SUSTAINABLE BUILDING AND CONSTRUCTION IN SOUTH-EAST ASIA

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Abstract
South-East Asia (SEA) is currently witnessing increasing population growth and rapid urbanization. The implications of these demographics are the increased demand for buildings and infrastructures, with consequential effects such as massive construction and proliferation of new building projects likely to cause environmental degradation.

Generally, the awareness on sustainability issues in the building and construction sector in the developing countries of SEA is generally low, although gradually gaining supports from stakeholders. Common practices includes the reliance on construction methods, design and materials that are often outdated and inappropriate to local climates and conditions and to some extent, imposing expensive business models. The activity of building is seldom seen as meeting the needs of the society and environmental protection but rather for stimulating the economy. Managing the built environment in SEA is therefore a major challenge for the future. The paradigm shift towards creating a more sustainable built environment in the region certainly requires the participation of all stakeholders, public-private partnerships, governance mechanisms and also strategies to encourage its implementations.

The paper presents the current status of sustainable building and construction in SEA, with examples of regional initiatives as well as challenges and barriers to SBC practices in the public and private sectors.

Keywords: Sustainable Building, Construction, Challenges, Barriers, Partnerships, Environmental protection.

1. Introduction

Construction is one of the largest industries in both developing and developed countries in terms of investment, employment and contribution to GDP. Its impact on the environment is considerable across a broad spectrum of its activities. Their impact on the environment can be significant in the following areas:

- consumption of renewable and non-renewable resources such as minerals, water and timber for building materials and components. This may also lead to the loss of bio-diversity;
- pollution of air, water and land from manufacturing and transportation;
- committing land for a new facility may lead to deforestation, loss of agricultural land, expansion of urban areas with associated transport and social problems, more demand for water, electricity and other services, and loss of bio-diversity;
- decisions about project goals influence design, construction and operation of the facility in areas of resource usage, quality of indoor environment, traffic issues, recycling, waste management, maintenance and life of the facility as well as social environment.

Buildings account for more than 40% of total energy consumption, and the construction sector as a whole is responsible for approximately 40% of all human-produced wastes. Hence, the provision of
adequate housing and infrastructure for transport, communication, water supply and sanitation, energy supply, and commercial and industrial activities poses a major challenge (OECD).

As the population continues to grow, the need to house people and industry, facilitate transport, build infrastructure facilities, and store drinking water will need to be satisfied. Existing urban areas will continue to expand as will rural settlements and recreational areas. The impact of new developments (i) causes land degradation and erosion, surface and ground water pollution, and (ii) contributes to land clearing required for new developments and acquisition of more agricultural and grazing land. Land clearing for urban development also affects the ecosystem.

The construction industry has already taken up the challenge of embracing the principles of sustainable construction and is on the way towards meeting its environmental responsibility. However, with an anticipated population and consumption growth, more building stock will be constructed to meet the growing demand (Spence and Mulligan, 1995).

Sustainable development is defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. The construction industry is both a major contributor to socio-economic development and a major user of energy and natural resources; therefore its involvement is essential to achieve sustainable development in our society.

The concept of sustainability in building and construction has evolved over many years. The initial focus was on how to deal with the issue of limited resources, especially energy, and on how to reduce impacts on the natural environment. Emphasis was placed on technical issues such as materials, building components, construction technologies and energy related design concepts. More recently, an appreciation of the significance of non-technical issues has grown. It is now recognised that besides economic and social sustainability, the cultural heritage aspects of the built environment are also important.

Still, sustainable construction adopts different approaches and is accorded different priorities in different countries. Hence, there are divergent views and interpretations between countries with developed economies and those with developing economies. With mature economies, developed countries are in the position to devote greater attention to creating more sustainable buildings by upgrading the existing building stock through the application of new developments or the invention and use of innovative technologies for energy and material savings, while developing countries are more likely to focus on social equality and economic sustainability (UNEP-IETC).

This paper presents an overview of the current state of sustainable building and construction in developing countries in SEA, with examples of regional initiatives and highlights of challenges and barriers to SBC practices in the public and private sectors.

2. Geographical Position

South-East Asia comprised of Malaysia, Singapore, Indonesia, Thailand, Vietnam, Laos, Cambodia, Brunei, Burma and Philippines, Fig.1 More than 85% of South-East Asia covers the area between 10 N – 10 S. South-East Asia can be regarded as a region of tropical islands because most of the lands is surrounded by ocean with an average distance of less than 200 km from the sea. Nearly half of the total area is in the form of peninsulas and extended subcontinents are part of mainland Asia, and remaining area consist of thousands of islands. Due to the geographical locations there is very little climatic variations amongst the countries.
3. Social and Economic Background

Most countries in South-East Asia region have undergone unparalleled social, political and economic transformations. Colonialism dominated much of the region but now replaced by other political systems. Economies, which were largely agrarian, became industrialized, export-oriented and better integrated with global markets. Agriculture was intensified to increase production for home consumption and export.

