

LOCAL INFRASTRUCTURE (*off-site*) PROVISION AND PLANNING APPROVAL SYSTEM IN MALAYSIA

Dani Salleh ¹⁾ Ho Chin Siong ²⁾

1). Doctorate student at Faculty of Built Environment, Universiti Teknologi Malaysia

2). Professor at Faculty of Built Environment, Universiti Teknologi Malaysia

Abstracts

Adequately provided infrastructure was a prerequisite for the sustainability of local development. Due to the rising cost of infrastructure, there is a paradigm shift from the public to private sector provision of infrastructure. Since then, local authorities are increasingly finding themselves facing a shortage of fund to provide the necessary infrastructure. Therefore, based on a study, the authors attempt to identify ways to promote private sector, specifically the private property developers to do so. Consequently, the scenario has encouraged local authorities to work on the ways to involve private sector to provide adequate provision of local infrastructure. The paper concludes with a short summary of key issues in local infrastructure and proposes an improvement of the present practice of local infrastructure provision.

Keywords: Sustainable local development, planning approval and infrastructure provision

1. INTRODUCTION

The planning system in Malaysia is established with a hierarchy from the national level to the lowest level. The lowest level is concerned with physical development within its domain. The system has been formulated in order to ensure a balance development in public interest. Meanwhile, the New Economic Policy (NEP, 1970-1990) has provided an idealised hierarchy of framework for physical land-use planning in the country. It complements the upstream planning effort by providing the necessary physical development strategies for executing the above socio-economic development policies in definite spatial terms.

In the past three decades, Malaysia has been experiencing a progressive rate of urbanisation. During this period urban development was largely unstructured except for the provision of basic infrastructure and services to facilitate the exploitation of resource-rich areas. The growth in urban centres necessitated the establishment of local authorities to facilitate the provision of organised urban services. With the provision of basic infrastructure and control of local development planning through zoning, as well as intra-urban linkages, urban areas thenceforth began to develop in a more orderly and planned manner.

In order to achieve this objective, it requires a thorough overview of the current scenario of local infrastructure and furthermore to understanding the practice of planning controls system in the country. For the purpose of this paper, the discussion intends to look at the scenario local infrastructure provision and how local authorities secure its infrastructure through the planning approval system framework.

2. URBANISATION AND LOCAL INFRASTRUCTURE

Malaysia is located in South East Asia covers with an area of 329,758 square kilometres can be divided into two main regions, East Malaysia (including Sabah and Sarawak) and West Malaysia (or Peninsular of Malaysia). Peninsular of Malaysia with an area of 131,598 sq km consists of one Federal Territory of Kuala Lumpur and 11 states. Whereas Sabah and Sarawak located on the

northern part of the Island of Borneo has an area of 198,160 square kilometres, is more than 650 kilometres to the east across the South China Sea. Total population was 22.2 millions (2000¹³) with the population density of 65.7 per square kilometres. 17.8 million out of this total population lived in Peninsular of Malaysia. Geographically, average of 80 percent of the total population lived in Peninsular Malaysia. In the Eight Malaysia Plan (8MP, 2001-2005) the country experienced a high rate of urbanisation of 66.9%. Comparatively the developed states in the west coast of Peninsular Malaysia experiences urbanisation rate higher than national average (about 77.7%). This is due to two main factors, namely the expansion of modern sector in existing towns and the greater rate of rural urban migration (see Table 1). These factors continue to influence the urbanisation rate in future.

