report on World Urbanization Prospects estimated 55% of the world's population will live in urban areas in 2015 (Erguden, 1998).

The current rate of urbanisation in the ESCAP region is somewhat lower than that of the world as a whole, estimated at 37 percent. The percentage, however, represents some 1.3 billion people, or almost one fourth of the world's population. The annual average growth rate of the urban population of the ESCAP region is currently around 2.9 percent, compared with 1.3 percent for the regional population as a whole (Skeldon, 1998). However, there exists a diversity of levels and in the pattern of urbanisation and urban growth within the ESCAP region.

Pattern of Urbanisation

Generally, four main country patterns can be identified on the basis of urbanisation and urban growth in the ESCAP region (Table1):

i) **Group 1** - Countries with high levels of urbanisation (above 70 per cent) but low urban growth rates (1-2 per cent per annum);
ii) **Group 2** - Countries with medium levels of urbanisation (30-60 per cent) and medium to high urban growth rates (2-4 per cent per annum);
iii) **Group 3** - Countries with low levels of urbanisation (less than 30 per cent) and relatively high urban growth rates (greater than around 3.5 per cent per annum);
iv) **Group 4** - Small countries with highly variable patterns.

Table 1 : Level and projected levels of urbanisation and associated variables, ESCAP region, 1994-2010

Country or economy	Level of urbanis-ation 1994 (%)	Annual growth rate (%)	Urban population 1994 (000s)	Level of urbanis-ation 2005 (%)	Level of urbanis-ation 2010 (%)	Growth in per capita GNP 1985-1994 (%)	Total fertility rate 1990-1995
ESCAP region	37	2.9	1,230,163	n.a.	n.a.	n.a.	2.6
Group 1							
Singapore	100.0	1.03	2,821	100.0	100.0	6.1	1.73
Macau	98.8	3.65	393	99.0	99.1		
Hong Kong, China	94.9	0.75	5,539	96.2	96.6	5.3	1.21
Republic of Korea	80.0	2.89	35,645	89.4	91.4	7.8	1.73
Japan	77.5	0.37	96,763	79.4	80.6	3.2	1.50
New Zealand	85.8	1.53	3,031	88.3	89.2	0.7	2.17
Australia	84.7	1.28	15,129	85.0	85.6	1.2	1.87
The Russian Federation	75.6	0.41	111,429	79.7	81.4	-4.1	1.53
Turkey	67.3	4.40	1,554	79.3	82.4	1.4	3.35
Group 2a							
Armenia	68.4	1.79	2,428	72.1	74.1	-13.0	2.60
Kazakhstan	59.3	1.24	10,092	64.6	67.2	-6.5	2.50
Azerbaijan	55.5	1.69	4,144	60.0	62.7	-12.2	2.50
Turkmenistan	44.8	2.28	1,796	47.7	50.5	n.a.	4.00
Uzbekistan	41.1	2.59	9,179	45.1	48.2	-2.3	3.90
Kyrgyzstan	38.7	2.07	1,807	42.9	46.0	-5.0	3.70
Tajikistan	32.1	2.86	1,906	35.0	38.0	-11.4	4.90
Mongolia	60.3	3.03	1,436	66.7	69.4	-3.2	3.56
Islamic Republic of Iran	58.5	3.61	38,452	64.7	67.4	n.a.	5.00
Democratic People's Republic of Korea	60.9	2.35	14,308	65.3	67.8	n.a.	2.37
Group 2b							
Brunei Darussalam	57.7	2.09	162	61.2	64.3	n.a.	3.07
Malaysia	52.9	3.88	10,422	61.1	64.4	5.6	3.62
Philippines	53.1	4.21	35,175	63.2	66.6	1.7	3.93
Indonesia	34.4	4.49	67,024	45.2	49.7	6.0	2.90
Thailand	19.7 (32)	2.49	11,487	24.3	27.4	8.6	2.10
China	29.4	3.99	355,597	38.8	43.0	7.8	1.95
India	26.5	2.87	243,486	30.9	33.8	2.9	3.75
Pakistan	34.1	4.44	46,615	41.5	45.4	1.3	6.17
Group 3							
Cambodia	20.1	6.23	1,999	27.8	31.6	n.a.	5.25
Lao People's Democratic Republic	21.1	6.08	999	28.8	32.6	n.a.	6.69
Myanmar	25.8	3.27	11,774	31.4	35.4	n.a.	4.16
Viet Nam	20.5	3.10	14,980	24.4	27.4	n.a.	3.87
Afghanistan	19.6	7.66	3,701	24.9	28.2	n.a.	6.90
Bangladesh	17.7	5.26	20,899	24.6	28.2	2.0	4.35
Sri Lanka	22.1	2.20	4,009	26.9	30.7	2.9	2.48
Nepal	13.1	7.07	2,797	19.9	23.2	2.3	5.42
Bhutan	6.2	4.81	99	9.4	11.4	4.4	5.86
Papua New Guinea	15.8	3.63	665	19.4	21.8	2.2	5.05

Country or economy	Level of urbanis-ation 1994 (%)	Annual growth rate (%)	Urban population 1994 (000s)	Level of urbanis-ation 2005 (%)	Level of urbanis-ation 2010 (%)	Growth in per capita GNP 1985-1994 (%)	Total fertility rate 1990-1995
Group 4							
American Samoa	49.4	3.84	26	54.8	57.6	n.a.	3.74
Cook Islands	59.9	1.83	11	65.8	68.5	n.a.	3.74
Fiji	40.4	2.22	311	45.4	48.7	2.4	2.98
French Polynesia	56.3	2.15	121	58.9	61.3	n.a.	3.20
Guam	38.0	2.36	56	41.4	44.4	n.a.	3.24
Kiribati	35.5	2.38	27	39.7	42.6	n.a.	4.36
Marshall Islands	68.5	3.96	36	74.8	77.1	n.a.	4.36
Micronesia (Federated States of)	27.6	4.01	33	33.6	37.6	n.a.	4.36
Nauru	100.0	2.57	11	100.0	100.0	n.a.	4.36
Niue	29.6	-3.11	1	30.0	31.7	n.a.	n.a.
Northern Mariana Islands	53.5	2.04	25	57.3	60.0	n.a.	4.36
Palau	70.3	2.70	12	74.3	76.2	n.a.	4.36
Samoa	21.0	1.07	35	23.0	25.0	-0.3	4.50
Solomon Islands	16.6	6.49	61	23.2	26.7	2.2	5.39
Tonga	39.9	3.53	39	51.9	56.2	0.3	3.74
Tuvalu	45.0	4.07	4	56.5	60.9	n.a.	3.74
Vanuatu	19.1	3.38	32	22.8	25.7	-0.3	4.68
Maldives	38.7	3.97	65	30.7	33.9	7.7	6.80

Source : Skeldon, R. (1998)

Urbanisation Prospects

As reported by Skeldon (1998), the prospects for future urbanisation clearly vary by group in ESCAP region. The levels of urbanisation cannot be expected to increase significantly in group 1 economies: they have reached levels equivalent to those of the most developed countries in the world where there is an observed stabilization once levels above 70 percent are reached. Among the countries under examination, only the Republic of Korea is expected to increase significantly its level of urbanisation to 2010 when urbanisation is projected to reach 91.4 percent, one of the highest levels in the world for a country of equivalent size at that time. Rates of natural increase among the countries of this group are low, which will mean that migration will be the leading component of any urban growth, with international migration towards the largest cities becoming increasingly important. Urban deconcentration rather than concentration is likely to characterize patterns of urbanisation among the countries and economies in this group.

Among group 3 countries, urban growth is likely to continue to be fast, but levels of urbanisation are rarely likely to achieve significantly higher levels than at present over the immediate future. By the year 2010, almost no country in this group is expected to have more than one-third of its population living in urban areas. This is due to the rapid rates of overall population growth that will cause rural populations to grow almost as fast as urban populations. The weak, or limited, economic base, and the political instability in several of the countries among this group, are factors unlikely to generate stable urban growth. Perhaps the one exception in this group will be Viet Nam which, after many decades of instability and isolation, is emerging as a potential centre of dynamism in the region.

It is among group 2 countries that we can expect to see the most dramatic shifts in urbanisation over the near future. Group 2b contains some of the largest and most rapidly growing economies in the world, and the concentration of their populations in urban areas will be an integral part of their development. The natural growth of populations generally remains moderate to high and urban growth will be caused both by migration and by natural increase, as well as urban boundary delineation. While the importance of natural increase to urban growth is common to group 2a countries, these are quite distinct in their recent economic growth, the vast majority showing very slow or negative growth. Stagnant rural sectors, and recent independence for many which stimulates urban administrative functions, will continue to favour a transition towards a more urban society.

The small group 4 countries show both highly variable patterns of urbanisation and highly variable projected urban growth rates. These range from islands with over half the population living in urban centres such as the Cook Islands, to those with less than one quarter of their populations in towns such as Samoa. Growth rates vary from the very fast in the Federated States of Micronesia, Solomon Islands and Vanuatu to much more moderate rates, with that for Niue actually being negative. Meaningful comparison of urban places in the countries of this group with those in other groups is virtually impossible as what is considered to be a town in Solomon Islands or Micronesia is going to be very different from the town in China or India.

Malaysian Context

Malaysia is one of the most rapidly growing economies in the world with relatively high rates of urbanisation and urban growth. Thus its urban development will be an integral part of its national development. As the size of urban centres are getting larger, social and economic relations get more complex. The dynamism of the urbanisation process in Malaysia stresses the importance sustainable development of cities in socio-economic terms which can be reconciled with sustainable management of space.

Urban management is becoming unmanageable by the sheer volume of information to run cities, time-consuming process, the diversity of responsibilities and insufficient monitoring in mitigating

crises. Information technology is an inevitable solution to organising and communicating information on urban activities through electronic systems. This would encourage the decentralisation of cities into theme satellite communities through lessening of the need for people to commute and things to be transported (Onyirimba and Azman, 1996). The establishment of the intelligent city of Putrajaya as Malaysia's new national administrative centre for the 21st Century within the Multimedia Super Corridor is an indication of the government's commitment in this direction. This will lead to the metropolitanisation of old cities with new cities. What used to be a single-centred urban area will be transformed into multi-centred one, creating a metropolis which consist of large core cities that are linked by industrial or commercial belts. This pattern of urbanisation which is expected to take place initially in the Klang Valley region will spread to other developed parts of the country in the near future. But is the pattern of urban growth and urbanisation desirable from the perspective of sustainable development. Have we fully tapped the potential of information technology to create a city of the future?

IMPLICATIONS OF INFORMATION TECHNOLOGY (IT)

Urbanisation is measured in terms of the ratio of number of people living in urban areas to the total population of a nation. However, increase in the proportion of urban population: total population has been accompanied by tremendous growth in the physical land area used for urban activities. A negative impact of urbanisation has thus been the extensive growth and encroachment of urban activities into the rural countryside. The consequences of urban sprawl are numerous and well-documented including expensive and exhausting commutes to work, pollution, flashfloods, shortage of water supply for domestic consumption, expensive housing and general degradation in quality of life. Hence, the agenda for sustainable urbanisation promotes the notion that we must not assume that there will be unlimited supply of resources to feed the relentless push towards industrialisation and the achieving of developed nation status.

The question we must ask is how can we achieve sustainable development? It is not sufficient to merely restrict growth of urban population to a designated urban growth boundary (one of the tools used in growth management in the United States of America). Planners must reexamine their concepts and understanding of urban city structure in an era where our daily chores (whether it is schooling, shopping or working) will be facilitated by telecommunications and information technology.

Urbanisation is an indicator of developed status. Traditionally, the higher the rate of urbanisation, the more developed a nation is deemed to be. As such urban growth is in many countries a desired or favoured trend to bring better services and amenities and better paying jobs to the citizens. Malaysia for instance pursued a policy of urbanisation first under the British Administration and latter under the New Economic Policy to restructure society.

However, urbanisation runs counter to the basic objective of sustainable development since urbanisation at whatever rate will deplete natural resources and encroach into the rural countryside. With modern information technology, the concept and meaning of urbanisation may need to be redefined. We need development but must it be accompanied by urbanisation?

Cities of the Future

A primarily goal of planning is to achieve efficiency in the utilisation of resources with the objective of creating a high level of environmental quality for healthy living in the city. Malaysia, through the Federal Town and Country Planning Department has propagated the *Total Planning Doctrine* which calls for specific attention to the relationships between Man and his Creator, Man and Man, and Man and the Environment. This doctrine strives to attain balanced and sustained development from the economic, social, spiritual and environmental aspects. To a large extent, these have been translated into the cities and urban development projects currently in various

stages of implementation in Malaysia such as Putrajaya, Cyberjaya, KL LinearCity, MEC City, Proton City, KL Sentral and Kuala Lumpur City Centre (KLCC).

To the casual observer however, these new cities appear no different from cities of today with its 12-lane highways, mass transit systems, multi-storey car parks, office complexes, shopping centres, and neighborhood centres. Of course they come packaged with the latest in information and telecommunications technology and are also beautifully designed. But are they truly the cities of the future or are we merely incorporating state-of-the-art technologies without exploiting the extended benefits which we will derive if we were to restructure our cities to facilitate and accommodate new processes and new ways to undertake various tasks.

From the agriculture revolution to the industrial revolution, we are currently witnessing the information revolution. In the cities of the future, the ability to capture, collate, analyse and transmit and receive information will be vital. All this will be facilitated by telecommunications and information technologies. Physical space will become a secondary issue as we create ***virtual*** real estate (as opposed to ***real*** estate).

Various names have been given to the city of the future including information city, cyber city, intelligent city, virtual city and numerous others but they should all possess the following characteristics:

1. ***Telecommunications Network and Accessibility***

   At the core of the information city will be high-speed telecommunications networks with global access. Fibre optic networks designed for zero downtime will be the favoured backbone in highly built-up areas while wireless and satellite systems may provide access to remote locations.

   Integrated Services Digital Network (ISDN) providing simultaneous voice and data transmission, modem dial-up or direct connections to the backbone will provide households and businesses access to resources in the virtual city. Teleports, which are centres with sophisticated telecommunication facilities, will provide citizens without personal information technology equipment an alternative means of access. These teleports which would be distributed in locations near to residential areas was once propagated as centres where workers could congregate to carry out their work instead of commuting long distances to their offices. For the average citizen however, a ordinary computer with ISDN connection (or even modem dial-up) would be all that is necessary for teleactivities including teleworking, teleshopping, telesocialising, and teleschooling.

2. ***Virtual Real Estate***

   Certainly, there will still be the need for houses or apartments to live in and there will still be the shops, restaurants and entertainment centers where city folks will congregate. The physical city will however be supported by a virtual counterpart, the virtual city where banks, schools, organisations, offices, shops, entertainment centres, social and community centres and governments will take up virtual real estate identified by their DNS (Domain Name), e.g. www.hbp.usm.my. The concept of virtual real estate is already a reality where famous sites such as **Geocities** offer hard disk space for the millions of homeless cybercitizens of the world. At the moment these sites are generally offered free with the hope of attracting advertisements. Advertisements are a major irritant for web-surfers but a business model would soon evolve where businesses would buy or rent and even sell virtual real estate to conduct business on the World Wide Web (WWW). Already, successful high-tech companies or companies with potential capture the Internet business are being bought and sold at a premium. The most recent example is the acquisition of Netscape by America On-Line (AOL). The creators and founders of these high-tech (mainly Internet-based) companies are in fact the pioneer

developers of virtual real estate. In much the same way shoppers choose their favoured shopping complex based on the attractiveness of the complex, shoppers in the virtual world will choose their favourite cybermarket based on price, variety, quality and the shopping experience offered by the website. Sites with high traffic volume and sales turnover would of course fetch high values in the virtual real estate market.

These virtual real estate could be located anywhere serving a global market. Its implication for planning is that it will replace and reduce the physical spaces required for traditional shopping activities. Planners follow a set of planning standards or guidelines in determining the future need for commercial office or shopping space as well as other amenities and facilities (schools, open spaces). Alternatively, the planner may project space needs based on projected turnover. These standards and methods must be reexamined to provide new tools for the planner to project future space needs. Demand for virtual spaces however will have little impact on physical space since the hardware in which the virtual spaces will be stored are very small compared the size of the building in which it will be placed.

Institut Teknologi Mara (ITM) has taken the bold step in declaring that there will be no limit to the number of students for its Internet-based academic programs. Conceptually, this virtual campus will translate into less demand on physical infrastructure such as lecture halls and hostels since the students will study mainly from the comfort of their homes. Extending the ITM model to the smart schools program we could conceivably have students from all over the country and even the world log-in to the Bukit Bintang Smart School hence providing opportunities to students even in remote areas of Malaysia. With the virtual city, we would only need one central banking facility accessible from anywhere using a personal computer connected to the information highway. There would be no need for a library in each town, university or school since the National Library will provide all the digital information electronically. Investments which would otherwise be used to build many library buildings, maintain staff and buying multiple copies of reading materials for the libraries could be channelled to built a central virtual library.

3. ***Anytime, Anywhere***

This happens to be a catch phrase in the advertisement by UNITAR, the first virtual university in Malaysia (published in the printed media!). It essentially sums up the lifestyle of the future providing flexible hours where distance and location are not a deterrence.

With the telecommunication infrastructure and the virtual components of the city in place, various forms of teleactivity can be conducted from the comfort of our own homes at any time of the day. Hence, we should be able to deal with the National Registration Department located in Kuala Lumpur from anywhere in the world at anytime of the day (instead of having to travel to Kuala Lumpur if you want your foreign-born childs registration of birth endorsed). A teacher would be able to monitor the progress of students from home when their young children are taking an afternoon nap. A systems analyst (Information Systems Officer or ISO) in a government department could monitor traffic on the departmental server from home while the Director of Planning could make decisions on applications for development approval even if he or she is attending a 9-month training program away from the office. Developers and consultants could access the Planning Department's server to investigate planning policies or track the progress of development applications from any location.

Being able to conduct business from a distance through telework, teleschooling, teleconsultation and so on, will translate into tremendous savings for the citizens and government and businesses. There would be less consumption of fuel, less need for mammoth carparks, less roads, less demand for vehicles and less need for office space for employees. The houses and apartments would have to be redesigned to specifically incorporate not only telecommunication infrastructure but suitable workspaces in the home. There will be greater

consumption of electricity and hardware and software will require building materials which could also end up in the landfill but generally we should expect the benefits to out weigh the costs (but by how much should the subject of research).

The major characteristics discussed above distinguishes an information city of the future from the traditional cities of yesterday. Malaysia has designed and are implementing various cities with different names but all incorporating telecommunications and information technologies. However, none appear to have gone beyond the infrastructure to attempt to restructure the processes and the physical urban structure. In particular, while e-government is a flagship application for the Multimedia Super Corridor (MSC) it appears confined to systems to create an electronic workflow system. There is no discussion in official literature on the three major characteristics of the information city discussed above. On the other hand, there is a lot of emphasis about the quality of life at Putrajaya with its Garden City design. Promotional materials even highlights a romantic boat ride across the lake from home to office. It is also obvious space planning for the government complex assumes that workers will continue to go to the office from 8.00 a.m. to 4.30 p.m. Research on teleworking is said to be in the second stage but officers at the MSC and MAMPU (Malaysian Manpower Planning Unit) are reluctant to discuss the subject at seminars and forums.

