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THE RELATIONSHIP BETWEEN CONSTRUCTION AND ENVIRONMENT: The Perspective of Town Planning System

M.Zainora bt Asmawi
Department of Urban and Regional Planning International Islamic University Malaysia
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ABSTRACT

Environment forms the basis upon which all human activities such as physical, social and economy take place. Malaysia is a nation that is blessed with the beauty of nature and at the same time advanced in terms of infrastructural development. Environmental resources are vital components of the environment that include land, vegetal resource, water bodies, atmosphere, flora and fauna. Nowadays, due to high rate of urbanisation, rapid population growth, and rapid economic growth led to greater need of space for operation, which subsequently forced the construction industries to meet this demand. This gives rise to various forms of environmental degradations which lead to disruption of environmental equilibrium. The study assesses the effects of construction industries on the environment in the perspectives of town planning. Town planning is an approach used to identify the relationship between construction activities and environmental resources with the aid of some tools such as Development Proposal Report, development control and planning permission among others. The study finds out that construction industry has grown to 17.4% during the period of 1996-2000, which is the peak period and is due to mega projects that mostly took place in the Federal Capital and the central part of Peninsular Malaysia. The methodology employed in this study is based on the available data derived from the secondary sources of information. It also aims at suggesting ways of achieving sustainable construction activities, so that our natural earth will not be harmed, destroyed or degraded.

KEYWORDS:
Construction, environmental degradation, environmental resources, town planning.

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1.0 INTRODUCTION

This report aims to present the current relationship between construction industry and environment in the context of town planning system in Peninsular Malaysia. It is essential to study this topic as undeniably the environmental consideration is vital in town planning field. In this regards, the current situation addresses that the environmental sector faces the great 'threat' of construction business as the nation develops. As such, it is hope that this small effort will benefit any concerned party and more importantly, it can and should support to protect the invaluable Mother Nature.

1.1 Study background

Construction activities gain a lot of momentum since the era of industrial revolution. It is among the measures of nation's level of development through provision of basic infrastructures such as housing, roads, schools and many others. Construction industry has grown drastically all over the world. It has significantly contributed to economic and social developments, and the same characteristics in both developed and developing countries, which is generation of employment. The construction business has been growing drastically since the past two decades, and played a vital role in generating global economy. Han (2010) analyses the future market trends of construction industries globally, where he states that in 2011, Asia will account for 37% of the global market volume with US$1.7 trillion, Europe US$1.42 which is equivalent to 31%, and North America US$1.057 trillion equivalent to 23%, and about 80% of the construction are carried out by local builder, and only 20% involves foreign construction firms. The expansion of this industry is due to economic development and the increased need for infrastructures such as housing, commercial areas, roads and other public facilities. The industry has achieved advancement, and this can be linked to the issue of globalisation. This is spread through the integration of information technology and communication improvement in recent years (Rezgui *et al*, 2010), and the application of method engineering principles in the field of information technology process construction (Žvanut & Bajec, 2010).

In Malaysian context, according to the Malaysia's Construction Industry Development Board (2008) construction industry is among the major pillars of the domestic economy, and it is also a key factor in economic growth. The activities of this construction take place within the context of the environment and with the support of the environmental resources. Economic growth plays a vital role in the expansion of construction activities in Malaysia. The overall GDP for the country grew from 4.3% in 2003 to 6.3% in 2008. The Construction Industry Development Board (2008) stated that the project development allocation and expenditure rose from RM 170 billion for the 8th Malaysia's Plan to RM 200 billion for the 9th Malaysia's Plan, this has boosted construction activities such as infrastructure, commercial, office complex, industrial and housing. Construction industries in Peninsular Malaysia are among the strong sectors of the economy and attached with some values. As such, construction activities played a vital role in the development of the nation. Since industrial revolution, the environment has been suffering severe environmental degradation such as vegetal destruction and land degradation as a result of disturbances on the natural resources of the environment, and gave raise to various ecological problems and land use changes.

Construction activities gain a lot of momentum since the era of industrial revolution. It is among the measures of nation's level of development through provision of basic infrastructures such as housing, roads, schools and many others. It is also a key factor in economic growth. The activities of this construction take place within the environment and with the support of the environmental resources. Economic growth plays a vital role in the expansion of construction activities in Malaysia. The overall Growth Domestic Product (GDP) for the country grew from 4.3% in 2003 to 6.3% in 2008. Construction industries in Peninsular Malaysia are among the strong sectors of the economy and attached with some values. As such, construction activities play a vital role in the development of the nation. Since industrial revolution, the environment has been suffering severe environmental degradation such as vegetal destruction and land degradation as a result of disturbances on the natural resources of the environment, and gave raise to various ecological problems and land use changes.