Table 1: Urbanisation rate by state in Malaysia (1995-2005)

State	Urbanisation Rate			Average Annual Growth Rate of Urban Population (%)	
	1995	2000	2005	7MP	8MP
More Developed States	66.5	73.4	77.7	4.9	3.8
Johor	54.4	63.9	69.1	5.7	3.8
Melaka	49.5	67.3	75.3	7.5	3.2
Negeri Sembilan	47.3	55.0	58.2	4.4	2.3
Perak	56.2	59.5	65.3	1.9	3.0
Pulau Pinang	77.0	79.5	83.3	2.7	3.1
Selangor ¹	80.8	88.3	92.7	7.3	5.0
Wilayah Persekutuan Kuala Lumpur	100.0	100.0	100.0	2.0	2.2
	37.4	42.1	45.9	4.7	3.9
Less developed States	35.1	38.7	43.3	3.9	3.9
Kedah	33.5	33.5	36.7	0.5	2.8
Kelantan	35.0	42.1	44.0	5.2	2.2
Pahang	29.6	33.8	38.9	3.5	3.7
Perlis	39.8	49.1	53.2	7.7	4.9
Sabah ²	41.8	47.9	54.6	4.4	4.8
Sarawak	46.6	49.4	50.1	2.7	1.6
Terengganu					
Malaysia	55.1	61.8	66.9	4.8	3.8

Source: Eight Malaysian Plans (8MP, 2001-2005)

In line with the national trend, the development of individual cities and towns in Malaysia is also keeping pace. The rapid urbanisation process has created pressure for the provision of adequate and efficient of infrastructure and public facilities. Similarly in other countries, infrastructure provision always concern with the involvement of public sector in the provision of physical facilities ranging from public amenities, highways and road construction, dams for generating power supply, water treatment plant, airports and many others crucial facilities at local level.

3. ISSUES IN LOCAL INFRASTRUCTURE PROVISION

The adequate provision of appropriate infrastructure is vital to the economic of our communities in particular to the local development. In Malaysia, most of the local infrastructure traditionally was undertaken by local authorities¹⁴. According to Mohammad Nong (1990), the local authorities themselves

¹³ See Preliminary Count Report, Population Census of Malaysia 2000.

¹⁴ See Local Government Act 1976 (Act 171) and Street, Drainage and building Act 1974 (Act 133).

have to finance their infrastructure (*on-site* or *off-site*)¹⁵. In responses to this, they have taken various steps to upgrade its infrastructure facilities within its areas. Since then millions has being spent on the provision of infrastructures in the form of local roads, road-surface maintenance, drainage system, road furniture, upgrading traffics system, providing street lighting system, sewerage system and others through various relevant implementation departments in the local authority (see Table 2). Such huge expenditure within limited of resources requires local authorities to implement its infrastructure projects strategically. This is a must in order to stimulate the strategic urban sector development and avoiding the allocations taped to less needed projects.

Table 2: Local infrastructure expenditures in Municipal Council of Penang Island Financial 1992-1995

Type of Services	Expenditures RM			
	1992	1993	1994	1995
Roads Maintenance	6,554,383.00	8,382,517.00	9,750,876.00	11,690,556.00
Road-surface Maintenance	3,325,373.00	3,542,472.00	4,526,449.00	4,721,820.00
Drainage System Maintenance	427,965.78	846,549.31	1,137,786.60	1,921,421.70
Road-Side Maintenance	136,139.68	251,562.51	266,194.48	1,179,299.24
Road Furniture Maintenance	200,619.48	402,869.81	160,445.30	208,014.51
Upgrading Traffics system	543,340.00	104,743.00	358,494.00	600,000.00
Street Lighting System Maintenance	2,464,285.00	3,339,063.00	3,660,000.00	3,660,000.00
Traffic-Light System Maintenance	274,678.00	247,444.00	330,000.00	340,000.00
Villages Development Schemes	116,004.00	52,069.00	133,811.04	250,000.00
Maintenance of Sewerage Pipe-Lines System	1,365,177.00	1,566,617.00	2,912,671.00	2,704,789.00
Total	8,853,581.94	10,353,389.63	13,485,851.78	15,585,344.45

Source: Department of Engineering, Municipal Council of Penang Island (MPPP), 1996

The practice therefore, was much contributed financially consequences to the local authorities. In order to reduce such burden, an effective approach to reform the present practice should be formulated as an alternative means to secure the required infrastructure. Presently, local authority was proactively in identifying ways to accommodate the incremental developments within it areas. As provided under present planning legislative, it gives power to local authority to regulate the development and also to impose requirements of financial contribution and appropriate public facilities to developers' prior planning permission is granted. This means that private developers are required to provide such *on-site* requirements such as road improvement, construction new road and other facilities.