Rapid industrialization and economic growth have changed virtually every dimension of life in South-East Asia. Yet, by measures of health, education, nutrition, as well as income - the quality of life within the region remains poor for most people. At least one in three Asians has no access to safe drinking water and at least one in two has no access to sanitation (ADB 1997). Literacy rates are low, particularly for women (ADB 1997). Poverty is a major problem: some 75 per cent of the world's poor live in Asia (UNESCAP/ADB 1995).

In most countries, economic development and industrialization have taken a heavy toll on the environment. At the turn of the century, environmental degradation in the region was largely due to poor farming methods and colonial expansionist land practices in South-East Asia. In South-East Asia, rapid economic growth began in the early 1980s before the economic currency crisis in 1997.

Malaysia, Thailand and Singapore are the leading countries in South-East Asia with robust economic growth in spite of the recent economic ‘currency’ crisis. These countries report almost a full recovery from the crisis while Indonesia and the Philippines have experienced setbacks due to the recent political instability. Myanmar, Cambodia, Laos and Vietnam are lagging behind due to ideological crises. Although there are differences in terms of economic development among the South-East Asian countries, in general socio-economic patterns in this region throughout history share similar patterns of development – a major shift of economic dependency on agriculture to industrial-based production.

The Europeans during the colonial period introduced monetary-based agriculture economy with intensive plantation of rubber and oil-palm for the overseas market. However, by early 1980s there was a drastic reduction in the demand for rubber and palm-oil. Consequently, the governments in these countries shifted the economic pattern from agriculture to industrial production. The shift creates new types of professions, which has attracted migration by the rural population to the city.
Compared to the rural population, poverty levels of urban population in South-East Asia was small. Benefits of the countries’ economic growth were mostly enjoyed by the urban population. The urban population explosion caused housing shortage with the cities becoming overcrowded. Migrants who could not afford to buy houses end up in squatters. The squatter environment is poor and exposed to pollution, diseases, fires and hailstorms since there is minimal provision from the public authorities. The growth of the slum and squatter areas is uncontrollable.

The issues commonly raised today are problems of uncontrolled development of urban growth, which is not managed based on environmental concern. One of the tangible results of this human error is an increase in flood-prone areas and river pollution, indirectly suffered by the population living in related areas.

4. Construction in South-East Asia

Asia is currently witnessing increasing population growth and rapid urbanisation which is predicted to grow at an average rate of 2.4% per annum between 2001-2015 (GEO3). In the less developed nations this figure rises as high as 40%. Some implications of these demographics are increased demand for buildings and infrastructure, massive construction and new building projects and therefore increased related environmental degradation. Agenda 21 for Sustainable Construction in Developing Countries highlighted that, “there is a sense of urgency about introducing sustainable construction practices into the developing world...as it is still largely under construction and every minute means the construction of a building, road or dam that will in all likelihood not be sustainable”.

4.1 Existing Construction Issues

In some developing countries of South-East Asia, the construction industry is not fulfilling its potential role in development. Often, there seem to be some difficulties in the execution of construction projects due to inadequate capacity for the planning and design of projects; difficulty in obtaining tenders for small projects in which international contractors are not interested or for projects which are too large for local contractors to handle; inefficiency in planning, design and construction, and difficulties in obtaining materials. Delays in project delivery are common and represent a physical constraint on development.

Where construction projects are implemented, the cost is often higher than anticipated, and this represents a financial constraint on the successful implementation of development plans. This is due to various factors such as poor estimates, variations by the client, inappropriate technology and design, inappropriate tendering and contractual procedures, inefficient on-site supervision and construction management.

A problem endemic to developing country in South-East Asia, is the reliance on ‘western’ construction methods, designs and materials that are often outdated, not energy-efficient, inappropriate to local climates and conditions and impose business and trade models that are expensive and inappropriate. Subsequently, cement has replaced indigenous materials and is responsible for 8% of carbon dioxide emissions world-wide. The replication of western approach was the result of foreign investment with its corresponding imposed design, construction and development pattern models (Du Plessis, 2002).

For most South-East Asian countries, the import content of construction activity is high; approximately 30 per cent of the value of gross output may be accounted for imports, 60 per cent of all materials, as well as a significant percentage of professional, managerial, supervisory and even craft skills. In addition to finished products, developing countries are importing factor inputs such as machinery, energy and raw materials. The increasing dependence on imports has imposed a severe strain on the balance of payments and fuelled inflation.

In most developing countries, there is a severe shortage of skilled labour for the construction industry. A large percentage of the skills required are not available locally. The local contracting industry is not sufficiently developed. Local contractors to operate only on small residential projects while the larger industrial and commercial projects are awarded to foreign-based construction firms. This is the case even in countries where there exists a strong entrepreneurial tradition.
Although most developing countries have abundant natural resources that could meet the demand for basic building materials using largely indigenous inputs, the local production of building materials often does not meet demands. For example, there are severe bottlenecks in the supply of building materials due to demand fluctuations and lack of capital for the build-up of supplies, or inputs. In cement producing countries, cement is often regarded as a local product even when 60 per cent of the production cost is due to imported energy (Levin, 1997).