The construction activity has numerous effects on the environment, because it ends up making the soil to be compact and impermeable to rainwater (Lowton, 1997). This specifically gives rise to erosion because as rain falls, the vegetal resources that absorb the water and reduce direct fall on the ground surface is destroyed, and the ground itself that absorbs most of the water is occupied by structures covered with cement, glasses and tiles. This subsequently leads to flash floods, erosion and expansion of flood plains. The presence of vegetal resources moderates the concentration of carbon dioxide in the atmosphere and used by the plants during the process of photosynthesis. Construction activities from inception to completion stages are always associated with the destruction of environmental resources.

1.2 Objectives

The outline objectives of this small research are to:

i. study the importance of conserving the environment in town planning activities;
ii. assess how construction activities can harm the environment; and
iii. examine the contributions of town planning system to environmental management in Malaysian context.

1.3 Significance

The outcome of the research benefits many stakeholders (e.g. local authority, NGOs, and representatives from construction industries) by:

i. providing local knowledge of the present state of the environment in relation to construction industries; and
ii. offering opportunities for improving the situation *via* the relevant tools available in the town planning system.

1.4 Research Methods

A descriptive and explanatory research was applied that relates to the concerned topics: construction; environmental management; and town planning. The primary research of this research was heavily relied on the document analysis to gather data. Data collection

was done at various government offices and libraries for gathering relevant information *via* reports, journal, books, and others. In addition, planning offices at state and local levels are the main agencies supplying required information. The research method consisted of content analysis of the current practice of construction activities and how it affects the natural resources.

1.5 Expected Results

The results are documented in an exploratory paper/report, demonstrating the results and findings of the study, in which the topic is about the relationship between construction industry, environmental management and town planning. The expected results would be on the contributions of town planning to managing environmental development sustainably. This report would be useful for relevant authority, such as Local Planning Authority as it reveals the current performance of town planning in supporting the efforts of conserving the natural resources in Malaysia.

2.0 CURRENT ISSUES CONCERNING THE CONSTRUCTION AND ENVIRONMENT

Due to the nature of activities of construction, it is commonly related to changes of environmental aspect. It always generates both the positive and negative impacts to the environment. In this regards, this research concerns on the harmful impacts towards the environment.

2.1 Environmental Degradation

Despite the fact that construction plays a vital role in physical, economic and social development of the nation, it is also linked to other environmental problems such as over extraction of raw materials from the environmental resources, reduction in water quality and degradation of valuable resource which is land. One sixth of the world fresh water, one quarter of the wood harvest, two fifth of its material and energy flow is affected because of the activities of construction industries (Darci, Houser & Heidi, 2008). According to the fifth Malaysia Plan (1986-1990), more than 30% of land in Peninsular Malaysia has been developed, but only 10% of the land is covered with natural forest that is rich and diverse in ecosystems.

A study carried out by Nik and Associates in 1999 on Multimedia Super Corridor revealed urbanisation has exerted more pressure on the environment and its resources, where forested areas have been cleared for different forms of developments. Similarly, Chhabra *et al,* (2006) in his study on land use changes of some countries indicated that most of the land use changes in Malaysia is from forest land uses to urban land uses such as residential, commercial, roads and other infrastructures. As a result, this has been the cause of soil erosion, urban flooding and landslides among others.

A picture taken in IIUM Gombak campus: flash flood always occurs due to massive construction and poor drainage system.

Responding to the alarming environmental issues, the Government of Malaysia through the Ninth Malaysia Plan (2006-2010) has incorporated environment and natural resource conservation in the preparation of both Structure Plans and Local Plans. These two types of plan are statutory plans as they are prepared according to the requirement in the provisions of Town and Country Planning Act 1976 (Act 172). Additionally, development standards and guidelines on environment, land use and urban surroundings are also available to improve planning and development processes. Similarly, there are efforts made by the national government such as the establishment of the National Biodiversity-Biotechnology Council.

Construction of road needs to blend the existing terrain to avoid landslide.

2.2 Environmental Stress

Construction activities exert more stress on the environment especially through emission of dust particles, toxic and other construction waste into the atmosphere. These wastes in the atmosphere are considered potential threats to public health. Vibration on construction sites during construction activities is a major stress on the environment and may result to seismic activities. According to Bao Shan *et al.* (2007), large-scale engineering construction has caused the enormous pressure to the regional ecological environment and changed the regional ecological balance. Others include increase solar radiation received and increased intensity of rainfall which results to flooding.