By referring to Section 133 of the Street, Drainage and Building Act 1974 (Act 133), in some cases, developers are required to pay for *on-site* of infrastructure such as sewerage, drainage system, water and construction or road improvement. Therefore, the local authority has to be more creative to explore the new ways to secure the needed *off-site* local infrastructure provision. The policies pertaining to infrastructure provision as outlined in development plans such as structure plans are generally very broad in nature. Whereby during planning approval, planning developers are required to ensure that planning applications comply with development plans and that enable the externalities can be minimised (Wills, 1995). The plans provide the basis for relevant agencies to prepare their infrastructure development programs and particularly for private developers to comply the requirements outlined by local authority in their proposed developments.

At the local level, its requires greater certainty before making decision in providing local infrastructure especially those facilities located out-site private development areas (or *off-site*

¹⁵ *On-site* infrastructure refers to those infrastructure required within the development areas and this normally provided by the developers or the land owners itself. However, *off-site* infrastructure refers to those infrastructure required out site the development areas to ease the impact resulted from the proposed development.

infrastructure). The local authority often seeks to increase contributions from developers to fund the required infrastructure (*off-site*). The changes have helped to reinforce the conventional approach that the relations between the local authorities and private developers are inherently conflict-ridden. In this context, local authority enables to ensure the committed development had adequate infrastructure provision before it can implemented.

The similar scenario also founded in Malaysia. The local authorities look ways to secure the required *off-site* infrastructure when private developers seek to secure higher return from development approval or there is a justified development impact occurred. However, some developers arguing the practice would undermine their commercial viability. No doubt, such feedback reveals developer has to allocate a side of development cost to construct *off-site* infrastructure. In principle the planning system can and does provide the needed infrastructure.

Table 3: Municipal council of Penang Island financial statement for 1992-1995

Types of expenditures	Real (RM million)			
	1992	1993	1994	1995
Income				
Income from council	78.33	85.58	95.39	82.51
Federal Government Grant	1.89	1.89	1.89	1.89
<i>Total income</i>	80.22	87.47	97.28	84.40
Expenditure				
Administration & general expenses	31.13	32.40	42.49	42.89
Maintenance	2.22	3.41	4.69	4.29
Special Expenditure	4.16	3.60	11.60	30.38
Capital Expenditure (Infrastructure)	70.26	70.24	94.78	122.20
<i>Total expenditure</i>				
Surplus/Deficit	9.96	17.23	2.50	(37.80)

Source : Municipal Council of Penang Island, Malaysia 1996

4. INFRASTRUCTURE PROVISION: WHY PRIVATE SECTOR?

The locations of the required *off-site* infrastructure had been allocated in development plan, however, with the limitation of funds has had forced the local authority to give priority to the needy areas in order to stimulate private capital investments. Accurate estimation of demand for *off-site* infrastructure and the cost incurred in providing such facilities has been very problematic segments in local infrastructure provision. As suggested by Simpson (1983);

“...when dealing with the provision of *off-site* infrastructure, the effects of an increase in demand from one site can be felt at several other locations where the fund allocated to the particular locations may be reduced. This may have ramification spreading over a considerable area...”

To minimise the uncertainty level of cost required to provide *off-site* infrastructure, local authority had developed an efficient system to involve private sector (or private developer) when they proposing a new development based on information of the committed development in the local authority. Alongside these technical assessments, the local authority has to formulate a standard negotiation practices on charges or contribution with respect to infrastructure (Healey *et al.*, 1996). A standardised practise of negotiation often gave developers incentives and clear path of the cost implication might be incurred at the early stage of development.