Unfortunately for the town planners, the literature on the information city though abundant provides little guide for the actual design and implementation. Furthermore, many aspects of town planning involve many jurisdictions. For instance, the planning of schools are a federal prerogative and unless the Education Ministry embarks on an agenda to create virtual schools, the local planning authorities would continue to follow the old planning standards on provision of schools. While local planning authorities have jurisdiction over the provision of commercial floor space it would still need a set of guidelines on how much physical space would be required or sufficient for e-commerce and traditional shopping activities. These guidelines must be developed based on research and study and even experimentation since there is little or no previous experience to emulate. The opportunities offered by Putrajaya and other similar projects in Malaysia should not be lost if we want to gain an edge in creating the information society of the future.

RESEARCH AGENDA FOR PLANNING THE INFORMATION CITY

Generally, little is understood about the implications of the information city on town planning. Much has been done to propagate a liveable city through excellent urban design and conceptualisation of the physical environment. Planners continue to be guided by the planning standards meant for a past era. It is now timely that a new set of standards are developed to truly build the information city. This can only be achieved with better understanding the implications through research in certain key issues discussed below.

Organisational Restructuring in Government and Private Firms

The trademark *multiple layers* of bureaucracy was designed for the paper-based manual system with the consequential red tape characteristic of government departments. Typically, a well-structured town planning department in charge of development approvals would provide for technicians (at the base of the pyramid) to undertake preparatory tasks such as data gathering and preparation of documents and maps to provide the input for decision-making. Usually, these tasks are routine and could be automated. When these materials are ready, they are passed on to the next level of the bureaucracy which may be a senior technician or technical assistant who are semi-professionals. These second echelon officers will vet and confirm the information or provide additional information. In many departments, the entire file is then transported to a Planning Officer who as a professional town planner would not only provide an opinion based on planning principles and guidelines but may very well end up checking the work of their sub-ordinates if their experience shows that particular sub-ordinates are less than diligent in carrying out their duties. Finally, the file will travel to the Director of Planning for final decision. In most instances

however, the files are likely to travel several times back and forth across the department for verification and consultation and paperwork before a decision is made. Then of course, the development application probably ends up with the developer's consultant for modifications, amendments or clarifications and resubmission and further processing in the planning department.

This cumbersome system can benefit from an electronic planning approval system. However, restructuring is required but old habits die hard. Government officers may insist on keeping all the existing staff and going through the various stages of plan processing as though they are doing the job manually. They are familiar with the old system and are reluctant to try innovative solutions. For instance, computing densities and entitlement during development control is typically carried out by the technicians using paper, pen and calculator but this is time consuming and error-prone. However, when they are shown a more accurate and innovative solution using IT, they accept that it has its benefits but complain that it requires more work to input the data. But even if they are willingly to try the system, all the levels of their bureaucracy get built into the electronic system. Obviously, redundancy is a critical issue since the use of technology will remove some layers from the bureaucracy which are translated into savings in cost of staff as well as space requirements.

Increasing use of information technology will eliminate many jobs. For instance, Universiti Utara Malaysia (UUM) is reportedly implementing a system where students will fill in an on-line application for financial assistance thus eliminating many jobs (including workers at the printers and data entry staff). A fully electronic banking system will make bank tellers as well as the officers who supervise them redundant and on-line ticketing will reduce if not eliminate the number of travel and ticketing agents.

The question is, will the new information economy create enough replacement jobs for the jobs lost through IT integration into the workflow? Certainly, there will be tremendous demand for workers who are able to create the information, develop the applications systems and manufacture the hardware which are required to drive the information city. But how many of these jobs do we need and what kind of skills must they possess?

Economic implications of Virtual Real Estate

A direct benefit for sustainable development is that there should be less real estate development since the requirement for offices and commercial spaces will be substantially or at least significantly reduced. This will be translated into slower depletion of building materials which are generally limited and non-renewable. Post offices, banks, shops, school buildings and every conceivable type of building will either become obsolete or required only in very small numbers. The impact of this would be tremendous reduction in real estate development.

The current and previous experience with economic slowdown has demonstrated that the construction industry is a major engine of growth. In future, virtual real estate would replace physical offices and buildings. Developers will invest in building virtual offices and shopping malls in which merchants will offer their wares for sale. But will virtual real estate provide sufficient growth to sustain the economy?

Vested interests such as real estate developers, financiers, landowners, the petroleum industry, the makers of automobile and its accessories, and government agencies with responsibilities for infrastructure development and construction may however persist in carrying out the traditional construction activities rather than channel their resources to building the virtual city unless it can be demonstrated through research that the economic returns from virtual real estate could be just as lucrative. It is often said that real estate development requires little in terms of skill since anyone could buy a piece of land and become a developer. On the other hand, developing virtual real estate would require specialised knowledge and technical know-how. Thus a new breed of developers will emerge. They will create virtual shopping malls and sell or rent out virtual shoplots (hard disk space) and provide the systems to manage the on-line businesses.

Finally, we need to look at the financial implications to the local authorities who are reliant on property assessment for a major portion of their finances. The virtual shopping mall can be accessed from anywhere in the world but it would conceptually require zero urban services from the numerous local authorities where their customers are residing and as such should be exempted from local taxes (except at the location where all the hardware and systems are housed in).

Managing Urban Growth

As the community gains in terms of economic status and wealth, it will demand a better quality of life. This has generally been translated into measures to manage urban growth which invariably results in a "not in my backyard" approach where communities tries to push unwanted growth to other localities.

The information city offers a comprehensive approach to urban growth management not merely from limiting physical growth but reducing space needs by way of centrally shared virtual resources. Urban growth management should then be seem not as regional or metropolitan initiatives but from a national and transnational perspective. Policies must be establish which de-emphasises urbanisation but instead emphasise more on a holistic approach to sustainable development. But will such a policy encourage sprawl instead? How will the town planners balance competition for (or resistance to) growth amongst various local authorities? We will need new tools to model growth and new mechanisms to facilitate dialogue between the local planning authorities. Even though the current planning legislation in Malaysia (Town and Country Planning Act 1976) provides for consultation amongst planning authorities it is basically a unitary model where each local authority decides what is best for itself. The general tendency amongst local planning authorities (and the federal and state authorities as well) have been to promote growth as much as possible.

Structure plans and local plans being prepared still follow the central place theory structure of urban hierarchy. This is mainly to accommodate the fact that some higher order services and goods require a certain minimum threshold to thrive. An alternative structure is the network cities comprising smaller similar-sized cities connected to each other. But in the information city, distance is immaterial since virtual resources could be located virtually anywhere. Thus the merchant is not dependent on local population for its customer base. Planners must therefore be introduced to needs theories and approaches to urban economic management which will support sustainable development.

IT Tools for Planning

Information technology, especially databases, GIS, CAD, animation and web-based technology will provide both the infrastructure for the functional operation of the information city as well as for the activity of planning the town itself. In particular, collaborative efforts in planning and design can be carried out on the web where not only professionals (such as planners, architects, engineers, etc) provide inputs but concerned citizens, NGOs, landowners and other stakeholders will contribute ideas, visions, needs and wants in a truly participative and empowering environment. This will be in line with the Agenda 21 demand for democratisation of the policy making process. The technology for such collaboration is already available in a limited sense but we will need to train future planners to handle the technology. This will necessitate a re-look at the professional curriculum of planners, architects, engineers and even systems engineers. Most planners in practice would readily claim that they are "IT illiterate" but are at the same time willingly to embrace IT. However, they are dependent on external experts to carry out most of their IT integration work. This causes problem since their lack of knowledge of IT prevents them from exploiting the full potential of IT while on the other hand the external experts are typically systems specialist with little or no knowledge of the processes in town planning.

What skills should we provide the planners of the future? Is it sufficient to teach planners GIS skills for purposes for suitability analysis or mapping or the ability to point and click to retrieve data and carry out tasks automated into the electronic-based workflow? Or should we strive to produce planners who are skilled enough to undertake an in-house GIS project including designing and structuring databases as well as applications systems development and maintenance? Even amongst the younger generation of students, there is still a general fear of technology and reluctance to independently take technology by the "horns" and make it work for them. This may be attributed in part to the lack of previous exposure to IT. We must reorientate our thinking, especially amongst policy makers, that IT skills are not the sole domain of computer science students.

IT skills must become an integral core of skills for the planner. Unfortunately, the planning curriculum as still paper-based. We must urgently carry out research to identify and develop a set of integrated IT skills required of planners. It is not enough to teach IT courses in isolation of the rest of the curriculum.

Planning standards needs to be reviewed

The information city will require a new set of planning standards because the cybercitizen will now have ready access to virtual resources. For instance, the requirement for office and shopping floor space would be drastically reduced. But at the same time, the space in the home may have to expanded or reallocated to accommodate teleactivities. And as the citizen spends less time on the road commuting, they will have better and more quality time to spend on leisure hence generating more demand for recreational amenities. The drafting of planning standards has traditionally be dependent on experience rather than scientific research since it is quite impossible to establish levels of demand. Nevertheless, research can be carried out to establish types of activities which can be transferred into the virtual space and thereby reduce demand for physical space. The amount of physical required would then be the subject of consensus by the community.

CONCLUSIONS

The Information City offers tremendous potential for pursuing the sustainable development agenda. But to reap that benefit, we must not merely incorporate the hardware and software but must reexamine and restructure basic processes. In particular, the concept of the virtual city discussed above will have to integrate into the design and development of the physical city. We still have a long way to go and we must begin by initiating the research agenda suggested above to provide us with a better understanding of what the city of the future should be or could be.

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21st Century Urbanisation: A Perspective Based on Sustainability and Information Technology

by

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21st CENTURY URBANISATION: A PERSPECTIVE BASED ON SUSTAINABILITY AND INFORMATION TECHNOLOGY

Abstract

The environmental and social benefits of sustainable transportation have always been recognised but are now mainstream as Kyoto and the community politics of transportation indicate. However sustainable transportation has always been seen as secondary in economic terms unless lots of unquantifiables were included. The results of a study for the World Bank now show that cities with significant sustainable transportation systems are more economically efficient in terms of a range of parameters including the amount of road expenditure, transit operating cost recovery, fuel-efficiency, road accidents, air pollution and in overall terms the percentage of city wealth that goes into transportation. The data show that cities with the most roads are the most costly and the most rail-oriented cities are the least costly. Further, the single most important variable relating to transport efficiency is the density of the city – the most sprawling cities are the least efficient. Thus strategies to contain sprawl, to reurbanise , to traffic calm, to build new light rail systems into car dependent suburbs with focussed sub centres, and to facilitate biking and walking, all add to the economy of a city. Strategies that build freeways and add to sprawl are draining the economy of cities. Global information age trends are making the need for these sustainable urban patterns even more necessary as trends show that reurbanisation around walkable sub-centres is favoured by information-based jobs and residents. The need to operationalise these strategies in planning and engineering practice and in the politics of infrastructure funding remain the major challenges.

Introduction

The professional practice of engineers and town planners mostly implies a marginalisation of sustainable transportation modes (transit, biking and walking). They are not seen as a key component of the dynamics of the urban economy, they are something you help because you should but the real transportation system is about moving cars and trucks. This paper is about how that professional perception now needs to change from environmental, social and economic perspectives. It tries to show how the 21st century needs to be more sustainable and IT-oriented and that the two agendas can be shown to overlap in the development of walkable sub-centres.

Environmentally, sustainable transportation is now mainstream. The sustainable cities movement has brought the environmental movement into the city and focussed their attention on the myriad of local and regional problems associated with automobile dependence (Newman and Kenworthy, 1998). Globally the attention of the world has been focussed on climate change and the Kyoto agreement which now sets all developed nations into a pathway of reducing energy. The biggest single technology causing greenhouse emissions is the automobile and it is the hardest for nations to recognise as the culprit. But as the process of reducing emissions becomes more and more mandated down to local level the need for planners and transportation engineers to find ways of reducing car use will be on the agenda – mainstream.

Socially, the situation with sustainable transportation is similar with the alternative modes very much in the centre of the social agenda. This is for several reasons including the reality that sustainable transportation modes have a stronger element of social justice, that most democratic processes lead to sustainable transportation choices rather than outcomes preferred by transportation bureaucracies, and finally the strength of revival by communities in response to the globalising economy is forcing a more community oriented transportation (see Naisbett 1994).

However, on the economic front the sustainable modes have not been mainstream; the only economists supporting these modes have tended to do so on the basis that there are massive unquantifiables that are left out of standard cost comparisons on the modes. However, ISTP has recently completed a major study for the World Bank which has provided a different perspective, indeed it suggests that sustainable transportation should be mainstream on economic considerations.

New Data on Global Cities

The full data from the World Bank study involved patterns in transportation, infrastructure, land use, environmental and economic parameters (Kenworthy et al 1997). These have been more fully analysed in our new book along with a more extensive set of transport and land use data on a further nine cities including four from Canada (Newman and Kenworthy, 1999).

A few of the key transportation parameters will be examined before looking in more detail at the economic parameters. The sample of 37 cities are set out in Table 1 below; most data are presented as a summary of the different regions.

The patterns of unsustainable car use are easily seen in the data on private passenger transportation energy use per capita in our global cities sample (Figure 1).

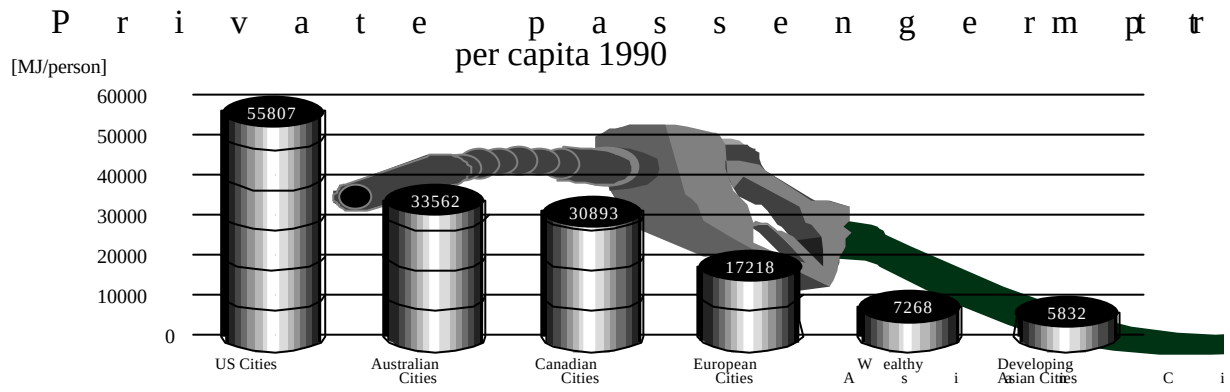


Figure 1

Likewise the patterns of sustainable transportation modes are directly opposite (Figure 2).

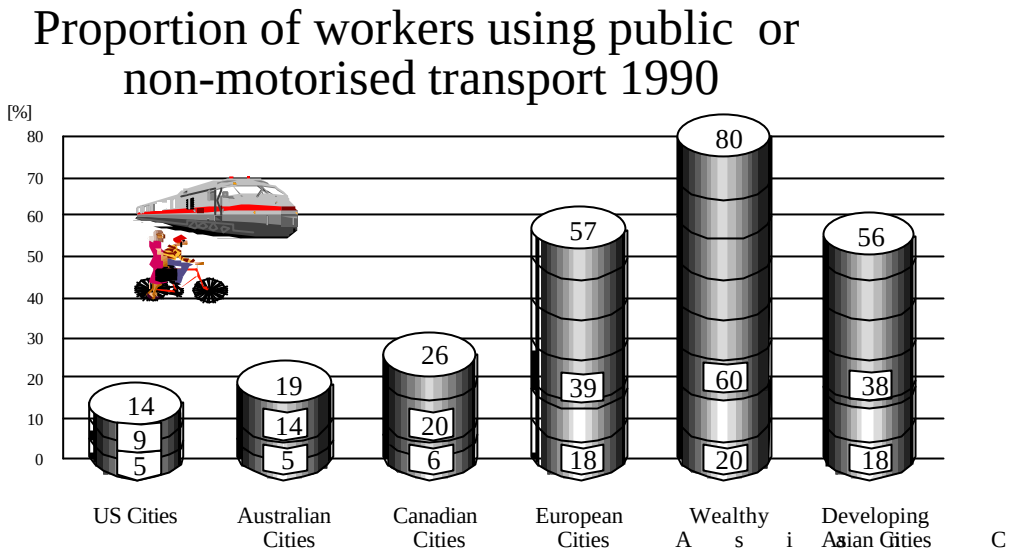


Figure 2

However it has always been assumed before that such patterns just reflect the nature of the economies involved: those who use more cars and less sustainable modes are wealthier. This is no longer quite so clear.

Car use and wealth

For many years there has been an implicit assumption amongst transport planners, engineers and economists that there is a close link between mobility and wealth (e.g. Rainbow and Tan, 1993). This leaves very few policy options open to cities for managing growth in car use. However, the data for such assertions tends to be national data and is rather selective.

Below we will examine the link between mobility and wealth by comparing the per capita use of cars in 37 global cities and see how this compares with their per capita city wealth (called Gross Regional Product or GRP).

The data on car use and wealth (in 1990 US dollars) are given in Table 1 and also in Figure 3.

CITIES	Car use / (km)	GRP / capita ($US 1990)
AUSTRALIAN	7203	
Perth	7,203	17,697
Adelaide	6,690	19,761
Brisbane	6,467	18,737
Melbourne	6,436	21,088
Sydney	5,885	21,520
AVERAGE	**6,536**	**19,761**
AMERICAN		
Phoenix	11,608	20,555
Denver	10,011	24,533
Boston	10,280	27,783
Houston	13,016	26,155
Washington	11,182	35,882
San Francisco	11,933	31,143
Detroit	11,239	22,538
Chicago	9,525	26,038
Los Angeles	11,587	24,894
New York	8,317	28,703
AVERAGE	**10,870**	**26,822**
Toronto (Metro)	5,019	22,572
EUROPEAN		
Frankfurt	5,893	35,126
Amsterdam	3,977	25,211
Zürich	5,197	44,845
Brussels	4,864	30,087
Munich	4,202	36,255
Stockholm	4,638	33,235
Vienna	3,964	28,021
Hamburg	5,061	30,421
Copenhagen	4,558	29,900
London	3,892	22,215
Paris	3,459	33,609
AVERAGE	**4,519**	**31,721**
WEALTHY ASIAN		
Singapore	1,864	12,939
Tokyo	2,103	36,953
Hong Kong, China	493	14,101
AVERAGE	**1,487**	**21,331**
DEVELOPING ASIAN		
Kuala Lumpur	4,032	4,066
Surabaya	1,064	726
Jakarta	1,112	1,508
Bangkok	2,664	3,826
Seoul	1,483	5,942
Beijing	351	1,323
Manila	573	1,099
AVERAGE	**1,611**	**2,642**

Table 1 Car use and Gross Regional Product per capita for 37 global cities, 1990

Correlating the data in Table 1, it is found that there is only a weak positive linear correlation between car use and wealth which only explains 18% of the variance and is therefore not particularly significant in terms of policy implications.

As already outlined, North American and Australian cities have considerably higher car use per capita than European and Asian cities. It is higher than would be expected just considering the level of economic activity or wealth, especially in comparison to the European and developed Asian cities in the sample (that is, Tokyo, Singapore and Hong Kong, China).

The large US cities in this sample have:

- 1.66 times higher car use than the major Australian cities but are only 1.36 times higher in GRP;
- 2.17 times higher car use than Metropolitan Toronto but are only 1.19 times higher in GRP;
- 2.41 times higher car use than the average European city but actually have only 0.85 the level of GRP per capita;
- 7.3 times higher car use than the wealthy Asian cities but have only 1.26 the level of GRP.