Typical pictures of construction site in Malaysia shows that developers will always bull doze the existing trees and leave the site bare open. This situation will pose the environment to many potential impacts, such as sedimentation and siltation.

2.3 Loss of Habitats

There are many types of habitats that have been destroyed due to urbanisation process. For instance, construction is said to affect wetlands through habitat loss, reduction in water quality, sedimentation (Azous & Horner, 2001). Construction on environmentally sensitive areas such as wetlands cause large deposition of sediments in the wetland areas and water channels, while for hilly areas, it gives rise to channel erosion and facilitates natural problems such as landslide and mudflow, and its activities on undulating topography aggravate slope stability. Lumber which is a forest product is a major component of building materials and is utilised extensively in both building and infrastructure construction. Plants are fragile living organisms and if too many are

removed, it can lead in some areas to environmental catastrophes (Beer & Higgins, 2000). The construction needs area, and the first step is land clearing and that normally involves destruction of vegetal resources and may result to the expansion of flood plains (Jesse *et al*, 2006). According to the fifth Malaysia Plan, soil degradation is mostly due to runoffs from newly developed land which led to high level of river and water bodies' pollution.

While the three greatest and most imminent threats to the survival of our civilisation are global warming, peak oil (the growing energy gap between supply and demand) and resource depletion, habitat destruction can have a more immediate and disastrous effect on certain localised areas and species. Sometimes these can also have a global impact (for example, the impact of the deforestation of the Amazon rain forests).

It is hard to keep track of the number of species made extinct every year, and of the further destruction of biodiversity and rare habitats. However the fact that the construction industry is such a huge consumer of materials, particularly of imported chemicals, minerals, metals and organic materials such as timber, inevitably means it has a huge impact and obviously has the greatest impact of any sector in one nation, on habitat erosion and destruction globally.

Many essential materials are now in short supply. These include materials such as copper, which is largely mined in South America where whole mountains have been taken down and landscapes altered in the search for ever more rare resources. They include materials like Titanium Ore which is used for the production of Titanium Dioxide, which is one of the main ingredients of paint among other things. This is often mined in rare habitats such as Madagascar with consequential and inevitable dangers to the ecology.

Of course it is possible to mine and extract materials from habitats without destroying them. However there will always be consequences to this benign form of extraction in terms of cost, speed and quantity. It is therefore imperative that we radically reduce our demand on such materials in order to allow this process to happen benignly. At present

the whole world is heading in the opposite direction, and we will lose huge areas of unique habitat forever in the coming years unless we change the way we consume such materials. This is particularly as regards how we build. It means using less of these materials by building more simply, with more local and plentiful (ie sustainable and renewable) materials and with less waste.

New development should avoid sensitive and fragile areas such as steep slope and hilly area to prevent any unwanted disasters like landslide.

2.4 Environmental Pollution

Finally the environmental impact of construction is also experienced in terms of pollution. This is not in the extraction but in the processing of materials for construction. Not surprisingly, the construction industry has the biggest effect of all sector because of the quantity of materials used in construction.

In the past there was a simple general equation between the amount of pollution and the amount of energy in a process. On the whole the more energy required, and the more processes, the more waste and the more pollution was generated. Processes such as the processing of plastics for PVC, PU and PI, the manufacture of Titanium Dioxide, the

galvanising of metals were all very polluting. Much of this is now controlled by legislation and pollution of air, for instance, land and sea within the European Union and many Western Nations is now reducing. However we have also exported a lot of our pollution in the outsourcing of our manufacturing to non-western nations such as China, India, and areas of South East Asia and South America. Products may be assembled in the West, but most of the basic materials and components are often processed elsewhere. The loss of control of manufacturing processes therefore has a considerable environmental impact.

2.5 Impacts of Climate Change

Construction of new buildings will add up the existing carbon (CO_2) emission. For example, building use in the UK alone contributes about 50% of the UK's CO_2 emissions and construction contributes about another 7%. It is evident that the Government figures on energy performance of houses grossly underestimate the CO_2 gains that could be made by building energy efficient buildings. The main base performance criteria for energy efficient buildings all concern the thermal performance of the building shell where most of the CO_2 gains can be most easily made.

The fact is that if we are serious about climate change then we need to stop playing games with technologies which do not deliver real CO_2 savings. The real challenge in this area is the refurbishment of existing buildings. However it would help for a start, if we also produced really energy efficient new buildings.

2.6 Waste Problem

It is a fact that construction industry is the major sector that generates waste. The waste can be categorised into two namely: waste generated during the construction activities and waste generated as a result of demolition. Construction waste is a global environmental problem which becomes burden of the environment; this is due to its difficulty to be recycled due to its features like bulk in size and its material and also difficulty to decompose easily.