Based on various studies (Sidney, 1996; Stephen *at al.*, 2000; Ronald, 2000 and Carroll, 2000) in order to fulfil the requirement, local authorities seeks for new methods of financing to

accommodate the increased demand of local infrastructure. There are various methods if private financing currently widely practiced, likely;

- Public Sector Delivery
- Service/ Management Contract
- Lease Contracts
- Public-Private Partnership (PPP)
- Private Finance Initiative (PFI - A form of PPP)
- BOOT, BOO or BOT (Schemes)
- Concession/ Franchise Agreements
- Joint Venture (JV)
- Full Privatization

One of the main constraint faced by local authority in providing infrastructure is because of their financial resources were squeezed by higher tier of government, and this has left only one option - the developer must contribute. Developers have always been required to pay for *on-site* infrastructure such as sewerage, drainage system, water, roads improvement etc. As an alternative to the constraints, the developers were required to provide *off-site* infrastructure. The major local authorities increasingly laid down requirements for private-sector provision for *off-site* infrastructure because of rapid growth in many areas combined with increase in construction costs and reductions in federal and state allocation, increased has had the cost for local governments to provide new expenditure.

5. REGULATING THE PLANNING SYSTEM FOR LOCAL INFRASTRUCTURE PROVISION

It has been seen that most studies have shown that adequate infrastructure facilities are very important for urban development and it is clearly a necessary precondition for sustained economic development (for examples see Healey, 1995; Choguill, 1996; Kaplinsky, 1999; Altshuler and Gomez, 1993; Claydon and Smith, 1997; Ennis, 1997; Bunnell, 1995; Koegh, 1985). However, the increasing cost of providing infrastructure for public expenditure has had a significant impact on the capacity of the local authorities to provide infrastructure as it did in the past. Therefore, it is important for the local authority to be proactive in identifying ways to generate additional financial sources to accommodate infrastructure requirement within the current practice of planning approval system. This requires the local authority to improve their collection methods or diversify their sources of revenue and articulate development control to promote the provision of infrastructural facilities.

According to Chung (1986), in this respect the expended role of town planning in the context functioned on the following five specific areas, namely; i). development planning; ii). socio-economic planning; iii). civic design; iv). infrastructure development planning; and v). advocacy planning. However, with respect to infrastructure development planning, planning in itself is not confined to allocating land for various types of development which it has to deal are often highly complex, involving investment decisions across many related fields of policies, these included the planning of infrastructure facilities. Therefore, planning approval system seen enable to be used as an effective instrument for to secure the additional infrastructure at the local level. Hence an effective approach within the framework of the present planning approval system should be formulated.

6. HOW LOCAL AUTHORITY MOBILISE FINANCE SOURCES FOR INFRASTRUCTURE?

In most local authorities in Malaysia, the infrastructure provision is ranging from agriculture, communication, public facilities, road construction, public amenities and public utilities. And yet there is no single body responsible to coordinate and to be in charge in providing and furthermore to financing such provisions. The tasks were undertaken by various ministries or departments in

stage of planning and implementing infrastructure programs. Therefore, this practice has contributed financial implication to the local authorities concerned. Therefore to reduce the financial burden, an effective approach development control system as practiced at Local Planning Authority (LPAs) might be alternative solutions to secure the required infrastructures projects.

As outlined in Local Planning Authorities (LPA) development plans such as Structure Plans are generally very broad in nature. The plan provides the basis for relevant agencies to prepare infrastructure development program and particularly for private developers to comply the requirements outlined. Meanwhile, it was identified that the rising cost of infrastructure provision has forced local authorities to look into ways of possibilities to secure infrastructure provision (e.g. entering into partnership with the private sector and more particular are property developers) to secure adequate provision of infrastructure.

The development plans contained the policy which requires the provision of *on-site* relevant facilities. Where the policy describes that the type of facilities or public amenities has potential to be provided in the particular location. Actually, the policy statements, give very strong requirements in improving the *on-site* infrastructure and these are i). to improve the quality of the present infrastructure facilities, ii). to improve access to and circulation to the location of the facilities provided, and iii). to identify the strategic and accessible location of newly development projects. When large property projects (residential) schemes are developed, it normally involves a negotiation process between public and private parties (developers) to secure *off-site* infrastructures prior granting of planning permission.