Perhaps of even more significance is the comparison between the developing Asian cities of Kuala Lumpur, Surabaya, Jakarta, Bangkok, Seoul, Beijing and Manila and the three wealthy Asian cities of Tokyo, Singapore and Hong Kong, China: the poorer cities have 108% as much car use but have an average GRP which is only 12% of that in the developed Asian cities. This is even more accentuated in the case of Kuala Lumpur, the most motorised developing Asian city. Kuala Lumpur has 2.7 times the average car use per capita of the wealthy Asian cities, yet only 19% of the per capita GRP.

The car use per capita figures in developing Asian cities in some cases include a reasonable amount of motor cycle use (motorcycle use is also included in other cities but is not as significant). However, this does not fundamentally affect the point being made here, which is that developing Asian cities, despite low levels of wealth compared to their more developed neighbours, are experiencing very much higher levels of private mobility.

Within the US, there is also a significant difference between cities that cannot be explained by simple economic factors alone. For example, New York (the lowest car using US city) has 36% less car use per capita than Houston (the highest car using US city), but is actually 10% higher in GRP.

The parameters below help to provide some of the detail as to why there is a negative impact on economic performance as a city invests in excessive levels of mobility through automobiles. It will examine direct economic costs such as road expenditure, percentage of GRP spent on the journey-to-work and transit cost recovery. It will then examine the indirect costs due to transport deaths and transport emissions. The detailed data on these items can be found in Kenworthy et al (1997) and Newman and Kenworthy, (1998).

Road expenditure

Road expenditure per capita (Figure 3) follows the pattern of car use and car dependence in the sample of cities, though it does not display such extreme differences (US cities spend $264 per capita each year, Australian $142, Toronto $150, European cities $135, wealthy Asian cities $88 and developing Asian cities spend $39 per capita). There is a higher level of maintenance in North American and Australian cities due to their higher amount of roads per capita, but it is obvious that considerable road building is still occurring in these car-based cities. The sustainability agenda will require a change in these priorities in the future if car dependence is to be eased. It is apparent from the above data and the economic parameters below, that such a change can also constitute a move towards greater transportation efficiency.

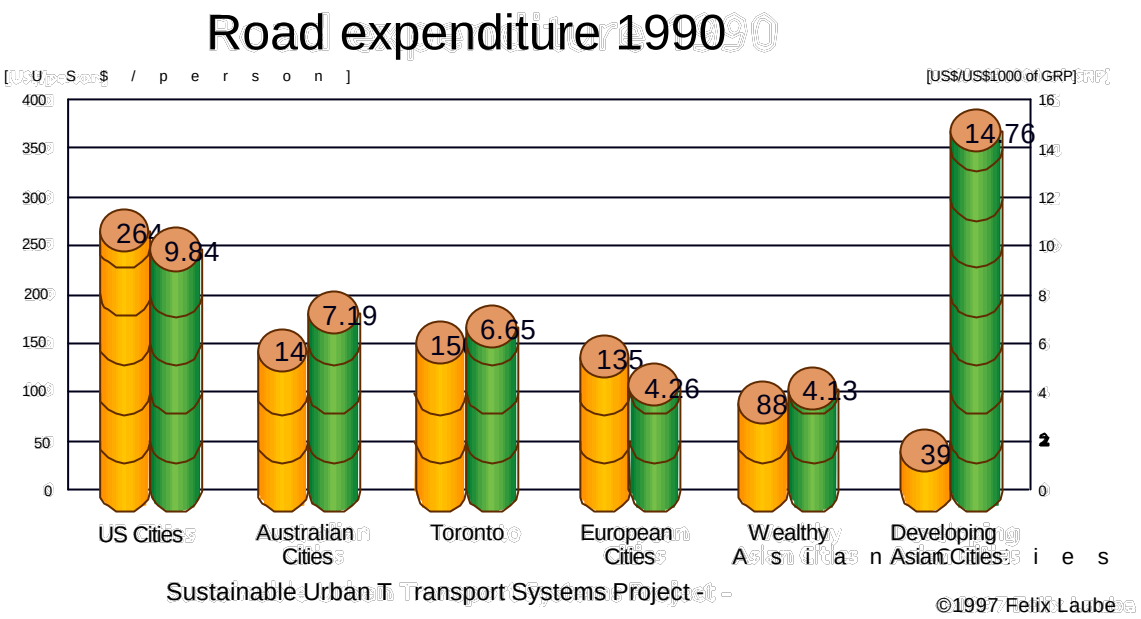


Figure 3 Road expenditure in global cities, 1990

Road expenditure in European cities is relatively high as they also have many new areas on their peripheries where a more car-dependent urban form has been created, e.g. the Copenhagen suburbs and surrounding villages that have been developed into suburbs since the 1940's have densities of 25 and 21 persons per ha and have much greater car use than the old city with a density of 63 persons per ha. Such areas will also require reassessment in the light of the sustainability agenda with a view to redirecting road funds to other modes as part of a strategic plan to reduce car dependence (see Newman et al, 1997).

In developed Asian cities, road expenditure per capita is one-third what it is in US cities, and 50% to 60% of what it is in Australian cities and Toronto. As shown below, it is also the lowest in relation to city wealth.

Road expenditure per capita in newly developing Asian cities appears to be comparatively small in absolute terms, though in Bangkok, Seoul and Beijing, there is evidence of relatively heavy spending on roads compared to other cities in this group ($61 to $72 compared with the average of $39). However, in terms of road expenditure per 1000 dollars of GRP, or in other words, in relation to a city's capacity to pay, money spent on roads in these developing cities is high. The figures for all the cities are: $9.84 for the US cities, $7.19 for Australian cities, $6.65 for Toronto, $4.26 for European cities, $4.13 for wealthy Asian cities and $14.76 for developing Asian cities. This latter figure is 1.5 times higher than in US cities, the next highest relative spender on roads. Bangkok is spending $18.56 per $1000 of GRP or 1.9 times US levels and Beijing is spending $46.11 or 4.7 times that in the US.

Percentage of GRP spent on the journey-to-work

The percentage of GRP spent on commuting is very similar across all the global cities at around 6% (Figure 4). It is slightly higher in the US at 6.9% and slightly lower in Europe at 5.4%. The developing Asian cities are higher with 7.4% of GRP on commuting due to their considerably lower GRPs and rapidly growing use of cars. Based on the data here, Manila and Surabaya seem to spend the most on getting to work (8.5% and 10% respectively).

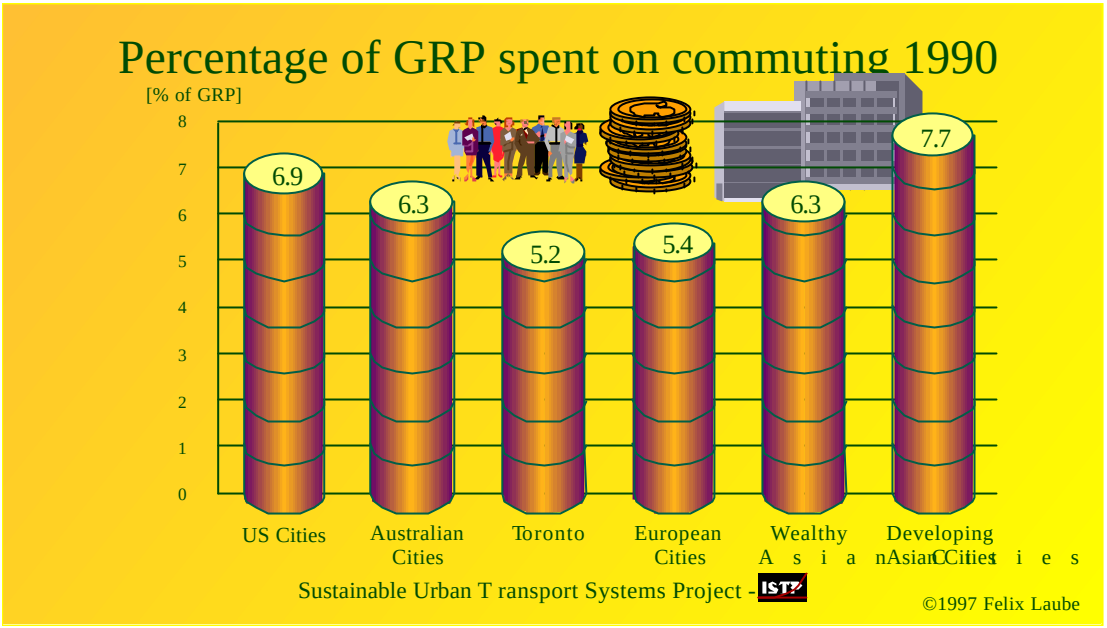


Figure 4 The proportion of city wealth spent on the journey-to-work in global cities, 1990

It is not unexpected that most cities end up with about the same commitment of their resources to commuting. It appears to be related to the way commuting times adjust to around 30 minutes on average in all cities independent of how they are provided with transport infrastructure (SACTRA, 1994). It is sanguine to be reminded that despite all the massive differences in transportation investment priorities and the large differences in transportation patterns in different types of cities, that urban people everywhere put a very similar amount of their wealth into commuting. It at least suggests that cities have an opportunity to be strategic in how they invest in transportation and that they are not going to miss out because of some recent fad.

In terms of sustainability this is a very hopeful sign. The sample of global cities shows that there are very similar levels of economic efficiency despite huge differences in car use. Thus transforming the transportation pattern of a city into one that is sustainable can be achieved without damaging overall economic performance (Serageldin and Barrett, 1993; World Bank, 1996).

Transit cost recovery

The indicator of transit cost recovery is one of the most emotionally debated issues of any area of public policy. The data in this survey, which measure operating cost recovery, is one of the first to show a comparative set of numbers from the major cities of the world which has been done on as consistent a basis as is possible. It shows that the percentage transit cost recovery follows very precisely the level of car dependence in the city (Figure 5):

- North American and Australian cities average a low 37% and 40% with Toronto standing out at 61% and the most bus-based, low density, car dependent cities of Perth, Phoenix and Houston have a mere 28% and Denver only 19% cost recovery. In such cities, even if fares are set reasonably high, it is difficult to have a high cost recovery because of the inherently higher cost structures of such systems (eg high labour input per passenger kilometre, low occupancy per service unit etc).

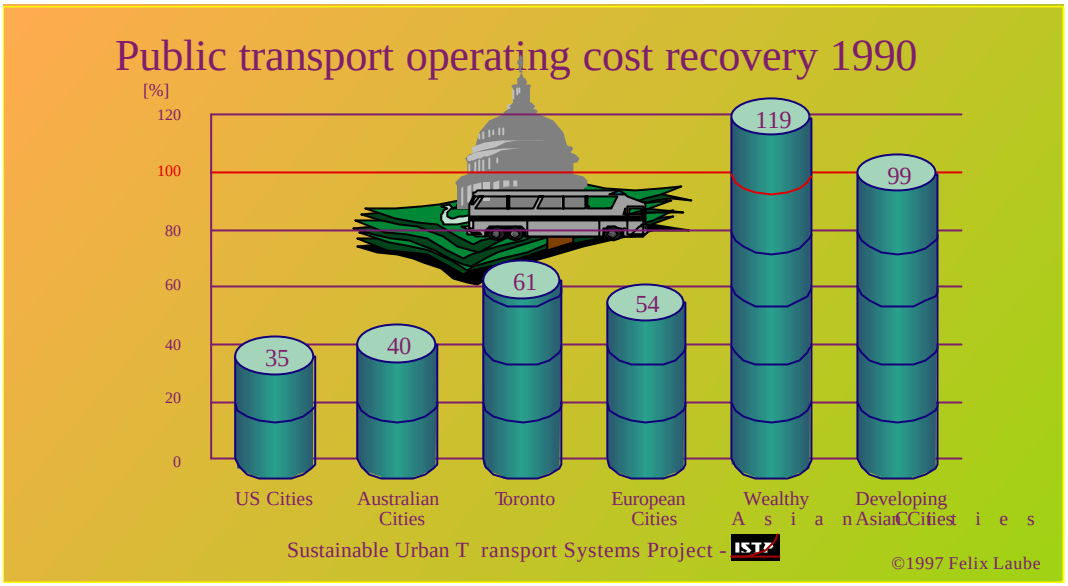


Figure 5 Transit operating cost recovery in global cities, 1990

• European cities average 54% cost recovery with a variation from 93% in London to 27% in Brussels. It needs to be understood that such variations are not just reflections of inherent economic differences between systems, but are also the result of conscious political choices made by each city as to how much of their public transport expenses they want to recover. London chooses to set high fares and recover almost all their costs (since the Thatcher years), while other cities such as in Germany and Belgium choose to recover a lesser proportion in recognition that roads are also being subsidised. The case of Stockholm with only 33% recovery also reflects a social/political position on the role of transit in the community. Of course, having made a decision to recover a relatively high proportion of transit expenses, it is certainly easier to do so in a city environment which is physically supportive of high transit use and where the quality of transit services enables transit to compete with the car. Thus in London it is extremely expensive to use the underground but it is still the best way to get around.

• Asian cities have on average very high transit cost recovery at 105%, with the highest in Hong Kong (136%) and Kuala Lumpur (135%), and the lowest in Beijing at 20% due to its very low fares and high staffing levels. Chinese bus and trolley bus tickets are perhaps the cheapest in the world, the average rate in the early 90s being less than US 0.5 cents per passenger km. This is compared to public transport prices (all modes) in other cities which range from a low of around US 1.7 cents per passenger km in Manila, through averages of about US 6 to 9 cents per passenger km in Australian, US and European cities (Hu and Kenworthy, 1996).

The transit cost recovery debate tends to focus on how to reduce government costs. It often concludes that it would be much cheaper to provide only buses as these have lower capital and sometimes lower maintenance requirements. These data suggest that buses are only effective in transit cost recovery in situations where there are large numbers of captive users, as in newly developing Asian cities such as Manila. The more fundamental way to recover transit costs in developed cities is to influence the form of the city towards a more transit-oriented structure. The role of rail systems in influencing and facilitating this cannot be underestimated.

Transportation deaths

In this section we examine the very real but nevertheless external cost of transportation due to traffic accidents. Many others have done estimates of what these costs actually represent (e.g. in the US the cost of road accidents was estimated in 1996 as US$150 billion: USA Today, January

3-5, 1997). Here we are just presenting the various patterns of transport deaths in the different cities.

The data show that traffic deaths tend to follow both the degree of automobile dependence and the level of development of the traffic regulatory system (Figure 6). In US cities, despite their highly developed road systems, strictly regulated traffic, and a population generally well-educated in traffic safety issues, traffic deaths are highest of all the regional groupings of cities (14.6 per 100,000 people). This seems to be due to the world's highest level of exposure of the population to auto traffic.

Transport deaths then decline with decreasing car use, though not in a parallel way, due presumably to the level of traffic regulation (Australian cities have 12.0 deaths per 100,000 people, Toronto 6.5, European cities 8.8, wealthy Asian cities 6.6 and developing Asian cities 13.7 deaths per 100,000 people).

Thus in developing cities such as Kuala Lumpur, which are motorising at a very rapid rate with high levels of motor cycle ownership and use and a relatively poorly developed traffic regulatory environment, traffic deaths are also very high at 22.7 per 100,000 people. This is despite the fact that the absolute level of automobile dependence is still very low compared to US and other developed cities. Overall, the newly developing Asian cities have an average transport death rate of 13.7 per 100,000 which is a far worse record than their level of car use would predict

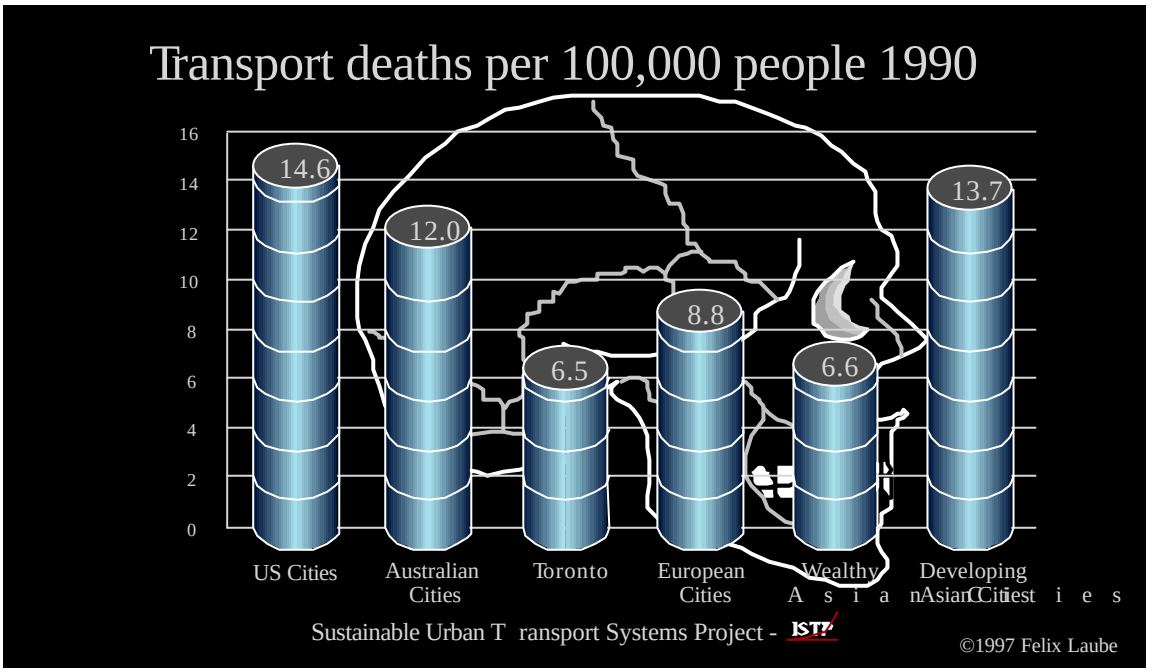


Figure 6 Transport-related deaths in global cities, 1990

Beijing, with 71% of total daily trips by walking and cycling, also has a comparatively low rate of transport deaths compared to other cities, as do most Chinese cities (6.1 deaths per 100,000). A study of seven large Chinese cities suggests a transport death rate of 4.8 per 100,000 (Hu and Kenworthy, 1996). The situation in Chinese cities can however be expected to worsen and perhaps begin to mirror the picture in the other rapidly motorising Asian cities in this sample as more and more traffic begins to mix with the high numbers of pedestrians and cyclists. This is especially true if little or nothing is done to slow down this rate of motorisation or to plan for effective harmonisation of motorised and non-motorised transport.

Overall, the data show how transport deaths decline with car use though not to the same magnitude as the differences in car use; Australian cities have 18% fewer transport deaths per 100,000 people but 40% less car use per capita than US cities, European cities have 40% fewer deaths than US cities but 59% less car use and wealthy Asian cities have 55% fewer deaths but 86% less car use. As suggested above, there are therefore other factors at work which lend themselves to reducing transport deaths such as traffic engineering, management and education. However, there are enormous resources and human energy poured into road safety when by far the biggest gains would be made by shifting to other modes and reducing the overall level of car use. This approach is rarely mentioned in road safety discussions.

There are some exceptional cities in terms of the patterns of transportation-related deaths:

- Metro Toronto at 6.5 deaths per 100,000 has less than half the traffic fatalities found in US cities which suggests that a good transit system can have other flow-ons in terms of traffic safety, e.g. fewer teenagers need to drive. Metro Toronto's transport death rate seems to be reasonably consistent with its other features (e.g. 24% of total travel on transit, compared to only 4% in US cities).
- Amsterdam at 5.7 and Copenhagen at 7.5 deaths per 100,000 have among the lowest rates in Europe and also one of the highest usage rates of bicycles. This puts into perspective the perception that cycling is dangerous, perhaps indicating that the social patterns developed in a city to accommodate cyclists (such as giving priority to them at all intersections) can flow on to a generally safer road system. The case study on Copenhagen has managed to reduce its traffic accident rates through an emphasis on bicycling and a 'culture of respect' for all non-motorised travellers.
- Tokyo and Hong Kong, China have among the best transport safety records at 5.3 and 5.7 per 100,000 due to their exceptional transit systems which appear to be far more important in determining overall transport safety levels than their congested major road systems.