The implementation of construction projects by construction sector in Malaysia results to production of large amount of construction waste (Ara *et al,* 2007), and has caused significant impacts on the environment *(ibid*). This is the reason for implementation of construction waste management in the sector.

3.0 ENVIRONMENTAL CONSIDERATIONS IN TOWN PLANNING

The meaning of "environment" in the context of this research refers to the discipline of build environment which relates to the objectives of achieving a balanced distribution of social, economic, political and physical element in the planning framework. Wong (1998) says that environmental issues have recently gradually gained momentum in the planning profession. Environmental considerations are important in town planning tasks, whether they are determining planning applications ranging from house extensions to a new airport, or developing policies for conservation and development (*ibid*). It is, therefore, important to include environmental considerations in the town planning practice.

The town planning system is generally designed to regulate and control the development and use of land in the public interest. Its nature is complex and it covers most aspects of land use development to protect the public and environmental interest. It is recognised as an important instrument for protecting and enhancing the environment and reconciling the interests of conservation and development. Consequently, it ensures the maintenance of environmental quality.

Town planning is also seen as a profession that adopts flexible approaches, which is able to adapt to changing circumstance and is not tied by rigid inflexible procedural rules (Tewdwr-Jones, 1995). This suggests that the role and scope of town planning can change to meet more contemporary global challenges. The use of development plans and development control can ensure that the development needed to help an economy grow takes place in a way that respects environmental capacity restraint and other conservation interests (Rowan-Robinson *et al.,* 1995).

The basic concerns of the town planning system are housing, transportation, shopping, leisure facilities and industrial needs. Cowell and Owens (1997) suggest that land use and environmental change are connected in fundamentally important ways, and that town planning is one of the oldest instruments of environmental protection. Healey (1988) says town planning has the capability of addressing the heterogeneity of land and environmental management problems and their variation in time and place. Town planning is considered to be an important instrument for integrated planning and management of land resources which incorporates a balanced approach to the conservation and development of land (Usulludin, 1999). From an environmental perspective, the contribution of the town planning system has been acknowledged as successfully contributing to the conservation of natural resources.

Blowers (1997) divides town planning into two components. The first recalls the activities of the preparation of development plans and the latter is about the operation of development control. At a broader level, he defines town planning as a means of achieving long-term environmental management. Cowell and Owens (1997) suggest that planning authorities be urged to take into account environmental considerations comprehensively and consistently in development plans and to integrate environmental concerns in all planning policies. In development plans, there will usually be a section or chapter on the environmental sector, which caters for the needs of conservation of the environment. Town planning can be seen as an alternative way of dealing with environmental issues. The development plan is seen as a platform on which environmental considerations are embedded, underlying every relevant policy. If environmental concerns are to be fully integrated into the development policy cycle, careful monitoring is required to close the loop and ensure that sustainable environments are delivered (Russel, 1999). However, he considers that it is difficult to measure the amount of environmental change that is a direct consequence of land use policies, particularly when the cumulative effects of various types of land use and development are involved. Whether town planning does or does not achieve its environmental objectives also reflects influential factors like political intervention, the social dimension and economic pressure.

Environmental planning can be seen as a fourth theme of planning along with economic planning, physical development planning and public administration and policy analysis (see Bishop *et al.*, 2000; Evans & Rydin, 1997; Healey, 1997; Taussik, 2001). It is considered by Blowers (1996) to be a strategic approach which is similar to the idea of town planning. Blowers (1997) suggests there are five major goals in environmental planning: resource conservation; building development; environmental quality; social equality; and political participation. The coverage is comprehensive in providing a wider environmental perspective. If environmental planning is to be a comprehensive socio-political process, it must have the quality of being 'integrated and strategic' (*ibid*: p. 45). These features of environmental planning are also common to town planning system.

Sustainability can be achieved if planning decisions are made in a wider environmental context. If they are, the town planning system has a contribution to make to the whole system of environmental planning. Miller (1990) notes that the town planning system can offer additional safeguards to environmental management, which depends on the role of development control as an instrument of pollution control.

4.0 THE RELEVANCE OF SUSTAINABLE DEVELOPMENT IN TOWN PLANNING

Recently, with the growth of the environmental movement around the world, the town planning system has been required to be more responsive to the pressures on the environment and to promote sustainable development to protect the environment for future generations. Blowers (2000), Bruff and Wood (2000), Dumashie (2001), Hales (2000), Rowan-Robinson *et al.* (1995) and Rydin (1998) identify the town planning system as an effective societal key instrument in delivering land use and development objectives that are compatible with, and therefore help achieve the aims of, sustainable development. Selman (1995) says that, for example in England, central Government sees the town planning system as an important agent in the delivery of sustainable development for the nation.