By considering the above scenario, the current practice of planning control system limits the ways local authorities to secure the appropriate provision of infrastructure for their communities. The similar situation also happens in many local where the constraints faced by entities other than local authorities to participate (for example participation through Public-Private Participation, Privatisation, Joint-Venture Project etc.) These problems exist because much of the legislation governing the activities assumes local authorities will own, provide and regulate the industries. However in U.K development control system was become very effective means for local authority to secure the needs infrastructure.

7. THE PRESENT PRACTICE OFF-SITE LOCAL INFRASTRUCTURE

In the British Planning System, planning approval process is essentially a co-ordinating and allocating of activities (Ennis, 1997). Planning approval mechanism always be found in the planning system and has identified as a useful method in securing *off-site* infrastructure provision (Claydon, 1996). What can be concluded is that the practice of planning approval was proven as one of acceptable method for local authority to be applied to acquire *off-site* infrastructure provision. However, planning requirements imposed via planning conditions might be applied if there's a must for developers to provide. This could happen if the approved projects will deteriorate the adjacent areas. Therefore, there is a need for developer to compensate or to provide any form of mitigation measures to avoid any predetermined negative consequences as resulted from the development.

As revealed by Bunnell (1995) and Purdue (1995), planning approval was a legitimate process. Planning officers at developers firm shall be equipped with an in-depth knowledge in the procedures of obtaining the planning approvals. It could be the responsibility in handling the planning related matters in the process. Based on a study conducted by the authors on the application of planning approval to secure infrastructure (*off-site* and *on-site*) from private sector, the remaining parts of the paper will elaborate accordingly to the research's findings. The findings actually discuss the present practice of how local authority acquires such infrastructure provisions from private sector.

7.1 Planning approval

Table 4 outlines the methods applied by local authority to expedite planning approval which involves of *off-site* infrastructure. From the table, there are three methods frequently applied by local authorities. The most effective method is that by having One-Stop-Centre to monitor planning application (77.3%). The centre would facilitate all the disputes arise between local authorities, technical departments and applicants (developers). The disputes would happen in case of there is disagreement on the part of developers in order to fulfil certain requirements as imposed by local planning authority (e.g. *off-site* infrastructure), technical departments requested to list the infrastructure needed them imposed to applicants (18.2%) and only one local authority initiated such as internal committee to expedite the planning application which involved withy *off-site* infrastructure (4.5%).

Table 4: The methods applied to expedite planning approval which involves *off-site* infrastructure

Procedures applied	Frequency	Per cent %
Each technical departments requested to list the infrastructure required by each individual departments	4	18.2
Having one-stop centre to monitor the requirements of planning approval process	17	77.3
The developer setup SPEAD (Surveyor-Planner-Engineer-Architect-Developer) to expedite the planning application.	1	4.5
Total	22	100.0

Source: Field Survey, 2005 (n=22)

The analysis had been made on the perceptions of developer on the impact of having in-house planning officers to deal with planning matters. However, in this part the analysis will looks on the present practice used by local authorities to acquire *off-site* infrastructure from private developer. Figure 1, revealed several methods of infrastructure delivery at the local level. Complete public sector delivery has present 100.0% from the council surveyed. The recent outsourcing approach of local infrastructure provision had been manifested in form of joint-venture (100.0%), lease contract (72.7%), service management contract (81.8%) and full privatisation (77.3%). However, other form of private option such as concession/franchise agreement and public-private partnership (PPP) was not successfully applied.