Transport emissions

Carbon dioxide

Carbon dioxide is now a focus of international agreement on Greenhouse gas reduction strategies, with all developed cities needing to show how they are reducing CO_2. Many documents have been presented on the issue at international forums, but invariably the area that is seen to be the least amenable to reduction is transport CO_2 (OECD/ECMT,1996; McKenzie and Walsh, 1990). The data here give some idea as to how progress can be made.

First, it is not just a matter of making technological improvements, as has already been shown. More fuel-efficient vehicles can just be used more, particularly if road conditions are improved to create freer flowing traffic. An integrated transportation strategy is required which simultaneously improves technology, facilitates modal shifts and reduces the need for travel. That this is possible without harming city economies is clear. The large variation in US cities with respect to CO_2 generation rates shows some indication of this (total transportation CO_2 per capita varies from 3,778 kg per capita in the New York region up to 5,193 kg in Houston), but the fact that Toronto has 46% less CO_2 per capita than the average US city suggests that its CO_2 generation rate in transportation can serve as a best practice indicator in North American cities.

Toronto is providing transportation at a rate of 0.108 kg of CO_2 per dollar of GRP compared to 0.160 kg per dollar for US cities (48% higher than in Toronto). Australian cities can do much better as well with 0.141 kg of CO_2 per dollar of GRP. European and wealthy Asian cities may be approaching world best practice at 0.059 and 0.054 kg of CO_2 per dollar of GRP. The newly developing Asian cities at 0.317 kg of CO_2 per dollar of GRP need to do better, though their apparently high rate of CO_2 emissions per dollar of GRP is probably mostly due to their much lower wealth.

Figure 7 summarises CO_2 emissions per capita for the global cities in 1990, showing the contribution from private and public passenger transportation. In all cases CO_2 from transit is very small relative to that from automobiles.

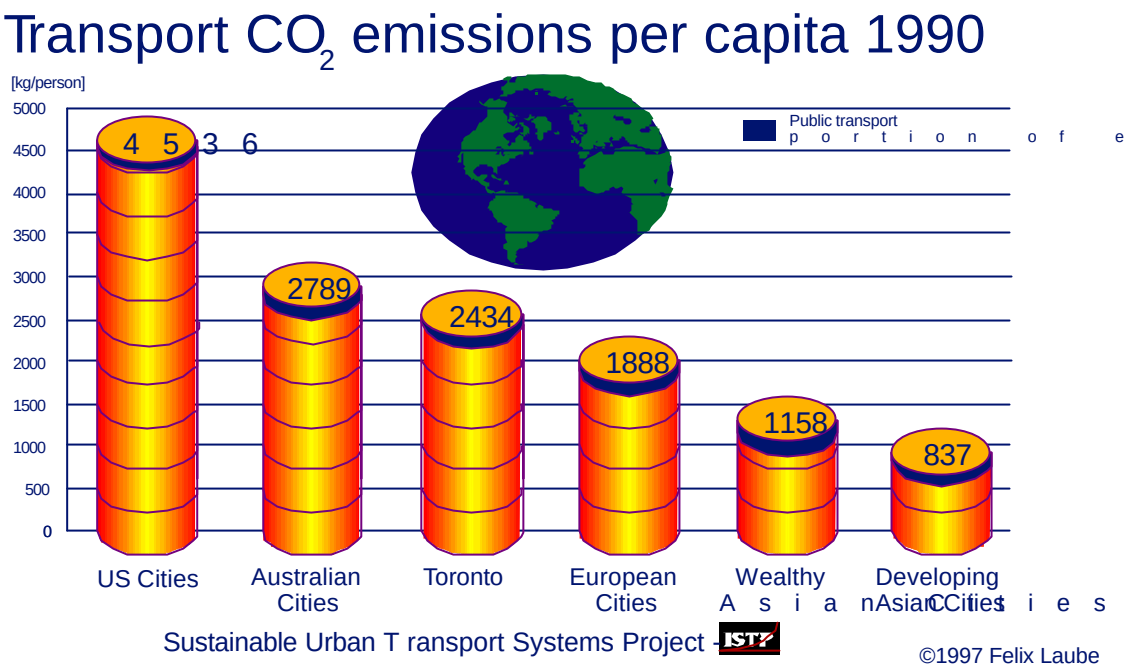


Figure 7 Per capita CO_2 emissions from private and public transportation in global cities, 1990.

Regionally significant automotive emissions

The major automotive emissions of concern to health and regional air pollution, including photochemical smog precursors, presented in terms of NOx, SO_2, CO, volatile hydrocarbons (VHC) and particulates, follow the same patterns as car use, with a few interesting exceptions Figure 8):

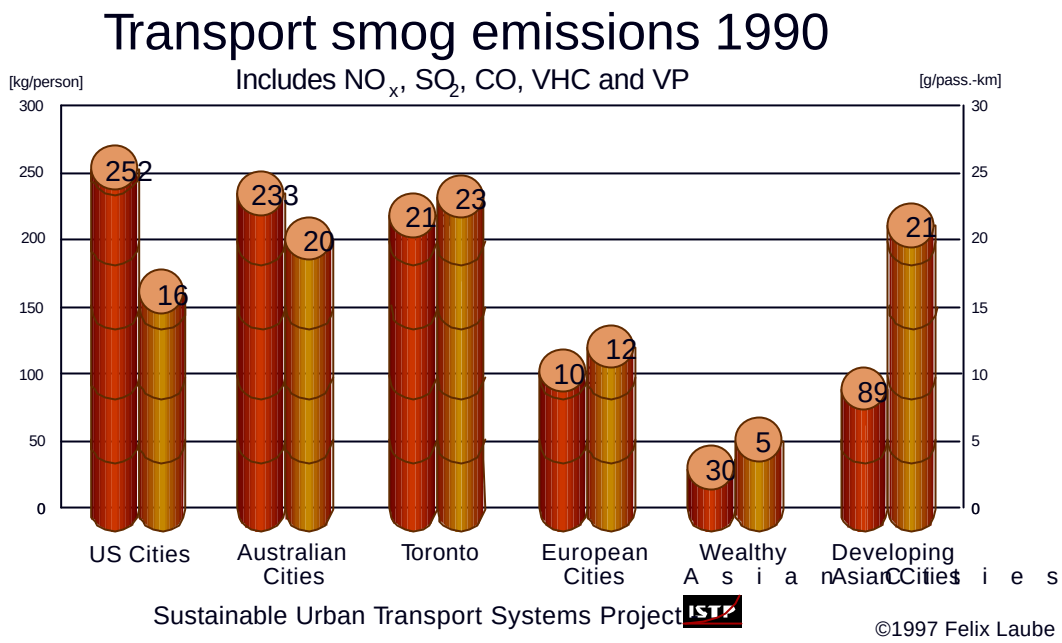


Figure 8 Per capita emissions of smog-related air pollutants in global cities, 1990

- Australian cities are almost identical in per capita air pollutant emissions to US cities, despite having 40% less car use per capita. This is presumably because the vehicle fleet is very old due to lower wealth, very lax systems of vehicle inspections, and because there are lower emissions standards on new vehicles than in the US (see Newman et al, 1996). Policy debates continue to emphasise traffic management as a solution to air pollutant emissions. Australian urban traffic congestion is probably amongst the lowest in the world, as suggested by the data in Newman and Kenworthy (1989 and 1998) on average speeds; this shows how minimal is the factor of smooth traffic flow in reducing emissions, compared to the sheer amount of vehicle use and the state of the vehicles themselves. US cities have even higher average traffic speeds than in Australia, but with very high per capita transport emissions, again emphasising the futility of trying to tackle automotive air pollution through improvements to traffic flow.
- Toronto is low in CO_2 due to its transit system and integrated land use (see Kenworthy and Newman, 1994), but it is only an average North American city in other emissions. This is probably again due to a vehicle factor, as its fleet is older and it has the least fuel-efficient cars in North America at 4.38 MJ/pass km, compared to an average of 3.51 MJ/pass km for the US cities.
- European city air pollutant emissions are as expected much lower in general than in cities in North America and Australia (57% of the level of NOx per capita in North American cities, 36% of the CO, 52% of the VHC and 63% of particulates). SO_2 is 20% higher however, due presumably to the higher amount of electricity (and hence coal) used in powering transit and the higher share of diesel fuel in the transport system.
- Asian cities for the most part have the lowest per capita air pollutant emissions. The exception here is Bangkok, which for its relatively low level of motor vehicle use, has very high volatile hydrocarbons (23.2 kg per capita compared to similar levels in US and Australian cities with much higher vehicle use; Bangkok is also much higher than the European cities at 11.6 kg per capita). In addition, Bangkok has by far the highest particulates in the world (9.1 kg per capita compared to a little over 1 kg per capita in most other cities).

Both these pollutants are linked to health problems. VHC is primarily from very inefficient, poorly maintained vehicles which are often idling for hours in traffic jams, Bangkok being towards a global extreme in these problems. Particulates mainly come from poorly tuned diesel buses and trucks, as well as two-stroke motor cycles, and such vehicles are very common in Bangkok (they are also common in Jakarta and Surabaya where particulate emissions are also comparatively high). It is not surprising that Bangkok traffic police wear gas masks and that there are increasing air pollution-related health problems in this city (see Kenworthy, 1995).

Proportion of city wealth on transportation

A final parameter that in many ways brings together this perspective on the economics of automobile dependence is the percentage of GRP on transportation. It is a sum of all the direct costs attributable to private and public transportation which is then expressed as a proportion of the city's wealth. It shows 'how much' passenger transportation-related goods and services are as a proportion of total goods and services in the city.

The data are summarised in Figure 9 and show a similar perspective to that already shown: except it is perhaps even more extreme than what many would have expected.

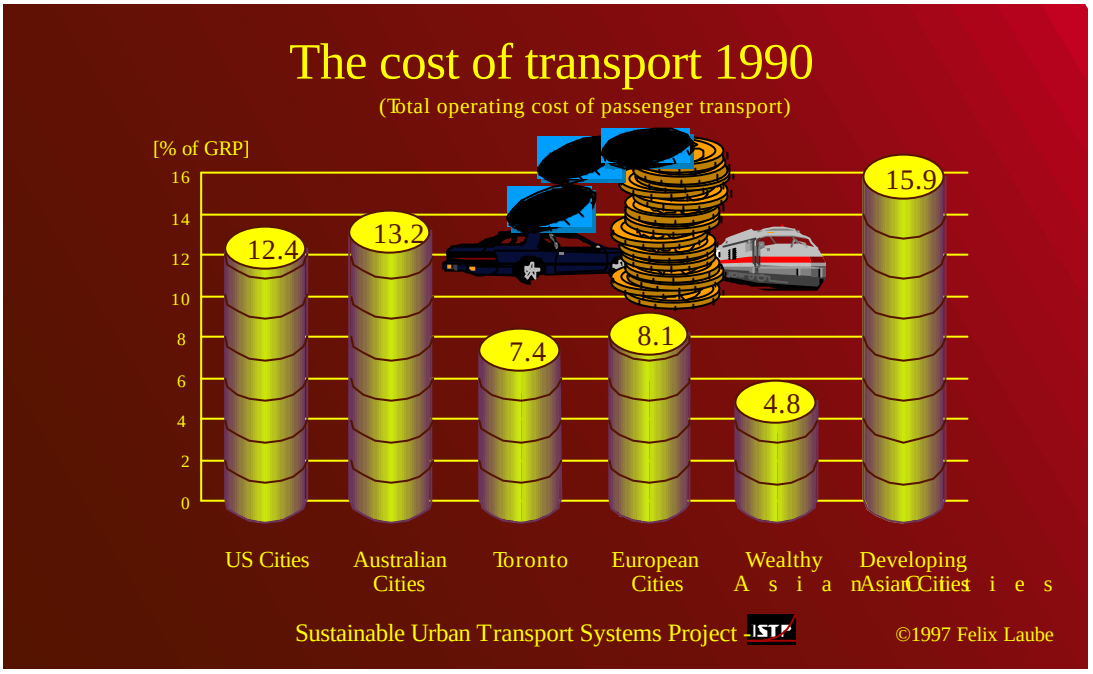


Figure 9 The proportion of city wealth on transportation in global cities, 1990

It shows that those cities with the highest automobile dependence (Australian and US cities) have the least overall economic efficiency in their transport systems.

The cities (in the developed world) with the highest proportion of their wealth going into transportation are: Perth at 17%, Phoenix 16% and Adelaide, Detroit and Denver all at 15%.

The cities (in the developed world) with the least wealth going into transportation are the European and wealthy Asian cities (at 8% and 5%) with their stronger commitment to transit systems. The best North American and Australian cities – Toronto 7%, New York 10% and Sydney 10% – also indicate that transit-orientation is good for a city's economy.

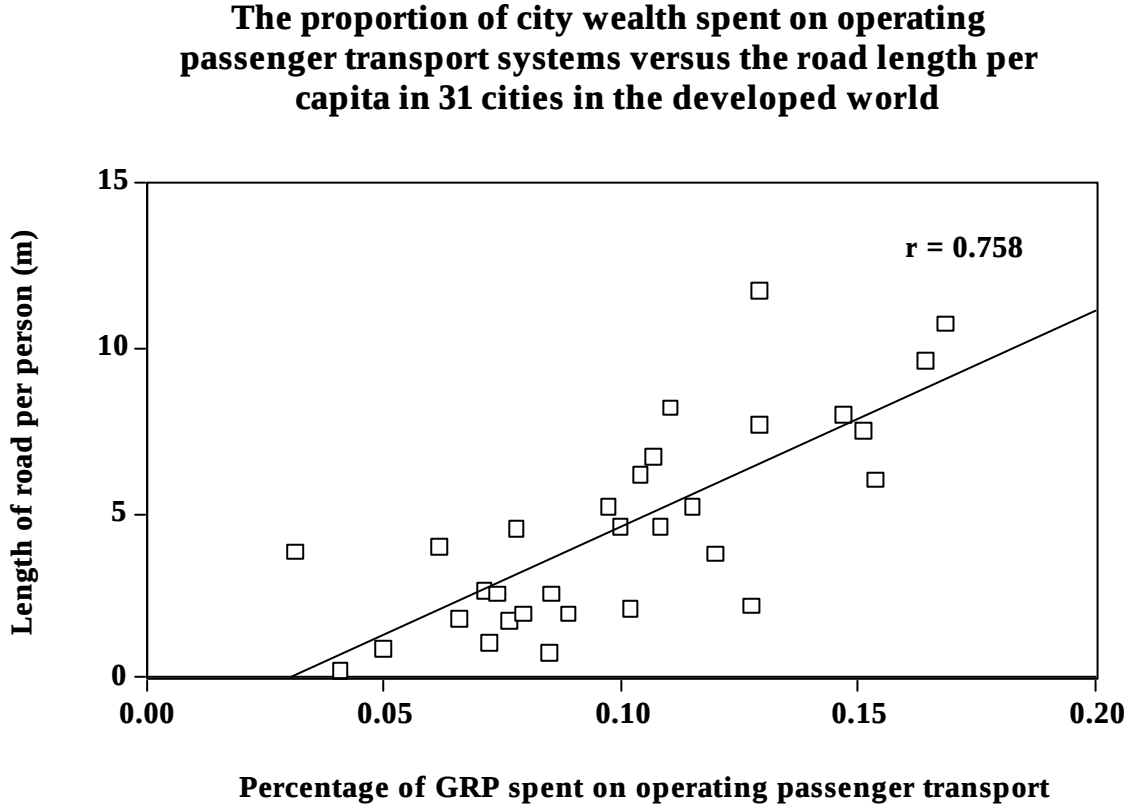
Understanding the patterns

The possible mechanism for the extra inefficiency associated with car dependent cities is suggested to be that car dependence:

- creates inefficiencies due to the extra land it consumes,
- the extra costs of infrastructure,
- the direct and indirect costs of the automobile
- the loss of investment associated with traffic dominated urban environments (compared to quality pedestrian friendly urban environments), and
- the opportunity cost due to loss of investment in productive industries instead of investment in unproductive suburb-building (see Newman et al 1997).

In terms of transportation policy the issues become very stark when the parameter of road provision is plotted against percentage of wealth on transportation, and at the same time the amount of rail orientation is plotted against percentage of wealth on transportation (Figures 10 and 11).

Figure 10



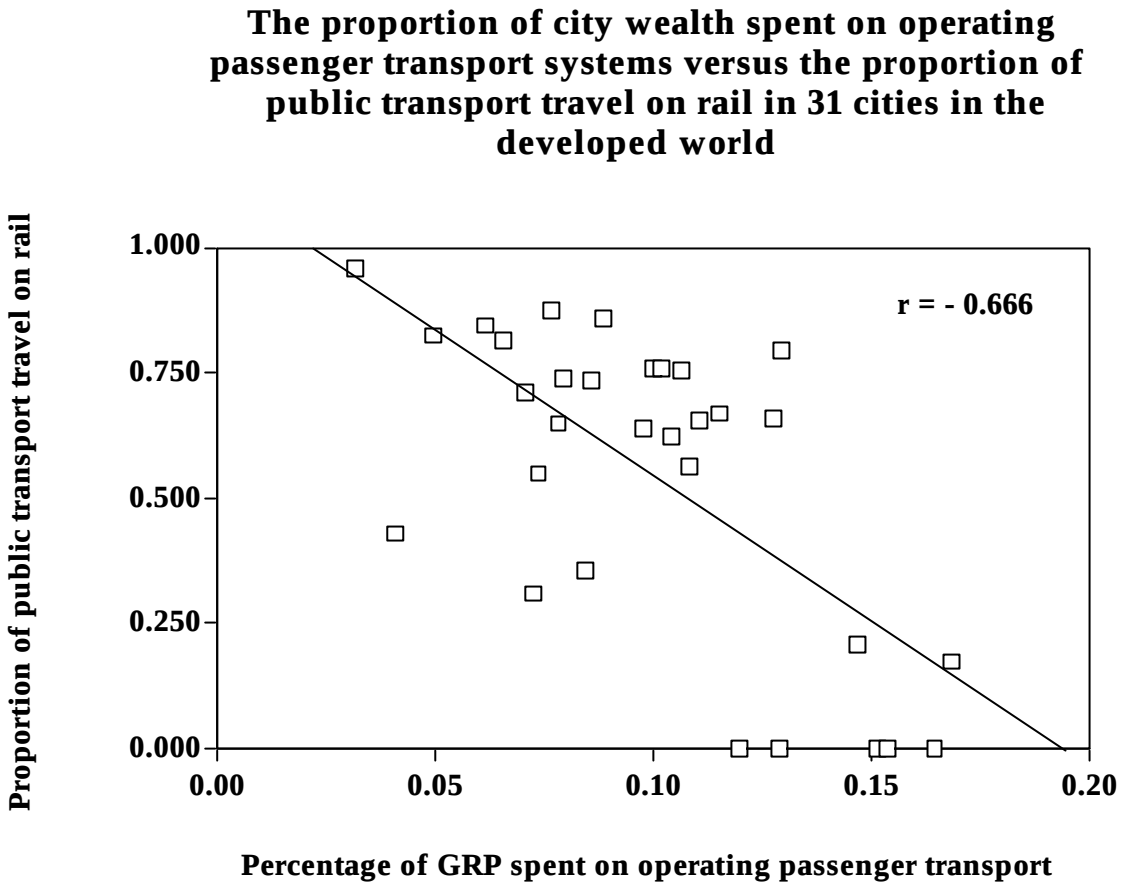


Figure 11

The correlations show that cities with the most roads are the least efficient, and the most rail-oriented cities are the most transport efficient. A similar graph can be done with walking/biking versus percentage of GRP transport as in general the more transit there is in a city the more walking and biking there is.