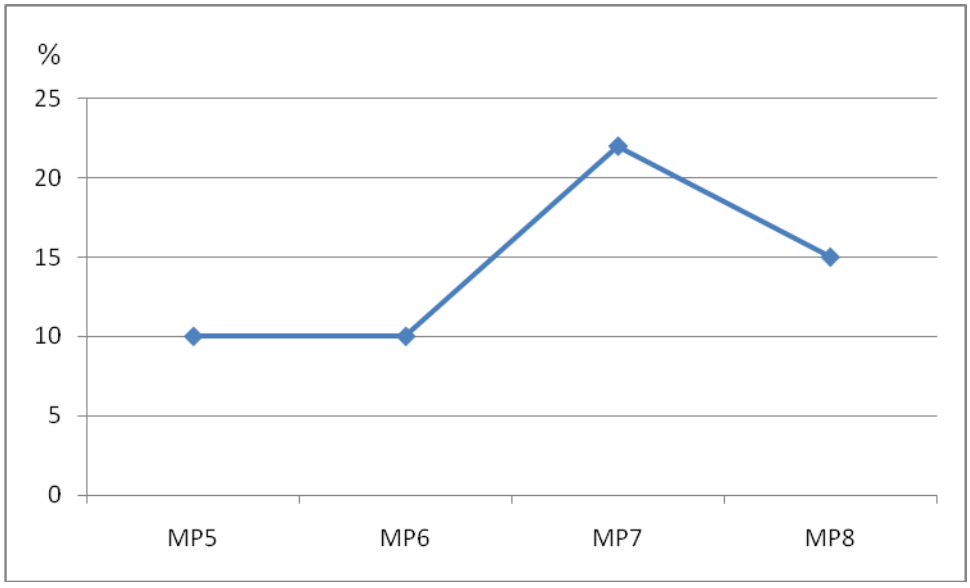
In theory, policy in town planning has an important part to play in delivering sustainable development because decision-making in development control should be based on development plan policy so that the use and development of land achieves certain ends. To achieve sustainable development, town planners have to operate in a wider context than in the past and consider key environmental resources. This is likely to require them to work with other professions.

5.0 CONSTRUCTION AND THE ENVIRONMENT: THE CONTRIBUTION OF TOWN PLANNING

5.1 Economic Pressure on the Environment: Malaysia Experience

Industrialisation process and economic development are essential in providing basic amenities of life and to sustain and improve our standard of living. Construction activities in Peninsular Malaysia have risen to its peak period of 17.4% during the period of 1996-2000 (7th Malaysia Plan). Figure 1 shows the changes according to 5th, 6th, 7th and 8th Malaysia Plans. The trends indicated that since the 5th Malaysia Plan until the 6th Malaysia Plan, the pattern remained the same. Eventually, in the 7th Malaysia Plan, the construction industry hit its peak time. This is due to the stable economic condition faced by Malaysia. This is the period whereby many mega structures were built, such as the project of Kuala Lumpur City Centre (KLCC), Petronas twin towers, and so forth. However, the challenge is: How to determine the direction and level of development that is not limited by what is most expedient for the present, but will benefit future generations as well provide for the immediate needs of society? Ecological problems tend to increase with the expansion of construction industries as it depends largely on the environmental resources as its raw materials (Hong Juan *et al*, 2007).

Figure 1:
Progress of construction industries during the 5th, 6th, 7th and 8th Malaysia Plans



5.2 Roles of Town Planning

Most people and nations of the world focus more on economic benefits and tend to forget about the value and function of natural environment. Environmental planning emerges due to issues related to town planning.

Adams (2001) states that the typical development planning normally has broad appeal in a democratic society. This apparently enables control of future land use change to be taken away from private landowners and developers and placed firmly within the arena of public decision. This is where the recognition is given to the importance of the statutory development plan system. The development plan is a necessary statutory instrument in controlling resource utilisation. The future development of land should be in accordance with this plan which has regard for environmental, physical, social and economic considerations (McConnell, 1981). Consequently, implementation of development plans occurs through development control. It is the principal means of

achieving planning goals and is the machinery whereby developers must obtain planning permission from Local Planning Authorities to develop.

Destruction of environmental resources is a factor in town planning and site development. The town planning role involves applying controls over both the location of major accident hazard sites and development near to these sites (Miller, 2001). The capability of the soil to withstand certain types of development should be known to avoid soil degradation; this will include soil studies before the project can takeoff. This will help to identify some impacts of land use change on the proposed development. The rapid destruction of environmental resources led to ecological investigation and integration of environmental components into planning. This is clearly stated in the Ninth Malaysia Plan (2006-2010) where environmental components are incorporated into planning and development which enabled a more integrated and holistic management of the environment and natural resources.