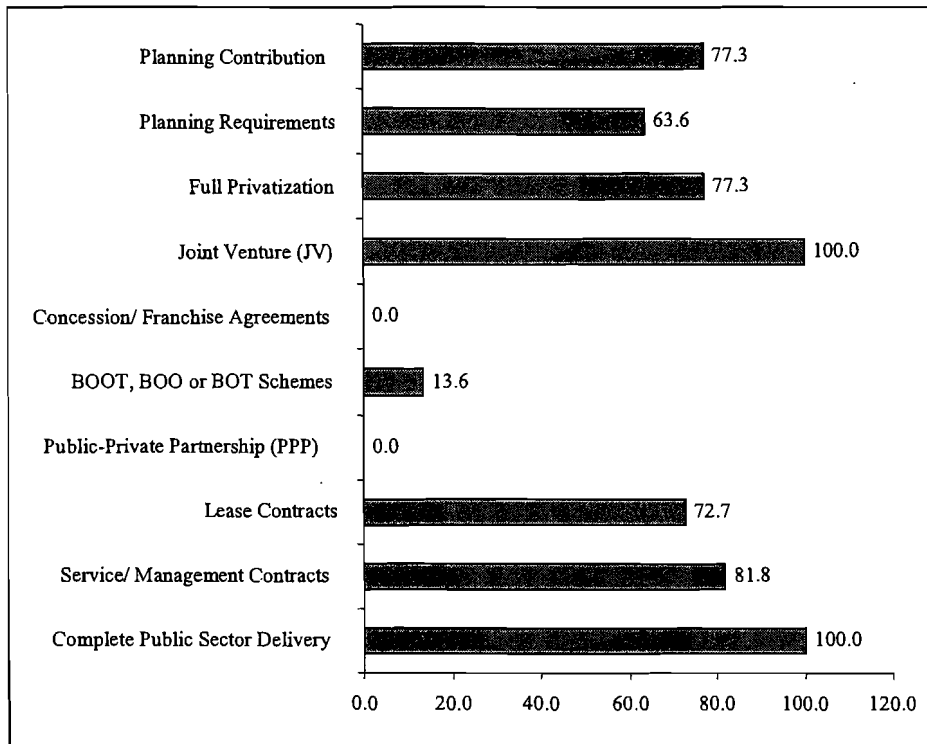


Figure 1: The present practice of off-site infrastructure provision

Source: Fieldworks survey 2005 (local authority n=22)

In fact, the breakdown in the above figure also suggests that apart from private option in *off-site* infrastructure, there are several other forms applied to acquire from private developer, such as the use of planning contribution (77.3%) and planning requirement (63.6%) during planning approval process. The use of these two forms to secure *off-site* infrastructure is very limited. It was found that local authority were widely uses private sector financing. However, this situation applicable to all types of infrastructure delivery as well as to the less effective, such as concession/franchise agreements and public-private partnership (PPP). These are few local authorities which utilises an intensive type of private sector delivery of *off-site* infrastructure, i.e. Built-Operate-Transfer (BOT, BOOT or BOO) (13.6%).

The above analysis can be concluded that besides public sector delivery the provision of *off-site* infrastructure was widely provided by private sector during planning approval stage. The findings has supported by Allison and Askew (1996), a local authority might seek contribution from private developer through negotiation while considering planning approval. In the return to the approved planning permission, the developer might give something to local authority in the form of 'contributions'. The contents of the contribution would be as what has been 'agreed' upon the approval. The process of securing benefits (e.g. *off-site* infrastructure) normally is enshrined between developers and local authority.

7.2 The reasons of using private financing option

For this purpose, local authorities were asked to indicate the reason of using private sector delivery method for *off-site* infrastructure provision. Private sector does offer improved service delivery when they are exposed in a competitive market. From the Table 5, the finding from the survey indicate that the main reason why local authority move to use private options in delivering

of *off-site* infrastructure is frequently because of to raise the necessary financial resource to fund the increase in demand of local infrastructure provision. This was represented by 100.0% (n=22) from the interviewed local authorities. Other reasons were to improve the efficiency and the quality of services (36.4%) and to increase efficiency of the services provided (13.6%).