Figure 12 demonstrates the significance of density in this relationship to city wealth (via the link to car dependence).

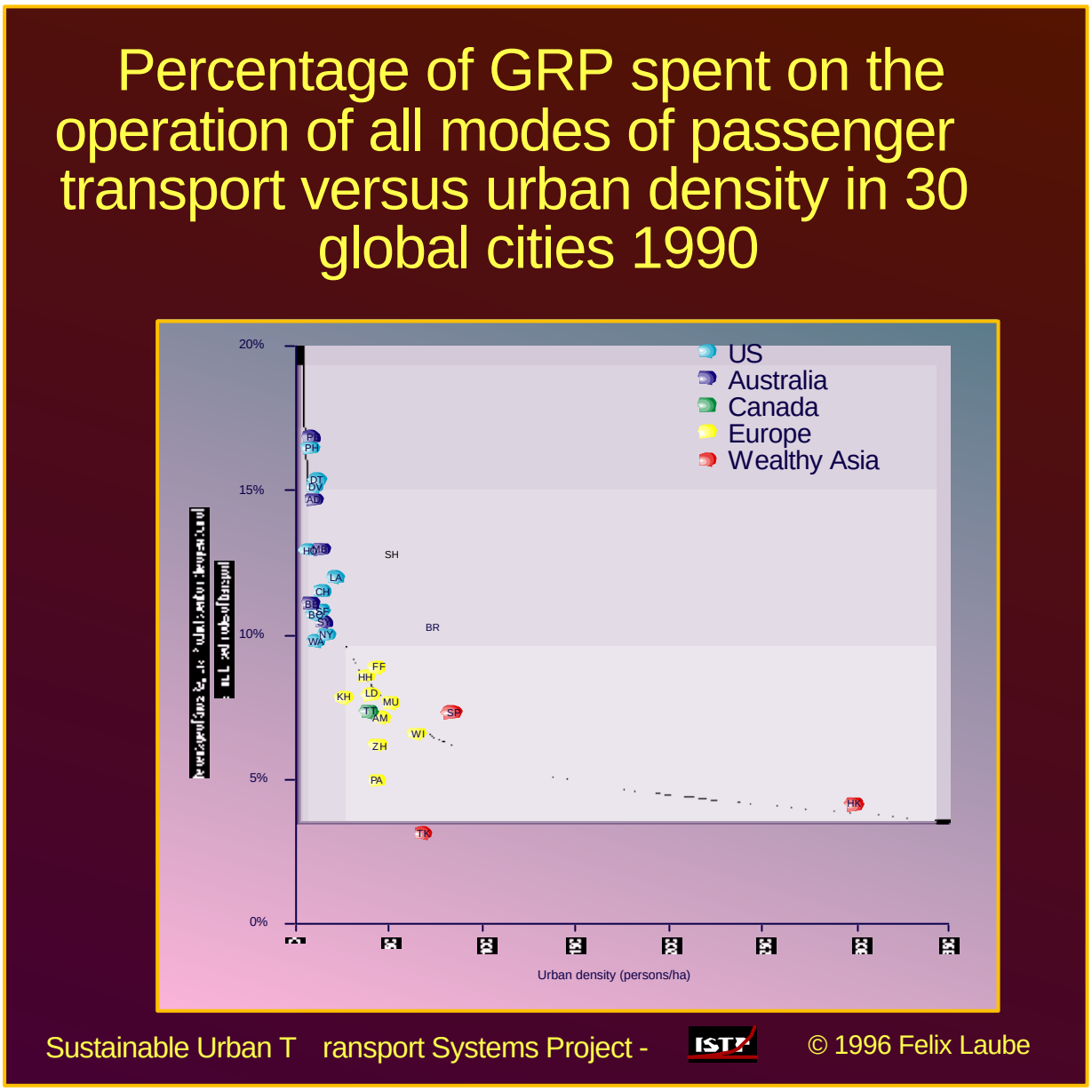


Figure 12 The total operating costs of passenger transport versus urban density in developed cities, 1990

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Figure 12 shows that the lower the density of the city the more it wastes of its wealth on transport. And this is probably the basis of the reason why road-based cities are less efficient: providing roads and facilitating cars is the basic mechanism for sprawling a city and this is an expensive way to build a city. It is less efficient in terms of infrastructure and if a city is constantly sprawling rather than reurbanising then there is less capital available for investment in productive innovative aspects of the city (see Frost, 1991 and Jacobs 1984). Therefore in economic and environmental terms the sustainability agenda is clear – contain sprawl, reurbanise and go for sustainable transportation.

The cities that don't follow this trend are the developing Asian cities (Bangkok, Jakarta) which are not car dependent, as they are still very dense, but they are car dominated. These cities are pouring their productive financial and human capital into auto-related activity but are not showing much

benefit from it. The transit-oriented model of the wealthy Asian cities on the other hand appears to represent the world best practice on how to create wealth and not have car dependence problems.

Global information age processes and sustainable transportation

The major economic process of our era - the information age - is testing us to see how it will impact on cities. Original pundits when discussing the impacts of information age technology suggested it would help to disperse cities making them more car dependent (Webber, 1963, 1964, 1968). More sophisticated approaches recognised that information technology had the ability to reform cities based on the reduced need for face-to-face interchange in some activities, but the continuing need for some quality human interactions critical to economic and cultural processes (Castells, 1989; Castells and Hall, 1994,). Hall (1997) after several years of being very equivocal on this, now states:

> "The new world (of information technology) will largely depend, as the old world did, on human creativity; and creativity flourishes where people come together face-to-face." (p.89).

Others have emphasised that 'local milieus' will emerge (Willoughby, 1994) or that local culture will be strengthened as globalised information makes national borders less relevant (Ohmae, 1990; Naisbett, 1994; Sassen, 1991,1994) or that the importance of face-to-face contact will ensure centres emerge as critical nodes of information-oriented production (Winger, 1997).

The data we have collected on cities covers the past thirty years of land use trends (Newman and kenworthy,1999). All cities in our sample our reurbanising but the historic trend that our study has picked up is that all except two have reversed their trend downwards in density; measured as a combination of population and jobs there has been a substantial shift towards increasing the amount of urban activity per hectare (Newman and Kenworthy, 1998). And everywhere these densities are focussing in on sub-centres and traditional city centres. In US cities the trend is to focus activity in outer suburbs through 'edge cities' and the inner areas continue to decline (apart from those cities where the social and racial issues have been resolved). Thus rather than dispersing urban activity the information-age seems to be focussing it.

Reasons for this reurbanisation and concentration in relation to this information era economics would include the approaches outlined above. Thus it seems that for the global information-era in our cities:

- Professionals require face-to-face interactions for creative project development work.
- Community always needs face-to-face (youth culture especially is very urban).
- Face-to-face meeting spaces are part of inner city design, but are lost in automobile city planning.
- Reurbanisation around human-oriented city spaces is occurring in almost all cities.
- Deindustrialisation of inner cities is making them even more attractive for human-based work locations.
- Travel time budgets (1 hr/day) are being exceeded on fringe locations hence busy professionals are locating near work.

Thus the information age seems to be favouring a multi-nodal city where the sustainable transportation modes are increasingly important as they are more able to build the human-based centers critical for the new urban economy. The challenge will be to ensure that such sub-centers occur throughout the city, not just in wealthy enclaves; the role of light rail extensions into car dependent suburbs as a means of creating viable local employment and services centers, seems to be a growing agenda.

Conclusions

The patterns of automobile dependence, based on transportation, infrastructure and land use patterns have been shown to follow a consistent story on the global cities we have studied. Their economic and environmental costs show the same pattern. They suggest some overall conclusions.

1. Cities with substantial commitment to sustainable transportation are doing better economically as well as environmentally. There appears to be no obvious gain in economic efficiency from developing automobile dependence in cities, particularly as it is shown in US and Australian cities. There is no relative gain in GRP per capita or in the percentage of GRP spent on commuting, trip times to work are roughly the same everywhere, transit cost recovery is much worse and road expenditure is higher.
2. There are, on the other hand, significant losses in external costs due to automobile dependence which have clear implications for sustainability. There are much higher levels of per capita car use, energy, emissions, and transport deaths. As the global agenda is focussing increasingly on sustainability, there is an obvious need to address these differences by overcoming automobile dependence.
3. European and wealthy Asian cities appear to have both the most economically-efficient and sustainable transportation systems. However, they will all need to do better in terms of car use, which is growing in most of these cities as well.
4. Rapidly developing Asian cities have considerably less efficient and sustainable transportation systems than would be expected from their levels of wealth. The positive side however is that they still have strongly transit-oriented urban forms, which means that good electric rail systems and more provision for non-motorised transportation, have the potential to rapidly transform them into more sustainable patterns.
5. Rail transit systems, compared to all other motorised transportation, appear to have the best energy efficiency and greatest ability to attract people out of cars, they are the most important factor in the recovery of transit operating costs, they seem to be the catalyst for compact sub-centre development and they make a major contribution to sustainability on all indicators. Transforming cities towards efficiency in both economic and environmental terms would appear to involve good rail systems.
6. Non-motorised transportation is highly significant in both economic and environmental indicators. Cities which implement plans for improving the contribution of non-motorised transportation are likely to see immediate and long term benefits.

Overall there is little reason for sustainable transportation modes to be left out in the cold. They ought to be in the centre of transportation decision making. This is becoming even more so as the information age economy develops.

The challenge then is for professional practice to develop the techniques which can allow a greater orientation to sustainable transportation–new cost-benefit techniques and land use-transportation models, new funding mechanisms for rail using value capture techniques, new community sensitive processes... And the political process needs to make funding of infrastructure a more integrative, regional planning process with an eye to the long term.

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The Vision of 21st Century Urban Development in Chinese Taipei

by

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The Vision of 21st Century
Urban Development in Chinese Taipei

I. Introduction

Chinese Taipei, a small island with a limited area of 36,000Km and a population of 21.7million, has been successful in economic growth since the World War II. Boasting a per capita national income of over US$13,500, Chinese Taipei is now recognized as one of the newly industrialized economies. Land is a scare and precious resource in Chinese Taipei. There is about 73.59 square kilometers which is slope-land and mountain, only one fourth is suitable for development. Therefore, Chinese Taipei has given strong emphasis to the overall planning and management of land use, and the environment management.

II. Sustainable Urbanization Profile

Table I shown the socio-economic index of Chinese Taipei. Given the fact that 77.1% of the population on Chinese Taipei live in urban areas, which is 12.3% of the island's land, urban problems are an accurate reflection of Chinese Taipei's environmental problems. Meanwhile, both metropolitan area and urban agglomeration scatter on the west coast of Chinese Taipei. Achieving a sustainable mode of living will require us to face the challenge of managing cities sustainable.

In order to determine whether our cities follow paths of sustainable development, it is necessary to develop indicators for sustainable cities to support the making of policies and plans, the management of resources. Take Taipei city for example, we have set up sustainable development indices to assess the effectiveness of past strategies and formulate future strategies for urban sustainable development.

The following sustainable development indicators indicate that sustainable development is already attained in ecological, educational and cultural realms. (Table II) In terms of environmental management, as the public becomes more environmental conscious, environmental management is also gaining the attention of the government and the public. Environmental loading, however is getting heavier than before, due to the high speed of socioeconomic development, population growth, which cause greater consumption and demand for resources. The rapid growth of the number of vehicles has also reduced the efficiency of public transportation.

Table 1 Socio-economic Index in Chinese Taipei

	1988	1997
Area km^2	36,000	36,006
No. of urban planned districts	417	441
Urban planned area as % of total area	12.1	12.3
Population in urban planned districts as % of total population	75.8	77.1
Per capita GNP (US$)	6,379	13,233
Passenger cars per 1,000 persons	78.8	204.1
Motorcycles per 1,000 persons	320.3	464.7
Park Space (m^2/person)	0.8	2.87
Hospital beds per 10,000 persons	0.59	–
Housing Ownership	79.1	80.7
Piped water supply (% of population served)	81.7	89.5
Sewerage coverage (%)	3.5	5.7
Electric lighting KWH per capita	920	1,854
Highway density km/km^2	0.544	0.55

Table 2 Sustainable Development Index of Taipei City

	1976	1994	1997	Sustainable Development Trend
Green Area (%)	27	34	34	+
Agricultural Land (hectares)	5,858	3,717	3,572	–
Eutrophication in Reservoirs (TSI)	47.6	41.7		+
Urban Population Density (thousand/km)	7.7	9.8	9.6	0
Possession of Automobiles (cars/thousand)	51.9	238.2	251.0	–
Public Transportation Distance (km/person)	6.9	4.3	3.8	–
Public Facilities Area (%)	–	25.46	25.56	+
Park Space (m^2/person)	0.8	3.4	3.7	+
Average Water Permeability	0.59	0.533	–	–
Length of Moderately to Severely Polluted Rivers (km)	24.7	31.7	27.1	+
Number of Days with PSI> 100	–	1,631	1,338	+
Daily Water Consumption (liters/person/day)	288	363	362.8	–
Solid Waste Generation (kg/person/day)	0.67	1.48	1.49	–
Sewerage connection Rate	–	23.60	34.01	+

"+" indicates toward S.D

" – " indicates against to S.D

" 0 " indicates no change

Over populated and economic activities concentrated on urban areas caused the following problems:

1. Uneven city-rural development has caused inappropriate resource allocation.
2. The intense demand for the environment and natural resources has caused serious environmental problem as many industrialized countries. For example, the improper and excess use of slope land and coastal area has resulted in damage and degradation of environment, and caused the drastic disturbance of ecosystem.
3. Heavy traffic in urban areas has caused the congestion and air pollution.
4. With limited land for development, both of the price of land and house are sky-rock high. The demand of affordable housing is strong.
5. Without appropriate urban environmental management and investment, environmental infrastructure such as incineration and sewage system are not enough, urban environmental quality was increasing declined.

III. Strategies toward Sustainable Urban Development

The concept of "sustainability" become prominent through the report of the World Commission on Environment and Development in 1987. Based on this concept, "sustainable cities" evolve as an important goal for governments around the world regarding city planning, development, and management.

Chinese Taipei, is fully aware of the importance of urban sustainable development. Now that our environmental policy guidelines have stated that environmental protection and economic development should be accorded equal emphasis, environmental protection may take priority when the situation warrants it. At the same time, sustainable development is now the highest guiding principle for land development. For urban areas, we hope to attain sustainable development by making socioeconomic adjustments so as to cut down demands on the environment.

In order to achieve the goal of sustainability of making cities safer, healthier, and more livable, equitable, sustainable and productive, Chinese Taipei, has been implementing the following strategies and action plans:

1. Proper land use planning
2. Urban regeneration
3. Sustainable Transportation
4. Town and Countryside Landscaping Improvement Program

5. Waste Minimization
6. Strengthening environmental investment
7. Establishing urban parks and green belts
8. Financing sustainable development and Public Participation

On the next part of my paper I will only in detail depict and evaluate the strategies of land use planning, urban regeneration and financing sustainable development.

1. Proper land use planning:

Using proper land use planning strategies, such as strict zoning control and environmental impact assessment to restrain urban growth and protect the environmental sensitive areas. In 1996, the National Comprehensive Land Development Plan (NCLDP) was approved by the government. This plan has an overall aim of promoting reasonable land use, giving balanced emphasis to improve people's quality of life and meeting the needs of productivity, while always keeping environmental protection and sustainable development as preeminent requirements.

Based on NCLDP, all of the land will be divided into two zones–Development Restricted Area (DRA) and Developable Area (DA), and the two zones will be managed under two different land use control or management system. Zoning system will still be used for managing DRA, while the Development Permission System will regulate DA. The strategy is to make the precious land resource can be used in a rational and sustainable manner.

(1) The management of Development Restricted Areas

The Development Restricted Areas are set up for protecting and conserving natural resources as well as for national security purpose. Therefore, most developments are prohibited except necessary development for environmental protection and principal public works which have been proved no harm for environment through environmental impact assessment process. There are four types of DRA including:

- Ecological Sensitive Areas, National Parks, Wetlands, Wildlife Habitat Areas, Natural Ecological Areas.
- Perceptual and Cultural Sensitive Areas, Historic and Cultural Areas, Special Scenic Areas.
- Resource Protection Sensitive Areas, Woodlands, Water Quality and Quantity Areas, Aquifer Recharge Areas.
- Natural Hazard Sensitive Areas, Flood Plain Areas, Geological Hazard Areas

(2) The management of DA

In order to make a greater efficiency in the utilization of land located in DA, land use restrictions should be reasonably relaxed. Chinese Taipei is going to adjust current land use control and management system. The measure is to gradually replace existing zoning change will be allowed through Development Permission. Any landowner or developer can make their own land use plan to apply for zoning change. In the past, only government has the right to make zoning change. Therefore, it is more flexible for land use, and can increase the supply of land for development.

The process for applying development permission includes three steps: planning permission (PP), development permission (DP), and the individual building permission (BP).

(3) Moreover, the concept of sustainable development must prevail as the highest principle in the plan's implementation–in urban development, housing construction, industrial development, expansion of transportation infrastructure, and so on.

2. Urban Regeneration

Urban regeneration is one of the important work of urban management. The task of urban regeneration means not only to brighten the face of our cities and create a better living environment; it means also to stay in tune with targets for meeting the demand of urban growth without expanding the urban area. To achieve all these things, we are adopting the following strategies for urban regeneration.

(1) Combine government planning with private investment
To ensure the quality of urban regeneration, the government should do the overall planning and then hand over construction to private sector developers. Only with the government taking responsibility for planning can the ideal of regeneration be realized, and an overall blueprint for the management of public facilities can be provided.

(2) Begin with the regeneration of public-owned land
Because of the extreme fragmentation of land-right ownership in Chinese Taipei, the holders of land rights vary quite considerably in their ability and willingness to participate in renewal projects. Only by the starting with the redevelopment of public land can the regeneration be realized.

(3) Provide incentives for private participation
The active involvement of the private sector will in future be the key force determining the success of urban regeneration. In order to make private sector more willingness to participate,

we have not only provided bulk ratio incentives, but also apply reduced or zero tax assessments to land and buildings within the renewal zones. Moreover, investors are given business income tax credits.

(4) Promote immovable property securitization and land trust

The utilization of immovable property securitization to raise capital can help release the government from financial difficulties. In addition, implementing a land trust system can resolve the problem of raising capital for urban renewal–and can do so equally for both public and private land-right holders. Moreover, such a system can satisfy peoples natural desire to retain possession of land and buildings passed on down to them by their forebears.

(5) Set up a publicly and privately funded urban renewal corporation

The corporation's main missions will be to conduct planning, to assist in the tendering process, and to coordinate and operate public facilities. The setting up of the urban renewal corporation not only can help the government carry out the work of urban regeneration, but also can raise the efficiency of that work, and ensure that results may be visible early on.

3. Financing Sustainable Development and Public Participation:

Apply market-based instruments such as the Air Pollution Prevention Fee, User Charges, Impact Fee, BOT, BOO, and Voluntary Programs as incentives for public participation in building and management of sustainable cities.