In Peninsular Malaysia, the Town and Country Planning Act 1976 (Act 172) governs the town planning in which it has stated several tools to be employed in protecting the environment. Town planning is an activity that tends to regulate the development and physical use of land to suit public interest and to make the future sustainable. It consists of two fundamental components: Development Plan and Development Control. Development Plan which is the 'heart' of the forward planning framework; statutory document; planted system that is prepared to guide future development and monitor spatial environmental changes, while Development Control (Act 172 refers Development Control as Planning Control) is applied during implementation of development plan by the use of mechanisms such as planning permission and enforcement of planning law by Local Planning Authorities. In addition, there area several planning guidelines and National Physical Plan (NPP) (provided by Jabatan Perancangan Bandar dan Desa [JPBD]) with the ultimate aim of protecting and conserving the environment, especially the sensitive areas such as hilly areas, wetlands, forest reserves and coastal areas. Table 1 shows the roles of town planning in environmental protection with the aid of its major tools, i.e. Development Plan and Planning Control.

Table 1: Roles of town planning in environmental management

No	Tools	Roles	Related sections under Act 172
Development Plan (Part III of Act 172)			
1	National Physical Plan	Formulation of policies and strategies to promote economic development, social planning and environmental protection.	Part IIB, section 6B, inserted by Act A1129
2	State Structure Plan	Interpretation of national and regional policies, containing development proposals and providing a framework for the preparation of Local Plan.	Amended and substituted by Act A1129
3	District Local Plan	Addressing detailed issues at local level and formulation of planning strategies and proposals according to Planning Blocks.	Part III, Section 12 (1), inserted by Act A1129
4	Special Area Plan	Detailed planning programme containing strategies and actions to mitigate immediate identified problems of an area.	Part III, Section 16B (1) inserted by Act A1129
Planning Control (Part IV of Act 172)			
1	Layout plan	Ensure conformity in land use and development and to protect environment	Part IV, Section 21B(1)
2	Development proposal report	To explain in detail, how the development will take place.	Part IV, Subsection 21A(1) Inserted by Act A933
3	Planning permission	Decides whether a development project to carry on, not to carry on or carry on with some condition, this depends on the extent of impact on the environment and surrounding land uses.	Part IV, section 2(1), Inserted by Act A933

6.0 THE NEED FOR SUSTAINABLE CONSTRUCTION AND ENVIRONMENTAL CONSERVATION

The term sustainability refers to the utilisation of the available physical and natural resources by the present generation without disclaiming the future generation to also meet their own. It means achieving four objectives at the same time: effective protection of the environment; prudent use of natural resources; social progress which recognizes the needs of everyone; and maintenance of high and stable levels of economic growth and employment (Boswell & Walker, n.d.). It is an effort towards efficient utilisation of resources. In order to achieve sustainability, there must be a balance between demand of natural resources by the construction industries and supply by nature.

It also goes along with the three Rs (which are: reduce, reuse and recycle). These three terms have been the major emphasis of most sustainable development programmes. Reusing and recycling of wastes is among the best methods to improve the environment, and these helps in minimizing the extraction and consumption of resources. According to Marinković *et al,* (2010), recycling of construction and development wastes represents on way to convert a waste product into a resource, where the environment benefits through energy consumption, emissions and fallouts reductions. Similarly, the performance measurement indicators (PMIs) that show the environmental performance outcome needs to be emphasized (Vivian, 2006).

The sustainability of construction depends on the level of its environmental consideration, economic benefits, social and cultural compliance. Sustainability in construction entails utilisation of suitable materials that are recyclable, choose the right construction materials that will ensure energy and resource efficiency in order to improve performance and be ecologically friendly. Sustainable construction could therefore be described as a way of designing and constructing buildings that support human health (physical, psychological, and social) and - which is in harmony with nature, both animate and inanimate (Hendriks & Janssen, 2003). The introduction of nanomaterials developed

from nanotechnology is a step forward in construction industry. Its benefit is long term and therefore cannot be seen in a short period of time (Kutschera *et al*, 2009). Other efforts include: preservation of natural vegetation and habitat, minimize erosion by reducing sedimentation during construction and maintain soil permeability. Efforts by the Malaysian Government towards sustainability include Agenda 21 (1999) with the aspiration to promote economic development and consequently strengthen sustainable development activities at local level through local authorities. National Biodiversity-Biotechnology Council was also established in 2001 to promote the sustainability of biological diversity. Others include green building index, the establishment of a state-level Sustainable Development Unit within the office of the State Secretary. A construction activity is a diverse in nature and it involves professionals from various backgrounds. Table 2 shows the efforts and actions of various professionals towards development and environmental protection in order to achieve sustainability.