Table 5: The reasons of using private sector for *off-site* infrastructure provision

<i>The reasons</i>	<i>Involved with off-site infrastructure</i>		<i>Total</i>
	Yes	No	
To raise necessary resources (e.g. <i>financing</i>)	22 (100.0)	-	22 (100.0)
Ability to identify and manage risks	1 (4.5)	21 (95.5)	22 (100.0)
To provide contemporary management skills and optimize performance	2 (9.1)	20 (90.9)	22 (100.0)
To improve the efficiency and quality of services	8 (36.4)	14 (63.6)	22 (100.0)
Efficiency improved when exposed to competition	3 (13.6)	19 (86.4)	22 (100.0)

Source: Field Survey, 2005 (n=22)

8. CONCLUSIONS

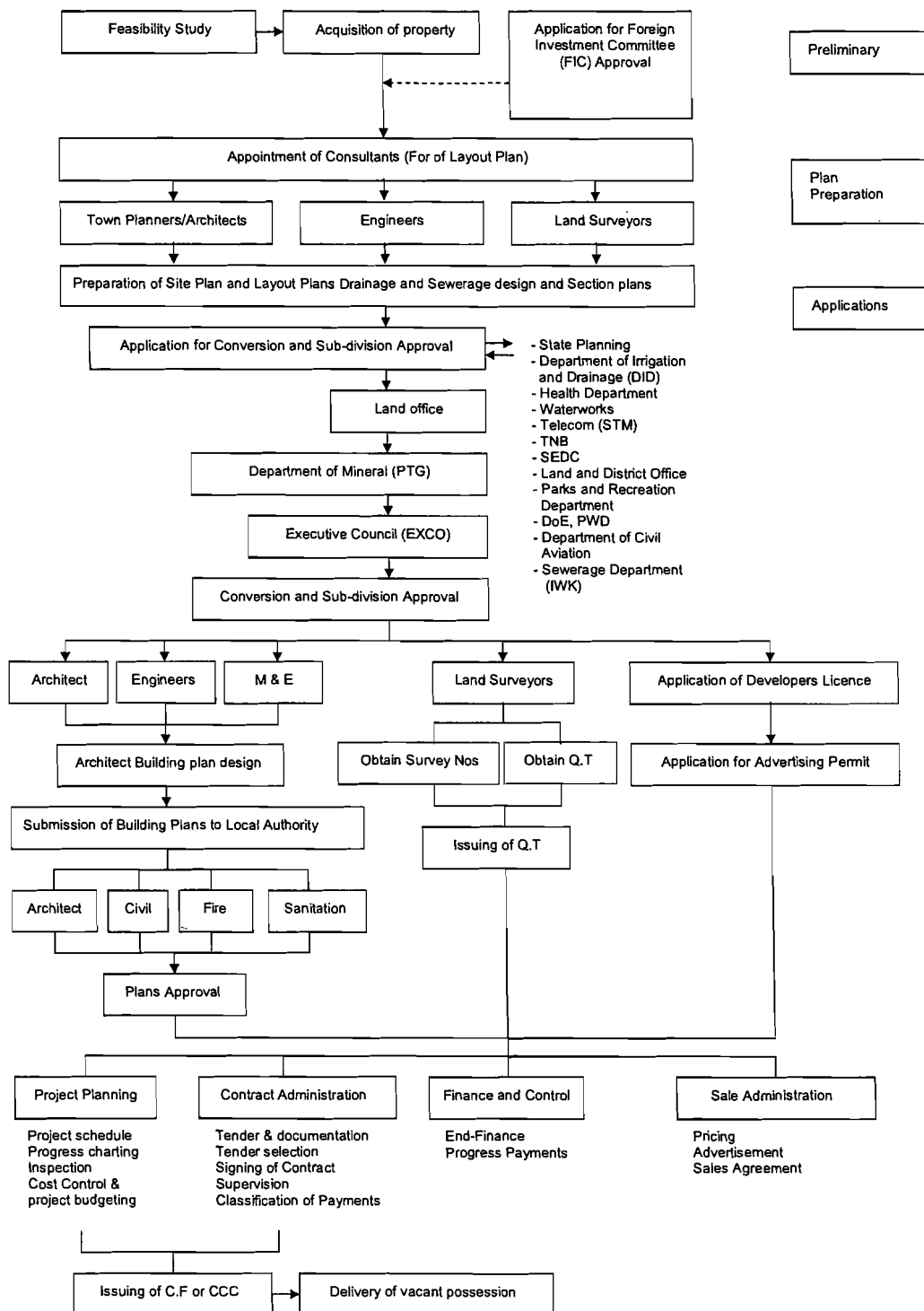
From the conclusion, it is clear that private sector involvement in local infrastructure provision is needed to be promoted by all related authorities. Ultimately, the main aim of private involvement in local infrastructure is to use private funding and improve efficiency of infrastructure delivery. The participation of the private sector in the provision of local infrastructure services has the potential of increasing the standard of living of the population. Also identified that if there is no immediate reform to the present practice on local infrastructure provision, it will continuously deplete the limited government funds desperately needed for other social programs and attracting local investments.