In order to increase the financing sources for environmental management. Air Pollution prevention fee has been implemented since 1 July 1995, and water pollution prevention fee will be implemented in the near future.

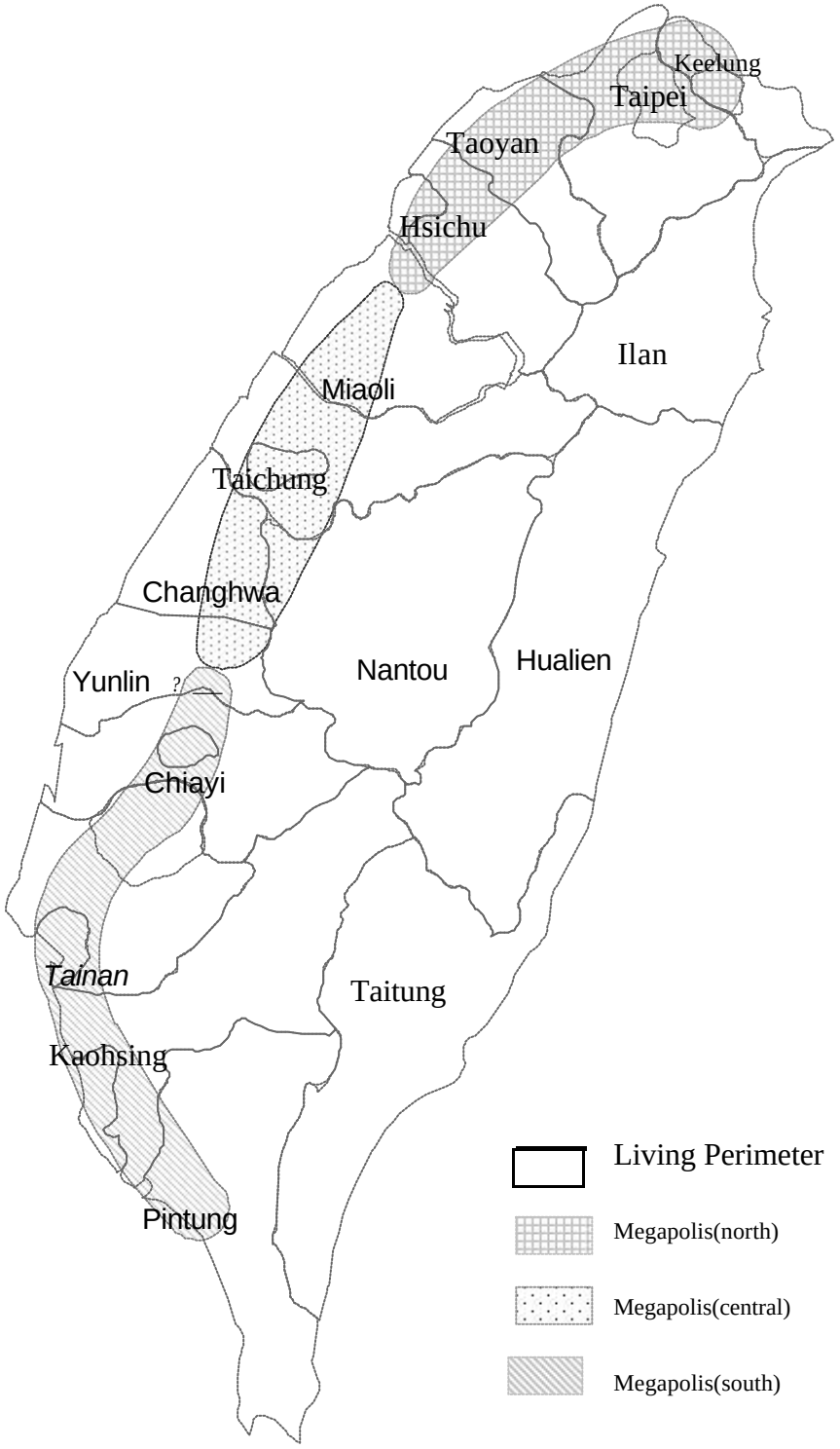
The private sector has mainly participated in transportation, power, recreation facilities and incinerator through BOT/BOO :

1. Transportation: MRT system, High Speed railroad
2. Recreation facilities
3. Incinerators: Eight BOT/BOO projects to be completed by 2001, capable of disposing 4500 tons of garbage per day. 10 more projects have been approved to handle 4050 tons of garbage per day in the future.
4. Power projects: 11IPP projects, total installed capacity of 9700MW by 2002.

IV. Vision

Spatial Structure of Chinese Taipei

Spatial Structure			Structure Content
International Level			APROC
National Level			Western growth management Eastern strategy development Off-shore islands revitalization
Regional Level			North, central, south megalopolises
Local Level	20 living perimeters	1. Metropolitan living perimeters	Taipei, Taoyuan, Hsinchu, Taichung,Tainan, Kaohsiung
		2. General living perimeters	Ilan, Keelung, Miaoli, Changhua, Nantou, Yunlin, Chiayi, Hsinyin, Taitung, Hualien
		3.Off-shore living perimeters	Penghu, Kinmen, Mats


Keelung
Taipei
Taoyan
Hsichu
Ilan
Miaoli
Taichung
Changhwa
Yunlin
Nantou
Hualien
Chiayi
Tainan
Taitung
Kaohsing
Pintung
Living Perimeter
Megapolis(north)
Megapolis(central)
Megapolis(south)

Water and Information Management

by

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Australia

Water and Information Management

1. Information Management in the organisation

- Spreadsheets and Databases
- Geographical Information Systems (GIS) Systems

Geographical Information Systems (GIS) Systems

(a) MapInfo: The Coffey modelling group utilises MapInfo for viewing and analsying field and model data from different layers
  - Data Analysis: MapInfo was used to view bore locations, water levels, fault locations, site layout and aerial photography all to the same coordinate base.
  - Model Parameterisation: MapInfo was used to view parameterisation of a MODFLOW model, along with project layout observation bores, dewatering boes and MODFLOW grid.

(b) Vertical Mapper: The Coffey modelling group utilises Vertical Mapper, an add on to MapInfo which enables 3D visualisation of field and model data.
  - Integrates with current information systems. It can be used to create digital terrain models over project areas, over which other layers can added like water supply bore locations, reticulation infrastructure, property boundary's etc.
  - Assesses potential impacts. Modelled dewatering impact on the plezometric surface around a proposed tunnel through an urban area.

2. Resource Assessment: Modelling

- Highly qualifed and experienced modelling personnel who are recognised leaders in their field
- Wide range of modelling presentation, data-analysis and visualisation software
- Large range of proprietary in-house software for everyday and specialist modeling applications
- Acknowledged world leaders in model calibration and predictive analysis technology
- Extensive computer programming capabilities
- Advanced computing platforms

Capabilities: Groundwater Expertise

- Groundwater movement
- Contaminant migration
- Unsaturated zone processes
- Saltwater intrusion
- Irrigation demand
- Surface water / ground water interaction

Capabilities: Surface water Expertise

- *Water Resource Investigations*: Planning, policy formulation and integrated catchment studies
- *Environmental Studies:* Water quality monitoring, stormwater management plans, erosion management plans, impacts of land use on water quality
- *Flood Studies:* Flood behaviour and mitigation, floodplain management plans, urban and rural damage assessment, flood forecasting and warning
- *Minesite Water Management Studies:* Hydrological audits, erosion control, water supply studies, water management plans
- *Hydrological Investigations:* Data analysis, water supply, catchment yield, reservoir behaviour, rainfall-runoff studies
- *Hydraulic Studies:* Steady and unsteady open channel flows, hydraulic structures, river diversions, dambreak analysis
- *Numerical Modelling:* Real time and simulation modelling of catchment, reservoir lake, irrigation, river and estuary systems, custom-designed models
- *Irrigation Studies:* Crop water requirements, flood harvesting, reliability of supply

3. Agriculture: Resource Assessment

In the following figures, results are presented for a model that was built in order to investigate the effects of introducing irrigation bores on existing production bores in an alluvial valley.

The model is run over an historical time period and the extra drawdown resulting from pumping from the two new irrigation bores, had they been in existence at the time is animated. Both the seasonal and long-term drawdown induced by theses bores is apparent in this animation.

This application would be directly applicable to municipal groundwater resource management.

Model Calibration Technology

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Urban Geographical Information System Development Trends

by

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Ministry of Construction and Transportation
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Urban Geographic Information System Development Trends

I. Foreword

Futurist J. Naisbitt wrote in his book *Megatrends* that scientific information in our everyday lives doubles in amount every five years. He also forecasted Information Explosion in the 21st century and asserted that the best countermeasure against it is to come up with a "system" that will adequately analyze and evaluate information.

Such information system carries a significant meaning in today's urban planning and management. Cities that we live in today contain vast amounts of geo-spatial information of all kinds, thus, calling for the need of Urban Geographic Information Systems (UGIS) that can efficiently handle all that information.

For this reason, I have chosen UGIS and AIS as my topics for today. In Korea, local governments are working on the UGIS, while the Ministry of Construction and Transportation is pursuing AIS.

II. Urban Geographic Information Systems (UGIS)

1. What is UGIS?

   UGIS involves creating a database of spatial and descriptive information. The database will be equipped with sufficient hardware and software to take in and update the data and print the results. Such information system will provide fast and efficient assistance in urban planning, management, and development.

2. Effects of UGIS

   (1) Enhances efficiency of tasks related to urban information and makes urban planning more scientific

   Tasks related to urban information include roads, parks, urban facilities, and public service matters like building permits. And, everyday, these tasks not only grow in variety but also in volume.

   Therefore, planning tasks can become more scientific by making use of computer to process large volumes of information, to do situation evaluation based on gathered and processed data, making estimations, and gauging results.

   (2) Assists in enhancing urban tasks and can act as stimulus to regional economy

   Information provided by UGIS will come in useful to planning of urban facilities (electric communications, power, and gas) and to general commercial activities (construction, real estate, transport, and retail sales). In the long run, we can expect UGIS to contribute to improving regional economy.

   (3) Facilitate urban administration and create a nation-wide network of UGISs

   Once exchange of information among government agencies via the UGIS is realized, registration and permit procedures will be considerably facilitated.

(4) In today's rapidly changing society, UGIS will be a powerful means in urban and regional development

Introduction of information systems to urban affairs will be an important device in solving various urban problems like over-development, deteriorating environment, and traffic congestion. It will also come in very handy in resolving regional conflicts.

3. Korea's development of UGIS

In Korea, UGIS started out with the development of database and application systems sought by local governments mainly to manage their road, water and sewage systems. Further development has led to the UGIS being linked to the high-speed information communication network and national GIS. Thus, UGIS is growing into cities' comprehensive information system.

Following are the most representative examples of early efforts of UGIS.

1) Kwangju and Ulsan UGISs

Aimed at managing various urban facilities like water & sewage systems, roads, electricity and gas, and communication networks, these UGISs were developed in the order of systems development, database set-up, and development of application systems.

2) Changwon Road Facilities Management System

Developed to increase the efficiency of road maintenance and management, basic plans were drafted, ground and underground facilities were investigated, and various plans were inputted into the system.

3) Daegu Water Facilities Management System

Development of application programs for management of blueprints, construction management, sewage operations.

Establishment of UGIS like these began in the early 1990s and some systems are currently in operation while others, in Seoul, Inchon, and Pusan, are still being developed.

III. AIS

Next, I would like to talk a little about AIS, a type of UGIS that the Ministry of Construction and Transportation is working on.

1. What is AIS?

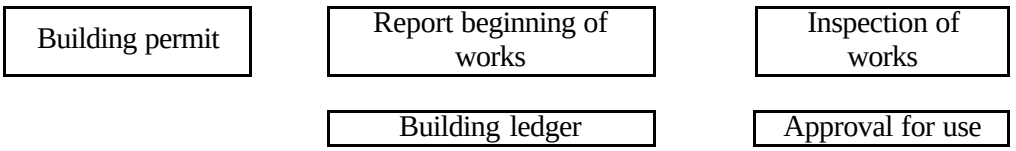
AIS refers to a system that can quickly and efficiently process the information related matter from the step of building permit to the step of building construction and occupancy.

2. Contents of AIS

1) Computerization of building administration procedures

In order to computerize the following administrative procedures, programs have been developed to cover 30 different areas including building permits, design alterations, beginning construction works, final approval of works, etc. About 60 different types of

documents can be issued immediately after being processed by the computer.



2) Computerization of construction blueprints

Blueprints that used to be submitted in hard copies can now be submitted in CD or diskette formats. This saves the contractor the cost of producing a blueprint and the receiving agencies need not waste a lot of their office spaces for storing these blueprints. Should an accident or emergency arise, a quick inspection of the blueprint would help to minimize human and monetary losses.

3) Computerization of building statistics

Daily building statistics, which are used as construction economy indicators, will be available in real-time. This eliminates the usual one-month delay in compiling the data using the conventional method. It will also contribute to expect demand and supply of manpower and materials needed in construction.

3. Current status and plans

1) Program development (December 1998): Develop 456 unit programs needed for 11 different fields in building administration.

2) Test operations (January – May 1999): Three local governments will undertake pilot operation of AIS to test its completeness.

3) Distribution of AIS to local governments (June 1999 – 2000) and beginning Internet services (after 2001).

IV. Conclusion

In urban affairs, as in all others, our time must be spent doing developmental and productive tasks instead of wasting it doing repetitive or typical things. In this aspect, Korea has deep interest in advancement of information technology that can be applied to its administrative matters dealing with urban affairs.

But in doing this, we must not overlook the fact that technologies like UGIS and AIS must be used to contribute to the development of mankind and its society, keeping in mind Naisbitt's warning that technology itself will not be the 21st century's most impressive breakthrough. True breakthrough can only be achieved by correctly positioning and expanding upon what technology means to mankind.

Infrastructure Provision:
Risk Assessment for Government

by

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Infrastructure Risk Assessment and Management: The Government Perspective

1. Introduction

1.1 Overview

Recent events in both Australia and Asia have underscored the need to understand the whole spectrum of implications of infrastructure[1] provision, particularly infrastructure provision involving partnership with the business/private sector. These implications manifest themselves both at the project level and at the broader, systemic level where there are potential implications for the institutions implementing infrastructure projects, for the government of regions in which they are implemented and for the economic development of the nation as a whole.

Governments need to understand the risks involved in infrastructure provision, whether by the public sector or by the business/private sector. The implications of public-private partnership (PPP) are particularly important to address due to their potential to provide resources otherwise unavailable for infrastructure development and to the potential substantial negative 'downside' of inefficiently structured projects. This is by no means an argument that PPP should not be used however, merely that its management is complex and needs close attention. Management priorities can be determined by considering the risks of particular investments and programmes of investment.

Traditionally the emphasis of risk assessment literature has been on the business/private sector and where it has dealt with government. It has focused on project risk. But the boarder issues of risk assessment of strategies and programmes at the regional and national levels have not attracted much attention. At a macro-economic level, risks posed by government policy has long been considered by rating agencies and financiers when assessing the riskiness of lending. While such risk is relevant at both the project and regional level, such analysis is insufficient to guide policy at the regional level because it does not assess the risks to the specific regional economy and the institutions regulating the various markets in this economy.

This later set of concerns is referred to in this paper as 'systemic' issues and related risks as 'systemic risks'. For the purposes of this paper and to avoid having to explain national interest each time economies are discussed, national structures impacting on regional economies, such as taxation structures, will be discussed in the context of 'regional issues' at the 'systemic level'. This usage should in no way be taken to imply that national governments have no responsibility for such systemic issues.

The purpose of this paper is to set out a methodology of risk assessment for infrastructure provision – both at the project and systemic levels. It will also outline the institutional constructs for effective risk mitigation. In doing so, it will be necessary to establish the economic context of infrastructure investment and to assess risks within this context.

[1] Infrastructure is defined for the purposes of this paper, as physical capital and its associated management systems which provide an intermediate input to production and which has the characteristics of a merit good (Head 1974) – that is, possessing the characteristic that the capacity to consume a minimum quantity should be publicly guaranteed to all.

1.2 Regional Strategies

Most cities and their surrounding regions lack adequate forward-looking visions o they want to go and plans for how to get there. Where strategic plans are made they are usually limited in scope, focusing, for example, on desired environmental and land use end-states, but not economic dimensions (Dowall, 1998). In developing countries they are often hopelessly out-of-date. As a result, actions by the usually numerous organisations which have a role in managing urban infrastructure systems, generate unintended consequences. For example, Economic development programs to promote environmental objectives may threaten jobs.

Clear strategic objectives are important for government risk assessment, just as they are for the business/private sector – how do you assess policy risk if there is no clear policy? However, in practice, we are faced with the situation that most city regions do not have a coherent strategy or if they do, they consist of multiple and contradictory objectives. There are thus tow important operational assumptions:

- It is possible to deduce an implied strategy from national and local government actions in respect of support to development; and

- It is possible to determine a preferred strategy of economic development and infrastructure provision in support of that development based on analysis of a regional economy and its institutions.

Such an approach has been developed by Dowall (1998). Call the Strategic Urban Assessment, it is divided into three phases: 1) rapid assessment of baseline conditions; 2) assessment of issues and opportunities; and 3) preparation of strategic recommendations for improving urban productivity and competitiveness and promoting sustainable development. Given objectives of the strategy, an analysis of existing industry groupings and an assessment of the institutions involved in support of economic development (infrastructure provision in the wider sense) can be undertaken.

1.3 Risks and Hedging

The categorisation of risk, despite the amount written on the subject, is neither comprehensive nor consistent. A diagrammatic overview (Teniswood, 1993), which is at least comprehensive, is shown below.

Figure 1 describes risks from the viewpoint of a particular firm supplying a good or service. But government needs to have a broader approach encompassing risk borne by the community as well as by business/private sector entities. Such approaches have been. For example, the New South Wales Department of Public Works and Services (1996) risk assessment framework is a more general categorisation of risk and is a useful starting point for framing institutional approaches to risk reduction in the provision of infrastructure. It does not, however, include the more systemic risks referred to above. Crucially, in one way or another, these risks link to economic issues.

[add figure 1]

The concept of linking risk and economic analysis is not new. Knight (1921) was one of the first to make the distinction between:

- 'risk' – that the probability (in a statistical sense) of adverse outcomes is known or able to be estimated; and
- 'uncertainty' – that circumstance which may lead to adverse outcomes, but which cannot be assigned a probability as the 'situation dealt with is in a high degree unique' (Knight, 1921:235)

Knight's purpose was to distinguish risks that could be quantified, monitised and thus included in economic analysis. However, in dealing with infrastructure projects, we must deal, almost exclusively, with projects which are 'in a high degree unique'. As technologies change, more of existing 'uncertainty' becomes 'risk' – foreign exchange futures change uncertain movements in exchange rates into risks which can hedged. On the other hand, new technology creates new uncertainties as potentials for good and ill emerge over time. Thus, we have to deal with uncertainty and find ways in which uncertainty can hedged – that is, develop and implement strategies for actions that can be taken to ameliorate uncertain adverse outcomes.

Two types of hedging are discerned in the literature:

- Financial hedging
- Operational hedging

The former involves the use if financial instruments (including insurance) to compensate companies for loss incurred when a risky event occurs. However, financial hedging instruments depend for their pricing on the existence of a set of data relating to the risk profile of a particular investment over time. Firms judge the cost of hedging against the capital at risk in order to decide

whether to take out a financial hedge or not. Many types of investments in urban systems cannot provide such data and this profile many be volatile over time. Further, the capital at risk may vary significantly, for example in the case of an infrastructure investment, the capital structure of the company owning the asset is likely to change significantly over the period of an investment (even if the structure and management of the operating company remains unchanged). Thus, except where urban management organisations are dealing with financial risk, or where a risk is insurable, such as public liability insurance, financial hedging is limited in its application.