Table 2: Interrelationship between construction and other professions

Professions	Actions towards sustainability
Town Planning	➢ Developing green neigbourhood planning index. ➢ Incorporating environmental elements into planning system in a sustainable manner.
Architecture	➢ Designing of green buildings index. ➢ Recommending environmentally friendly building materials.
Engineering	➢ Adoption of environmentally friendly approach in its engineering works. ➢ Recycling leftover materials use of sustainable materials such as nanomaterials, etc. ➢ Applying green construction method.
End users	➢ Use of sustainable energies.

7.0 FINDINGS AND DISCUSSION

The study was experimental in both its application and content. In analysing the operation of town planning system within the context of environment and construction, it reveals some findings, as follows:

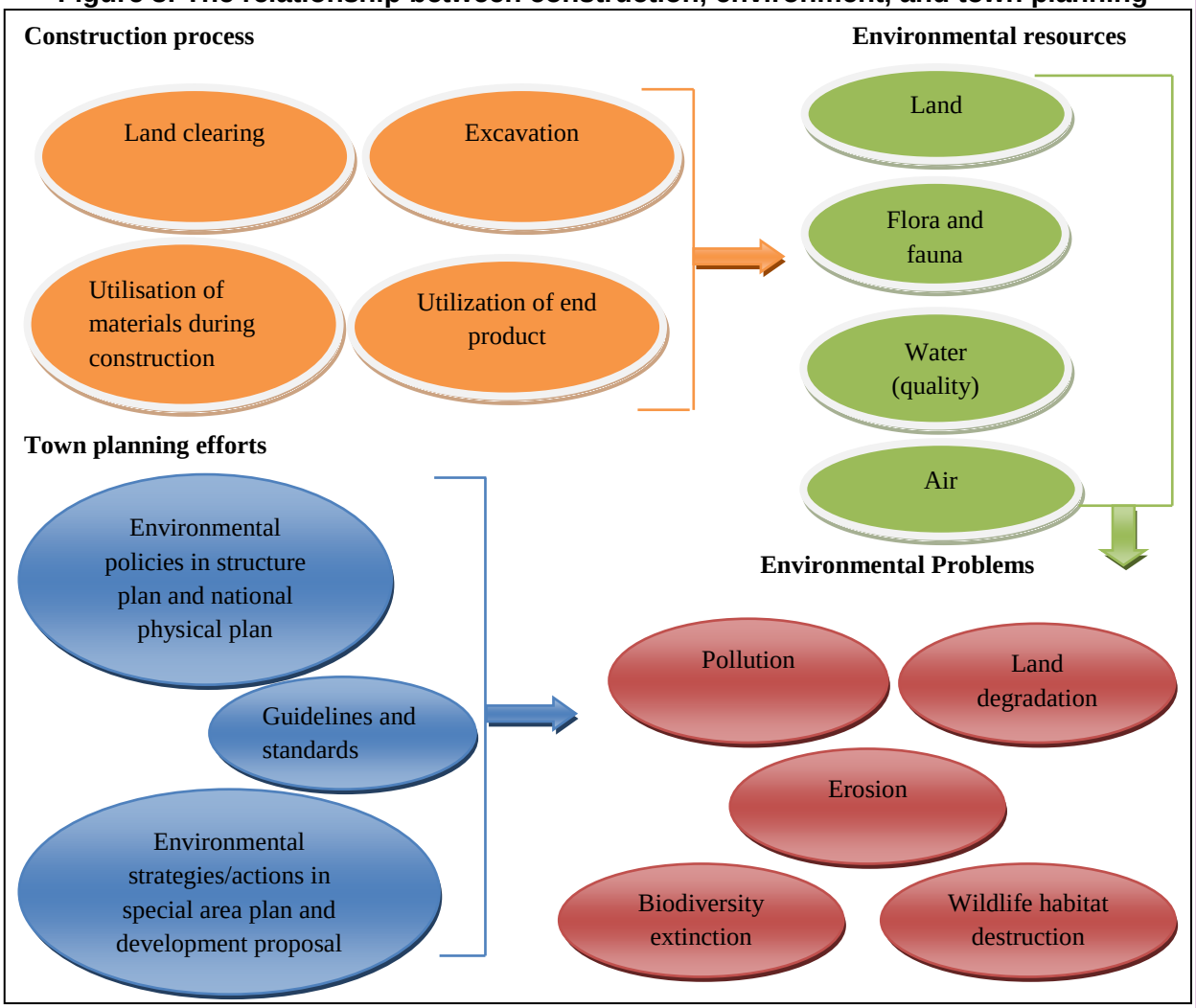
i. The co-existence of environment in the development process (town planning and construction industries)

It is noted that building materials comes from the environmental resources. Site planning during land development is the initial stage that involves land clearing; this is the first step towards environmental destruction. Excavation gives rise to land degradation and erosion which give way to water pollution. In the process of structure erection, some activities produce effluent, when these effluent are not treated before disposal, it affects the quality of both ground and underground water.