It can be concluded that the present practice of local infrastructure provision would further squeeze local authorities financially and further worsen environmental quality. Local infrastructure provision is not only a costly responsibility but more importantly it entails several financial implications. To resolve these undoubtedly problems it is suggested that an integrated-method of local infrastructure provision needs to be adopted. It is based on the costs-sharing concept amongst the users of infrastructures by adopting and integrating the improved framework of development control system in the country.

References

- Allinson, J. and Askew, J. (1996). Planning gain, in Greed, C. (Ed.) (1996) *Implementing town planning : The role of town planning in development process*. Harlow : Longman.
- Altshuler and J.A Gomez-Ibanez (1993). *Regulations for Revenue: The political Economy of Land Development Exactions*. Washington D.C.: The Broongkings Institution.
- Booth, P. (1996). *Controlling Development : Certainty and Discretion in Europe, the USA and Hong Kong*. London : UCL Press.
- Bunnel, G. (1995). Planning gain in theory and practice: negotiation of agreements in Cambridgeshire, In *Progress in Planning*, Vol. 44, pp. 1-113, 1995. Elsevier Science Ltd.

- Choguill, C. L. (1996). Ten steps to sustainable Infrastructure. In *Habitat International*, Vol. 20, No. 3, pp. 389-404. Elsevier Science Ltd.
- Chung (1986). *The Role of Town Planning in National Development*, paper presented at National Seminar in Planning, organised by ITM.
- Claydon, J. and Smith, B. (1997). Negotiating Planning Gains Through the British Development Control System, in : *Urban Studies*, pp. 2003-2022.
- Ennis, F., (1997). Infrastructure provision, the negotiating process and the planner's role, in : *Urban Studies*, pp. 1935-1954.
- Federal Department of Town and Country Planning, (1993). *Manual for Development Plans Preparation*, Kuala Lumpur.
- Healey, P. , Purdue, M. and Ennis, F., (1995). *Negotiating Development : Rationales and Practice for Development Obligations and planning Gain*, E & FN Spon.
- Government of Malaysia (1976). *Town and Country Planning Acts, Act 172.*
- _____ (1974). *Street, Drainage and Building Acts, Act 133.*
- _____ *Eight Malaysian Plan (8MP, 2001-2005)*
- Kaplinsky, E. S. (1999). *An Evaluation of Development Charges and their Alternatives in Israel and in Ontario*. Unpublished Master's Thesis at University of Toronto.
- Keogh, G. (1985). The economics of planning gain. In S. Barrett and P. Healey (eds), *Land Policy Problems and Alternatives*, pp. 203-228. Gower Publishing Co. Ltd. Aldershot, Hants.
- McKinlay Douglas Limited, Brent Wheeler & Co (1996). *Liberalising the Regulation of Governments' Infrastructure: An Issues Paper*.
- Muhammad Nong (1990). Financing urban infrastructure: Trends and issues. Paper presented at *National Planning Conference*. Jointly organised by Malaysia Institute of Planners of Malaysia (MIP) and Department of Federal Town and Country Planning (JPBD).



Appendix 1: Development Process in Malaysia
 Source: Adopted from Tan, 1996