A concept that has much utility in the analysis of risk in urban systems is 'operational hedging' on the part of public and business/private sector participants in markets. Operational hedging includes all non-financial actions a firm may take to reduce risk, for example, relocating production to achieve a better match between costs and revenues (Chowdhry and Howe, 1995). In the public sector, it often amounts to changing regulatory standards in technical specifications or design, for example requiring a higher standard of redundancy as a safety margin in case of catastrophic failure. It can also involve institution change, for example changing the structure of markets by introducing competitive tendering for procurement of infrastructure may decrease risk of corruption and thus lower costs for companies utilising this infrastructure.

2. Elements of Risk Assessment

2.1 Overview of Generic Risks

The key characteristics of risk in infrastructure provision (Lindfield 1998) are that:

- It varies over the phases of provision, specifically the development, implementation and operation phases;
- It is embodied in several markets, specifically the finance, land, capital goods and infrastructure service markets; and
- The board categories of risk to consider (after Lewis and Mody 1998) are financial, business (strategic direction and management), organisational (called 'operational' by Lewis and Mody) and event/external risks on the participants on both sides of the market.

These risks are summarised in Table 1 which constitutes a generic risk assessment framework.

Table 1: Generic Risk Assessment Matrix

Market	***Development Risk***	***Construction/ Implementation Risk***	***Operational Risk***
International Capital Markets			
National Capital Markets			
Land Markets		Financial, business organisational and event/external risks	
Capital Goods Market			
Service Market			

This framework can applied to both systemic risks and to project/programme risks involved in infrastructure provision. For example, key systemic public policy risks include specific or cumulative impacts on:

- budgets, including contingent liabilities, and resulting taxation burden for industry and commerce (capital market risks);
- the environment (land market risks);
- the social and political risks of aggregate policies of infrastructure provision – affordability issues, for example (usually manifesting through land market mechanisms such as squatting or the marginalisation for the poor on the periphery of cities); and
- the functioning and cost of the infrastructure networks serving industry and commerce – impacting on their competitiveness (risks of inefficient functioning of the market in the sector concerned).

There are thus two stages of risk assessment required:

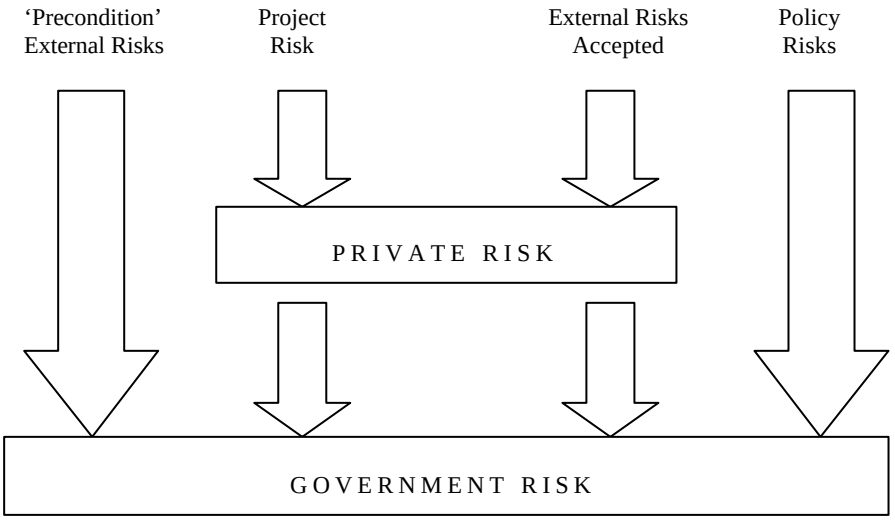
- A first stage where risks broad to government policy and the community are assessed, systemic (strategic) measures to mitigate these risks designed; and
- A second phase where specific infrastructure delivery systems are subject to risk assessment.

Examples of these processes are described in the sections below.

2.2 Government Risks

The risk of 'default' to the government applies mainly to project risks. In Australia and many other countries, central control of operational agency finance means these risks are not just related to the construction and operation of the project but also to its financing. A badly structured deal may end up within the State's loan ceiling allocation and/or incur taxation costs on the business/private sector party for which the government is liable. 'External' risks are essentially born by the government(s) as the business/private sector will demand this as a precondition of participation. Policy risks are by definition government risks. Such a system is shown in Figure 2.

Figure 2. Risks in Infrastructure Delivery



Source: AHURI

External and policy risks should be of particular concern to government(s) as they are central to successful implementation. Management of these risks depends on a clear understanding of physical, financial and technical options available and their technical, financial, environmental and social consequences in the context of evolving technology and community values.

This management process might be a definition of strategic planning as we need it, but do not have because of the 'political' nature of such a process. The costs to the business/private sector in extended negotiation processes, holding costs and other transaction costs are great. Moreover, ineffective management of these risks has major political implications and are therefore relevant to politicians.

3. Examples of Systemic Risk Assessment

3.1 Systemic Risk in Ho Chi Minh City (HCMC) Viet Nam

The case of Viet Nam illustrates systemic risk at the highest level – that required institutions are not even in place let alone operating effectively. The analysis used an extension of cluster analysis (Porter 1990) to identify concentrations of industry and supplier/customer linkages. An assessment of the key strategic infrastructure required to develop these clusters was then undertaken. The institutional constraints to implementing this infrastructure were then documented. The case study presented here was undertaken with limited data and resources, which can be undertaken using existing techniques and data sources available in many countries.

From the industry assessment (qualitative) Figure 3 shows how the competitive position of industry clusters in the HCMC economy can be plotted and are described by using concentric circles to scale them relative to competitor clusters in other cities. The relative location in the plot was decided using delphi techniques – groups of industry 'leaders' and researchers were asked to estimate rankings. A SWOT analysis is then undertaken in each industry. Infrastructure required to take advantage of opportunities and to mitigate weaknesses can then be identified.

[add figure 3]

Systemic Assessment

As the systemic level, the conduct (or lack of conduct) of economic reform in two essential areas relating to the land market constitute the most important risks for the urban economy in general and the industries identified in particular.

The first area of reform is the equitisation of state enterprises and the separation of these enterprises from government regulatory and planning activities. Without such separation, there is little incentive, and often no actual administrative mechanism, to maximise the use of resources of the enterprises concerned on the part of the managers of those enterprises nor to charge the enterprises fairly for the public resources they consume. There is no incentive, for example, to move land intensive low value-added economic activities (such as the sand deport in the centre of the city's commercial district) to a more appropriate location if the manager of the state enterprise concerned cannot buy/lease more suitable land, cannot sell the land/right to use the land and does not have to pay property tax proportionate to the opportunity cost of the land.

The second area of reform is implicit in the above – reform of the land administration system. Land transfer and land use change constitutes a significant transaction cost within the economy, requiring many resources and time to accomplish legally – where that is possible – and significant resources and time together with an 'uncertainty premium' of continuing bribes and payback periods (higher required rates of return on investment) where it is accomplished illegally.

In capital markets, the reliance on foreign (albeit concessional and FDI) sources for much infrastructure finance exposes the economy to foreign exchange risk. Vietnamese financial institutional do not have the capacity to fund, or even serve as a channel for foreign finance. There is no expertise within the government sector in negotiation of PPPs, although some have occurred on unknown terms.

In the various infrastructure sectors, there are few realistic masterplans and no ability to prioritize, regulatory functions are 'bundled' with operational functions creating conflicts of interest within government and legislative environment for regulation is unclear.

The risk of 'bad deals' for both the public and business/private sector is manifest.

3.2 Systemic Risk in Argentinean Water Sector

The Argentinean Case is an example of systemic risk at the next level - appropriate institutions may be in place, but that they may not work effectively together and may not have the flexibility to adapt to other circumstances.

With the World Bank's support and assistance, the government of Argentina embarked in 1990 on an extensive privatisation programme, encompassing virtually all the public services and federally owned enterprises such as electricity, natural gas, oil, telephone, water supply and sewerage, airlines, railways, subways, roads and ports. Privatisation was part of a comprehensive state reform, which consisted of a series of macro-economic measures adopted by the government with the ultimate objective of promoting economic stability. In the water sector, the concession for the water supply and sewerage services of Greater Buenos Aires, which started operating in May 1993, was preceded by a smaller concession in the provision in the province of Corrientes. By the end of 1994, several other provincial water companies, which were following the Buenos Aires concession model, were in advanced stages of contract negotiations, bidding or bid preparation.

The Buenos Aires concession was awarded to Aguas Argentinas (AA) – a consortium of mainly international companies led by Lyonaise des Eaux Dumas (LED) – (equity of 25.3 percent) with Aguas de Barcelona, compagnie Generale des Eaux and Anglian Water (combined equity of 25.1 percent). Argentine representation consisted of local investors – Sociedad Comercial del Plata and

Meller y Banco del Galacia (combined equity of 39.6 percent) – and company employees through Programa de Propiedaa Particiada (equity of 10 percent). Subsequently the IFC has taken a five percent equity stake in AA (see below for financing details). On 1 May 1993, the private concessionaire started operating the Greater Buenos Aires system. Figure 4 summarises the key actors in the process of the Buenos Aires concession and the incentive structures linking them.

- inspection of the figure highlights three incentive problems which compromise the efficient functioning of the market in the water sector:
- the divorce of ultimate responsibility for the legal contract (Economic Ministry) from the regulator (ETOSS) creates a duality of control over AA;
- the use of LED to manage the operation creates two different sets of incentives among the owners of AA (LED being one and the other investors being the other); and
- there is no institutional linkage between ongoing strategic investment planning and the sector agencies.

The figure also highlights the importance of the capital markets and (planning for) the land markets.

[add figure 4]

Reviewing the major systemic issues associated with the award of the AA Concession are:

- The mode of business/private involvement was indeed 'briefly considered' – other models, including further unbundling of the system and using a mixture of management contracts (for networks) and BOT operations, could have considered.

- The evaluation of risk left out entire markets which generate risk – to 'financial risks were reduced by ensuring free convertibility of foreign currency' is entirely inadequate and to say 'legal risks were reduced by introducing into the concession contract clear clauses on arbitration and other modalities of resolving disputes' is, in the light of subsequent event, incorrect.

- Lack of clear structuring for private funding, in particular the form of concession agreement which made the provision of collateral for borrowings difficult, caused difficulties for the IFC in structuring the finance. Such exercise improves with practice, but as each project is unique, rigorous assessment is required on every project.

- In consideration of concession size there was confusion between numbers of contracts and real competition – creating two separate water and sewage companies is creating two separate monopolies – 'yardstick' competition is theoretically possible, but does not help Paris consumers under the same model (The Economist 1994a).

Following on from the last dot point above, the model, despite its high transactions costs, has been applied for other regions in Argentina without evaluation of the risks involved in this very different context.

3.3 Systemic Risk in Australian Roads Sector – the Case of the M2

The Australian case illustrates that, even in well-structured institutions, policy risk is stall extant.

The M2 expressway is part of Sydney's erstwhile ring and radial expressway system. The A$400 million project is to be implemented on a BOT basis by a business/private consortium. The M2 provides a continuous high capacity motorway between the Lower North Shore and the rapidly developing north-west of Sydney.

Figure 5 summarises the key actors in the M2 project and the incentive structures linking them. The complexity of the institutional structures apparent in the figure stems from extensive experience is this form of financing which has evolved complex mechanisms to allocated and hedge risks.

All the financing was provided by the business/private sector in the form of equity, infrastructure bonds (tax-free bonds used for approved projects). Consumer price index (CPI) indexed bonds and medium-term debt. All the revenue risk was taken by the business/private sector.

While the quality of the risk assessment and allocation was high, it suffers, in case of the systemic assessment of the Auditor-General, in being 'post facto'. In particular, the lack of strategic policy against which to assess the viability and net benefits of PSP was identified as a key constraint.

The main area of policy risks identified is that embodied in the imperfect structuring of the sector in terms of the network control function versus ownership of the network. An efficient structuring of the transport sector would be much more likely if the RTA and the public transport authorities were regulated by the same body. This is the concept which eludes the Auditor-General in his consideration of the strategic planning context. The second area of risk follows from this and the lack of strategic context defining the (programme) role of the business/private sector, and is

encompassed, in the tendering processes for BOT projects which does not capture potential efficiencies.

Lastly, the need for institutional change in strategic areas such as taxation treatment needs to be assessed in terms of its impact on revenue risk. The Australian case illustrates that small incentive change may induce large changes in investment behaviour.

[insert figure 5]

4. Examples of Project Risk Assessment

4.1 Project Assessment – the Case of HCMC

The priorities of the infrastructure development strategy (see Roberts 1998) may be summarised as:

- increasing efficiency of access of export industries to export markets by increasing outer and inner ring road access to, and efficiency of, ports;

- facilitating efficient production by the provision of infrastructure geared to the cluster in question;

- minimising environmental impact of production by the provision of infrastructure geared to the cluster in question and moving dangerous industries out of high density residential areas (such as the chemical cluster in the Quan 6/11 area);

- minimising labour cost and access to the suppliers of producer services (which for the foreseeable future will be located in the CBD) by facilitating ease of movement across the city for labour (not for goods which will be forced to use the ring roads in general) by creating an efficient long haul public transport systems on radials and ring road and encouraging private operators to service concentrated employment areas from stops on the trunk routes (this has to be combined with effective central city traffic management action); and

- minimising labour costs by enabling the establishment of housing areas – providing appropriate infrastructure for affordable housing – near industrial estates.

The main risks to implementation of this strategy are respectively:

- failure to coordinate road activity (including dropping some already approved schemes), insufficient relocation capacity and budget for roads and difficulty in prioritising and funding port investments;

- lack of capacity, legislative backup and coordination; lack of marketing capacity and under-capitalisation of developers in the industrial estate sector to allow consolidation of clusters and the provision of infrastructure geared to the cluster in question;

- similar lack of capacity, legislative basis and coordination in land administration and environmental protection, together with under-captialisation of developers, to enable provision of infrastructure to minimise environmental impact of production;

- lack of capacity to compensate relocated people and enterprises moved for development and/or environmental reasons;

- lack of capacity for coordination of traffic management initiatives and public transport investments, which are inter-dependent, in order to achieve acceptable alternatives to motorcycle travel;

- inflexibility and lack of competition in the land and housing markets – now in the hands of parastatals – leads to an inability to respond to demand and thus minimise labour costs, for example, by enabling the establishment of housing areas near industrial estates;

- lack of strategic planning capacity; and

- financial markets which are neither sophisticated nor deep; and infrastructure development fund has been established as a first step towards providing the long-term funding required - the funds raised by this facility will be partly borrowed hard currency with equity from the HCMC government.

In respect of the latter dot points several issues arise for risk mitigation at the project level. Hard currency funds will not be hedged because there is no forward market in Vietnamese Dong. The facility will enable investors to mitigate some risks as joint venturing through the facility will ensure that the HCMC government has a vested interest in ensuring the financial viability and stability of the investments and constitute an implicit guarantee. Other financial hedging possibilities for investors in infrastructure are available through the World Bank and the Multilateral Investment Guarantee Agency (MISA), Asian Development Bank and bilateral export financing agencies. 'Soft' infrastructure linking potential investors in infrastructure to theses agencies is lacking as is such linkage for Foreign Direct Investors in the priority industry sectors.

4.2 Project Assessment – the Case of the AA Concession in Argentina

4.2.1. Development Phase

Capital Markets

In development phase, which includes the time frame up to contract award or financial closure, organisations in the capital markets can play a role in several areas:

- actually structuring the project for implementation (an investment bank in a 'project sponsor' role);
- financing the project structuring exercise; and
- providing advice on how the project can obtain long-term finance.

Which roles are played, and whether the organisations concerned are local or overseas based organisations, depends on the size of the deal, the stage of development of the local capital markets and the experience of the capital markets in this sector.

In the Argentina case, the World Bank undertook the financing of the project structuring exercise as there was no prior experience in PPPs in the sector and the local financial institutions could not fulfil a 'project sponsor' role. As the contract involved considerable investments over 30 years there was no 'financial closure' for this contract and the development phase ended at the award of the contract. The Bank financed an investment bank (Paribas) to study the feasibility of the project and structure the tender for the concession. In light of funding difficulties encountered at the implementation stage, more cognizance could have been given to risks associated with long-term financing provision, in particular the implication of the form of tender for collateral (credit risk). While these difficulties were overcome, the experience has implications for smaller contracts as the transaction costs involved in overcoming them were considerable and this form of contract may not be suitable for smaller investments.

From the policy viewpoint, incentives to develop local banking and long-term financing capacity also need to be considered in the design of the contract and/or in the design of supporting institutional development initiatives. These incentives can be directly incorporated into the structure of project financing or focused on facilitating building of capacity on the supply side. One direct mechanism was used in the concession agreement. There is a clause which requires 10 percent of any equity raised to be listed in Argentina. However, given the costs and disclosure requirements of listing, the concessionaire currently has no incentive to list. More efficient,

although more difficult, is to foster the participation of local capital by strengthening local intermediaries. These include IFC support of the Indian Infrastructure Leasing and Finance Services, and Bank support of development finds such as FUNDETER in Colombia and the linking them to the capital markets. Such financial structuring is also important for equity holders who prefer their holdings to be liquid. In particular, the IFC requires exit strategies to be formalised (reducing liquidity risk). These issues were not clearly addressed in the Argentine structuring exercise and this situation caused some additional difficulties for project financing by the IFC.

Land Markets

The strategic planning systems did not, in the Argentine case, integrate or provide for the physical investments envisaged. Water and sewerage systems can have significant negative environmental and social impacts. Large pipelines and waster water treatment plants can have negative environmental consequences, while relocation for the construction of facilities can be contentious.

In respect of the AA concession, these issues do not appear to have been contentious, a tribute to past design teams and Bank/IFC review processes. Nevertheless, it is important that the sector planning systems possess the ability to handle such issues. Given the breakup of OSN and the adversary relationship between AA and ETOSS (see below), it is not clear that the sector organisations continue to have this capacity. Although no delays were incurred in respect of the Argentine investments in the development phase, the lack of planning context has set the stage for difficulties in later stages (see below).

Capital Goods Markets

In respect of the Argentine case the need for, and selection of, capital items required is determined initially by AA personnel monitored by ETOSS. This technical knowledge is mainly embodied in the management company – LED. The consortium is paying six percent of gross revenues for this management skill. The ability of the regulator to match this expertise is questionable and was the reason for Bank-funded technical assistance to ETOSS. Such assistance was, however, forthcoming at a late stage in the development phase and AA was well into operation before the regulator was established as an effective institution.

Infrastructure Market

In the development phase, the major focus of activity in the sector itself is to ensure the regulator has an incentive to design the tendering process in the most efficient way possible and to minimise approval costs.

Owing to Bank involvement in Argentina, these processes were indeed efficient and transparent. Unfortunately, as discussed above, the regulator was slow in formation and had little to do with the process. If preparatory and tendering processes are to be handled by the regulator such a regulator should have been established early in the development phase. The organisational structure of a regulator is crucial to its effective operation. In the case of ETOSS, a regulator managed by consensus among three different levels of government and utlising staff from the former state monopoly in the sector does not seem to be a formula for responsiveness, flexibility and technical excellence, on the part of the regulator. Very strong incentives for regulator staff would be required to move it in these directions.