Figure 3 below shows how activities in construction process affect environmental resources and the roles played by town planning in mitigating the effects. It is undeniable that during construction works, it will harm the natural resources, eg. land, flora and fauna and so on. The activities of land clearing, excavation of site and its associated works will totally change or alter the environmental settings that lead to many environmental problems. This includes land degradation, soil erosion, loss of biodiversity and so forth. At this junction, town planning is regarded as one of the important fields in addressing these environmental problems *via* its instruments. There are several instruments available in town planning discipline such as planning standards and guidelines and its development plan system. In addition, its development control system also can contribute in protecting the environment. For example, in treating planning application to obtain its approval, town planning officers should acknowledge the importance of safeguarding the environmental aspects in the planning process. Meaning that, any potential positive and negative impacts on the environment can be predicted from the proposed development. As such, some mitigation measures should be taken

into account when dealing with planning process. Here we can clearly see that town planning has a role to play in protecting the Mother Nature.

Figure 3: The relationship between construction, environment, and town planning

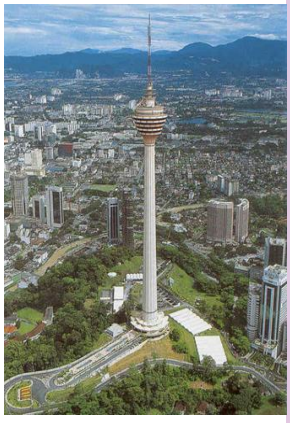


ii. The pressure of economic development

Based on the findings, it is observed that construction sector has grown rapidly in the past. It reached its peak period of 17.4% during the period of 1996-2000 (7th Malaysia Plan). This is attributed to mega infrastructural development projects that take place in the country such as the construction of the Kuala Lumpur City Center (KLCC), Kuala Lumpur International Airport (KLIA), Menara Kuala Lumpur, National Sports Complex, Commonwealth Village, North Butterworth Container Terminal, West Port at Pulau Indah, South Port of Klang, Shah Alam expressway, railways, commercial and industrial buildings.

iii. The impact of urbanisation process

It is observed in most of the built up areas of Peninsular Malaysia, the infiltration rate is low because the top soil is covered and water cannot penetrate. This gives rise to flood especially during the peak period of rainy season. It can also be attributed to construction of cleared forested land or on environmentally sensitive areas like wetlands, coastal and hilly areas. During this period, the first level of some buildings is high jacked with flooded water. Town planning evolved with several tools to checkmate these problems. The government is also forced to spend more on flood mitigating measures.



There are some ongoing projects currently taking place in different part of the country such as Kuala Lumpur – Putrajaya Expressway, Senai – Desaru Expressway, Duta – Ulu Expressway, power station in Tanjung Bin, Johor, Integrated Customs, Immigration and Quarantine Complex and Stormwater Management and Road Tunneling (SMART) for flood mitigation

and traffic dispersal in Kuala Lumpur. Records of the Construction Industry Development Board (CIDB) as reported in the Economic Report 2006/2007 by the Ministry of Finance Malaysia, local contractors are currently undertaking a total number of 48 projects which is worth RM 15.3 billion in 36 countries.

8.0 CONCLUSION

Healthy and conducive environment is the basis for all human activities. It is inevitable to stop development because of its impact on the environment, and it is pertinent to note that without the environmental resources, no living organism and human can survive on the earth because it is the ultimate source of necessity of life. Sustainability can only be achieved if a balance should come into play between the demand by development side and supply from the environment. There is also a need for restoration of extinct environmental resources, natural resources of the soil and water must be safeguarded for the benefit of present and future generations. The use environmentally friendly materials during construction should be emphasized, and designing structures in such a way that the end product use less energy and preferably renewable. Town planning has continuously played a vital role in mitigating most of the environmental effects of development through integration of environmental and ecological components into planning, development control, planning permission, formulation of policies/guidelines and standards, preparation of special area plans, management plans and other legislative supports. Currently, in Malaysian scenario, this positive practice is well embedded in the overall institutional framework of town planning system.

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