In respect of policy risks, the most important is the risk of inefficient functioning of the market as a whole and its component sub-markets. No formal consideration of these risks was undertaken in any detail for the concession design process. Presumably, it was assumed that the incentives of the commercial company undertaking the concession would foster efficiency. This is indeed the case in respect of revenue efficiency, but this efficiency may diverge from service efficiency (economic

benefits). The consequences of this divergence may be important (see below). Further, the form of concession has now been adopted as the de facto contract standard in the sector. Difficulties in respect of finance (as discussed above), of scale in relation to transaction costs and of ensuring competitive behaviour in an integrated monopoly (discussed below) call this choice of generalised standard into question.

4.2.2 Implementation Phase

Capital Markets

AA first tapped the international capital markets with a US$100 million euro-commercial paper issue lead managed by Chemical investment Bank and Galacia Capital Markets in 1993. This issue was 'name' lending at very high rates for short-term (three years maximum, rolled over every six months) working capital. This debt was retired in 1994 by 10 year IFC funding, and IFC 'B' loan funds (commercial bank loan lent in association with an IFC loan including cross-default mechanisms) in association with other multilateral funds. The IFC issues were collateralised with considerable difficulty – given that the form of contract meant that the concessionaire had, at the start of the contract, no assets, no right to transfer the concession and no of cashflow. The collateral used constituted the difference between the performance bond and value of the assets which would have to be 'bought out' on termination of the contract. Such collateral had to be structured so as to take into account the need to allow subsequent lenders equal rights to this collateral.

Foreign exchange risks are identified in all debt documentation as significant, but also these risks are considered to be adequately 'hedged' by the recourse of AA to tariff increases to compensate for changes in the exchange rate. Further, the IFC arranged hedging (a swap to fixed interest) for US$173 million of AA's variable rate borrowings. Country risk is unhedged and the concessionaire and participating banks derive their only comfort from the IFC's 'halo' effect.

Additional financing will be required by AA. While some of this will be generated from cashflow, the company will need to tap either the local or international capital markets again. The Argentine capital markets are expensive, but 'unenhanced' (without IFC 'halo' or Bank guarantees) access to the international capital markets is considered limited. However, this lack of access may be convenient for AA (see the section below on Infrastructure Market). AA has not issued any equity after the initial, contract mandated, initial issue of US$120 million. In addition to listing requirements, which imply the existence of a defined operating environment to allow forecast of future earnings and impossible in the current regulatory situation, AA's ability to list is circumscribed by its recourse to extensive debt finance which results in an unattractive debt coverage ratio. Unfortunately, given that there is no 'put' option in regard to IFC equity, this situation is potentially inconvenient for the IFC and other equity holders who might wish to exit. The other alternative source of finance for investment is cashflow – resulting from the price current consumers pay. Extensive recourse to cashflow financing will alienate customers, a policy risk, and is likely to be resisted by the regulator.

Financing arrangements for the implementation phase can therefore be said to have been less-than-perfect in their structuring.

Land Markets

Risks involved in land-related issues in Argentina became evident in the construction/implementation phase. Although the government bears the responsibility to provide land for the concessionaire's investment, the concessionaire is involved in the process nevertheless. An illustration of an amicable solution to a land problem achieved by AA may be seen, in respect of the construction of a small sewage treatment plant where some resistance to its location was encountered from residents of surrounding areas. This problem was solved by

negotiating a change in the investment programme such that the impacted area would be moved forward in the investment programme, allowing it to be connected to sewers more quickly. In respect of the main northern treatment plant however, the land has neither been acquired nor cleared of squatters. It is highly likely that this situation will lead to delay in the implementation of the sewerage component of the investment programme. This situation may suit AA management (see below).

Capital Goods Markets

No difficulties have been reported in acquiring capital equipment in Argentina, given import tariffs are relatively low owing to the reform process.

Infrastructure Market

Central to the efficient operation of the concession is sequencing and implementation of investment. In this regard, the incentives provided by the tariff structure in the Argentine case are perverse. The tariff structure is such that the maximum return on investment results from increasing the efficiency the efficiency of, and billings from the existing water network. Coupled with the fact that metered connections pay more and thus there is intense resistance to (paying for) new connections (which are metered), this situation is a significant disincentive to expansion of the network. Of course, rehabilitation of the existing system is a major investment need, but additional investments are also required.

The regulatory framework is identified as a significant risk in the IFC's project analysis. The provision by the Bank of institutional strengthening to ETOSS is the principal risk management tool identified in that analysis. This is a concern, as early in 1997 the relationship between ETOSS and AA had broken down to the point where the government felt compelled to pass a law, 'over the head' of ETOSS, for contract renegotiations. Much of the conflict between ETOSS and AA revolves around the composition and scheduling of the investment programme – and its implications for tariff revisions and/or penalties. AA's stated concerns about lack of access to capital markets, (comparative) lack of concern in regard to non-payment by newly connected customers and lack of access to sites must be seen in this light. A thorough revision of the water and sewerage tariff structure is necessary to fix the incentive structures applying to AA, and a review of ETOSS functioning will also be required.

At least the risks associated with underfunded regulators have been avoided by funding ETOSS with a 2.67 percent surcharge on the water and sewerage bill. ETOSS is very well-funded, to the point that questions are asked in regard to the performance of the regulator in relation to its staffing.

4.2.3 Operation Phase

Capital Markets

The standard of the ongoing financial management of AA is important to the continued viability of investment in the Argentine case. LED has both a financial incentive to perform well (if gross revenues go up, its six percent share also goes up) and a reputation to protect. Further, continued access to the capital markets depends on performance.

Land Markets

The project operators have some incentive to retain high quality advice in respect of physical investments, because skeptical local governments will generate approvals risk if poor planning of operational activity is manifest.

Infrastructure Market

Central to consideration of risk for the business/private sector are revenue and input (cost) risks. Counterpart policy risks are risks of being 'held up', of preserving residual value and of efficiency in procurement of inputs.

In the Argentinean case, all of these risks are extant, although some are well-managed. Revenue risk is ostensibly with the business/private sector. However, revenue cost risks are inter-related. Encompassed in the categories of costs are additional taxation, new environmental regulations and foreign exchange costs – thereby hedging these risks. Tariff revisions (revenue risk) can under the contract be, and have been, triggered by increases in costs of over seven percent. The major risk issue, unresolved in the contract, despite some 19 pages of the contract being devoted to the issue, is the basis on which the tariff will be revised. Such risk can only be managed in the context of a flexible and efficient regulatory regime.

The major input risk for the concession is (was) that of labour inputs. Relatively generous redundancy payments undertaken by the government and one of almost equal size funded by AA (with IFC funds) have reduced employment by approximately 3,000 staff. Remaining staff are well-motivated and well-paid.

From the policy perspective, the major risk is being 'held up' – that is, being subjected to a capital and /or operational strike by the operator for which the government receives the blame. Experience and reputation provide the capacity and incentive for LED to avoid such tactics. Risk of being left with worthless assets at the conclusion of the contract is relatively well handled in the concession contract. The concessionaire has an incentive to maintain assets as the concession may be extended and the incumbent is likely to win the concession (this is the experience in France). Further, any investments not fully depreciated in the last 10 years of the concession (which have been agreed as outside the concession works) will be paid at their depreciated value. However, the performance bond is released at the end of the concession period, even though there is an additional three-month period in which claims against the concessionaire can be made.

Lastly, there is the risk of inefficiency in the procurement of capital goods and contracting for operations and maintenance within the concession period. Incentives within the contract need to ensure such procurement is efficient. This is not currently the case. Bank/IFC guidelines and the concession contract require that sub-contracts over US$10 million must be competitively bid. However, it is relatively easy to break down large contract sums into contracts of less than this amount. In Argentina, the incentive for the consortium is to award contracts to companies affiliated with members of the consortium. There is no compensating loss of revenue to the consortium as the cost over-runs, provided they are OVER seven percent of total costs as nominated in the concession agreement, can be passed on to consumers.

4.3. Project Assessment – the Case of the M2 in Australia

4.3.1 Development Phase

Capital Markets

During the development phase for the M2, no explicit structuring of the capital markets was necessary. The Australian capital markets are broad, deep and efficient. However, specific action has been taken on behalf of the infrastructure sector by the Australian Taxation Office (ATO), supported by the RBA, ISC and the ASC (all of which are Commonwealth agencies). These actions have been designed to mobilise long-term finance for infrastructure which would otherwise not have moved into unfamiliar sector. In general terms, these actions reduced taxation risks. More general capital market developments (such as CPI-indexed bonds) are extended to the financial sector through financial innovation under the competitive pressure of the tendering process.

Relatively small tax concessions have been found in Australia to be highly effective at overcoming initial resistance to innovative financing. Learning from experience with 'negative gearing' provisions (tax provision which allow individuals to deduct interest on the financing of rental property as an expense), Commonwealth agencies have begun to address some of the taxation impediments to business/private sector investment in infrastructure. In particular:

1. The issue of non-taxable/non-deductible infrastructure bonds have been issued.
   The issue of such bonds addressed an important practical difficulty investors had with (no) depreciation allowances during construction. However, the ATO and Treasury strongly objected to them as tax havens for the wealthy and they have subsequently been suspended. An alternative instrument has been developed around tax deductibility of some financing costs, but its acceptability has yet to be tested. The issue of such bonds was, in any case, heavily restricted, confined to financing the acquisition or construction of new public land transport infrastructure and sea port facilities, or public electricity generating projects. Moreover, to be eligible it was necessary for the issuing company to intend to own and operate the project (for the purpose of producing assessable income) for a period of not less than 25 years. Thus, while the initiative jump started the provision of long-term finance, its continued flow is likely to depend on risk/return profiles and the following initiative.

2. Depreciation treatment of 'Infrastructure Assets' has been altered.
   Some infrastructure projects may involve a substantial level of investment in non-plant depreciating assets, such as roads, retaining walls and pipelines. In the absence of an appropriate amortization deduction, investments in such projects could be discouraged. Accordingly, the Government has decided that income-producing structural improvements will be eligible for write-off allowances at the 25 percent rate.

In the development phase of the M2, business/private sector capital market organisations:

- advised the RTA on structuring the project for implementation; and

- structured the financing packages of the competing consortia.

CPI indexed bonds were devised and used to eliminate most inflation risk from over 50 percent of project funding. The credit quality of the companies issuing the debt and equity was assessed by both financiers and the RTA.

The project was developed by the RTA to a degree of detail (short of contract documents) which clearly set out the physical and performance requirements so that tenders would have a common basis of financing for their tenders. This cost was borne by the RTA. Tenderers bore their own costs to financial closure and investment banks operated on a 'success fee' basis. Tenderers also bore interest rate risk to a cut-off date for approvals after which the RTA bore this risk.

Land Markets

In Australia, the planning processes were relatively thorough and the RoW was preserved. However, native title claims to one section of the RoW and potential environmental action, both action through the courts and illegal action, posed a risk to the project. Given that the selection of the route was a government decision, the RTA accepted these risks.

Infrastructure Market

In the development phase, the major focus of activity in the sector itself is to ensure the regulator has an incentive to design the tendering process in the most efficient way possible and to minimise project costs.

The tendering process in Australia was transparent and efficient in the generally accepted definitions of these terms. However, the transaction costs involved were high (of the order of A$50 million mainly for merchant bank fees). Further, from the viewpoint of economic efficiency, the BOT process is, in concept, flawed. If a sub-optimal design is efficiently financed, it may constitute a winning tender. A two stage process, where tenders are first called on design and then on financing has the potential to produce a more efficient outcome. Transaction costs are still high, however and efficiencies are dependent on the presence of both competitive financial markets and on high quality tenderers for the design phase (which would have to achieve a given level of credit rating). Such a system is unlikely to be useful for such (relatively) standardised things as power plants, bit can be useful where design differences can make significant difference to economic and/or financial net benefits of the projects. It is predicated on a highly sophisticated and competitive capital market, however.

A broader issue in the Australian context is the combination of the network operator and the regulator in the one agency (the RTA). This is one of the concerns which lies behind the business/private sector's concern for competing infrastructure projects, and the need for the policy risk associated with addressing this concern to be accepted by the Government. If the regulatory authority was independent in respect of 'dispatch' of infrastructure, analogous to the power sector, there would be less justification for this concern.

4.3.2. Implementation Phase

Capital Markets

Little of significance occurred in the capital markets after financial closure excepting the listing of the operating company, providing 'exit' for equity holders.

Land Markets

The risks evident in the development phase were effectively managed and did not impact on the project.

Capital Goods Markets

No difficulties have been reported in acquiring capital equipment in Australia where tariffs are relatively low.

Infrastructure Market

In Australia, incentives for the business/private sector are focused on the need to maintain a good reputation in this field in order to ensure eligibility for future tenders. One additional level of sophistication in structuring incentives was that embodied in the relationship between the contractor and the project proponent (Hills). The contractor agreed to purchase a substantial amount of Hills shares on completion of the project – giving the contractor a strong incentive to complete on time and to a high standard of quality.

The Auditor General audited the process and found some weaknesses. These were published and publicised.

4.3.3. Operation Phase

Capital Markets

Again, the Australian case is similar to the Philippines case and incentives for effective performance continue to apply in the operational phase, as the companies involved wish to undertake more such projects.

Land Markets

In all cases, the project operators have some incentive to retain high quality advice in respect of physical investments because skeptical local governments will generate approvals risk if poor planning operational activity is manifest.

Infrastructure Market

Central to consideration of risk for the business/private sector are revenue and input (cost) risks. Counterpart policy risks are risks of being 'held up', of preserving residual value and of efficiency in procurement of inputs.

In the Australian case, revenue risk is real and extensive. High levels of quality in traffic modeling combined with predictable land use and development policies have resulted in accurate (conservative) predications of revenue. Input risks are minimal.

4.3.4 General

Some additional factors in risk assessment for this and like projects are:

- Staff change in government agencies mean that old ground must be covered again in each new deal, showing the limitations of the learning process outlined above. Better training of regulator managers would enhance this learning process.

- Standardisation and contracting have played an important role. Industry sources indicate that standardised contracts and success fees for consultants are being more widely used and significantly reduce transaction costs.

- Transaction costs remain an important issue. It should be noted that the minimum size of tollway deals is about US$200 million. Hospitals have been financed down to about US$100 million. However, smaller deals are difficult to finance owing to the fact that transaction costs are not proportional to deal size. New mechanisms are required to address the funding of smaller scale infrastructure (and now for larger infrastructure as well with the demise of infrastructure bonds). Standardised revenue bonds may be an important mechanism.

5. Risk Mitigation Institutions

5.1 Line Departments

Risk mitigation for line departments focuses on efficient and transparent tendering procedures and high levels of expertise, particularly in PPP projects.

The analysis of the case studies emphasised the importance of the risk implications of the contractual form used to structure the relationship between the regulator and the private entity(ies) involved. This form had implications for both:

- The development of the sector

(Would the particular project be easy to 'grandfather' into future sector reforms and what impact was the 'demonstration effect' having on the other potential projects in the sector?)

- The formulation of future projects

(How best to advance the efficient use of business/private sector financing in future projects?)

These issues have been discussed above, and the assessment framework can be used to assess contract forms.

5.2 Sector Regulators

Risk mitigation for sector regulators focuses on the development of flexible but comprehensive standards and performance targets.

Central to the operational efficiency of infrastructure projects is the relationship between regulator and operator. While of necessity an arms-length relationship, it must be a cooperative one as all possible circumstances occurring over a (typical) 20 or 30 year period cannot be foreseen at the time of formulating the contract and incorporated in the contract. The analysis framework has identified three factors as important to this relationship. They are arrangements for:

- Tariff revision;
- Retaining residual value of investments; and
- Dispute resolution.

While there are three basic forms of tariff setting (Vickers and Yarrow, 1989) rate of return, price caps and yardstick competition – all three reduce to reliance on the rate of return on invested capital to determine the efficiency or otherwise of a tariff regime. Owing to the presence of asymmetries in information availability, the regulator is usually at a disadvantage in determining of the cost structure base for the required rate of return at any time after the initial competitive tender. These determinations should thus be minimised by the contract form.

Tariff revision, where not linked to an index such as is used in a PPA, is the determinate of profitability. Despite their tender, under which they will assume that project return will be generated over the course of the concession period, operators naturally prefer to obtain their base return as quickly as possible. Thus they will exploit, as far as possible without undue risk to the continuation of the contract (assuming it remains potentially profitable), any weakness in the contract or regulatory process. This leads to two conclusions:

- It is most efficient to incorporate in the contract output performance standards rather than design investment and O&M inputs in order to reduce the basis for tactical bargaining; and

- Where changes, in particular new investments, are required to a contract they should be subject to competitive challenge, where possible, and the contract needs to incorporate the flexibility for such challenge – again reducing the basis for tactical bargaining.

Dispute resolution requires both a mechanism and an attitude of compromise. It is difficult to engender these, on the one hand, while trying to avoid the inefficiencies of regulatory capture on the other. Sector policies for capacity building of regulators, and perhaps of operators, may be required. Such capacity building programmes can be systematically designed utilising the planning process.

5.3 'Omnibus' Regulators

In many countries, the institutional setting for infrastructure delivery is sometimes complex with numerous agencies involved in the planning and implementation of infrastructure at several levels of government. In Australia, there is no specific agency responsible for coordination of the provision of infrastructure at the national level, the Department of Regional Development and Transport has a watching brief and is involved in specific projects.

Federal environmental and native title legislation is also important in the planning and implementation phases of projects.

However, the key regulatory agencies in respect of infrastructure financing are:

- the Australian Taxation Office (ATO);
- the Loan Council;
- the Reserve Bank of Australia (RBA);
- the Insurance and Superannuation Commission (ISC) and the Australian Securities Commission (ASC);
- State Auditor Generals and other public enterprise regulators; and
- the Australian Consumer and Competition Commission (ACCC).

These agencies and their roles are discussed below as an example of the issues which need to be faced by regulators in every country.

The ATO as an agency of the Federal Treasury administers (and strongly resists) specific legislation providing for special taxation treatment of bonds issued to finance infrastructure projects, Infrastructure Bonds. The issue of such bonds addressed an important practical difficulty investors had with (no) depreciation allowances during construction. Depreciation allowances were also increased for infrastructure.

The Loan Council determines the ability of state governments to take on debt in the light of existing commitments and likely future revenue. It also determines how various financing arrangements are to be interpreted as liabilities for the state governments. Loan Council treatment of infrastructure financing has been considered more generous than its treatment of financing arrangements designed to fund non-infrastructure projects. It should be noted that local governments are creatures of the state governments in Australia and have no independent constitutional existence. Their borrowings are thus also subject to Loan Council review and their liabilities reflect on the liabilities of the State.

The Reserve Bank of Australia has oversight of the banking industry specifically and of the capital markets generally. The Insurance and Superannuation Commission and the Australian Securities and Exchange Commission, in particular, are important regulations of channels (life and superannuation offices and the stock exchange respectively) for long-term finance required by infrastructure projects.

The Auditor General of each state has a watching brief, on behalf of the taxpayers of each state, to ensure that public money and assets are used as efficiency as possible. For the government, it also has an advisory function, in association with the Attorney General, in respect of the financial implications of contracts to which the government is party. The Auditor General of New South South Wales has routinely audited private infrastructure projects and published the results – as in the case of the M2 (Audit Office 1995). States also have, usually semi-independent, regulatory and pricing agencies to regulate the performance of public infrastructure providers.

The ACCC is charged with implementing 'competition reforms' throughout the economy – meaning that all enterprises, including all significant government enterprises, are to be placed in a competitive environment so as to maximise service efficiency. As a result of this substantial 'unbundling' of infrastructure services is to occur with potential for moving large parts of what were monolithic public monopolies into the business/private sector and/or for generating significant opportunities for business/private sector financing. The roads sector has not yet been addressed by the ACCC.

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