In some countries where there is a monopoly in supply and shortages have been created deliberately in order to force up the price. The steep rise in prices of land and building materials has effectively removed decent housing from the reach of low- and medium-income groups in most developing countries.

The situation is aggravated by the widespread adoption of designs and technologies, that have been developed in a very different context in advanced industrialized countries. These designs and technologies are often unsustainable and inappropriate in light of supply of local resources and indigenous social and economic conditions. The technologies increase the dependence upon imported plants, materials, and equipment, as well as foreign professionals and contractors, whilst inhibiting the development of local resources. This applies to construction of infrastructure as well as buildings, in both the public and the private sectors.

The acceptance and use of technological innovations by the industry has been slow due to various factors. Innovative materials and technologies developed by government research institutes are seldom used by governments in their own construction activities. Frequently, even government tenders for low-cost housing projects specify expensive conventional building materials and technologies instead of proven low-cost technologies developed by government research institutions. Due to lack of public sector demonstration projects, contractors stick to the "proven" technologies that are often unsustainable from the social, economic and environmental point of view, and wide application of new innovative building materials and technologies is impeded.

5. Sustainable Building and Construction Developments in South-East Asia

Sustainability, as a concept, has only recently been introduced to the building and construction sector and SBC is not yet an integral part of decision-making and business practice. Sustainable building and construction aims at introducing practices and technologies and designing more sustainable products that are more efficient in terms of resource and energy use, reduce the impact on the environment, provide better value of living and work conditions, whilst improving economic productivity and competitiveness. Priority areas are the reduction of resource use, particularly building materials, energy, and water, and innovation in design – because it is at this stage that the decisions can determine the efficiency and performance of a building and the degree of its impact across its lifecycle. Sustainable planning and procurement practices and policies are also high priority issues as well as customer/client/consumer awareness and innovative construction processes.

SBC requires a holistic, multi-disciplinary approach to buildings, involving all actors from planners, engineers, architects, contractors, clients/users across the life-cycle of the structure from commissioning, design, construction, use and deconstruction/demolition. The components of sustainable building and construction are promotion of the use of local, cost-effective, environmentally-preferable building materials, climate sensitive design, flexible/multiple use design, low-energy and energy-efficiency, higher quality at lower cost construction, water efficient and conscious features, lean and clean construction processes and life-cycle thinking.

The introduction of sustainable building and construction in South-East Asia will promote integration of environmental considerations into decision making and environmental management practices at the conception, design, use and deconstruction stages of a building life-cycle. It therefore aims at resource efficiencies and mitigated impacts across the sector, throughout many stakeholder groups. Such practices improve environmental performance including planning considerations, access to local infrastructure, materials selections, improved sites, land and water use, environmental design, improved construction processes and waste management during construction and demolition. This
would also result in high performance buildings that are efficient during use with lengthened service lives, and generally with higher value with lower risk.

Economic dimensions of sustainability includes the creation of new markets and opportunities for sales growth; cost reduction through efficiency improvements and reduced energy and raw material inputs and creation of additional added value.

In most of South-East Asia countries the awareness on sustainability issues in the building and construction sector is generally low and just beginning to address the challenges of sustainable construction. There is a growing awareness of energy efficiency issues in countries such as Malaysia, Singapore and Thailand, but still in its infancy. Some major national projects in sustainable construction and energy efficiency in buildings have been implemented by national governments and private sectors.

Among others existing sustainable construction projects in the region include the development of Putrajaya (the Federal Administrative City of Malaysia, Fig.2), Securities Commission Building (Malaysia), Telekom Tower (Malaysia), MECM Low Energy Office Building (Malaysia), Urban Redevelopment Authority Building (Singapore), Singapore Immigration and Registration Building, Hanoi Daewoo Hotel Building Vietnam and Plaza Bank International Indonesia.

The new KLIA is also designed to be an environmentally friendly airport with its central theme of an "airport in the forest" and a "forest in the airport", Fig. 3. The airport is perhaps unique in the world for its environmental aspirations. The central theme is carried out through a rain forest arboretum in the center of the international terminal and forested grounds surrounding the facility.

The forested edges of the airport will serve as a buffer to keep the surrounding development in control, while concentric landscape and forest rings are proposed to surround the airport site creating the effect of an "airport in the forest".
The current / planned initiatives for promoting SBC in Malaysia include:

a) Malaysian-Danish Country Programme for Cooperation in Environment and Development (2002-2006) with a joint overall objective: "to assist Malaysia in achieving sustainable development, through the implementation of environment and natural resource management projects, in line with international environment conventions and agreements".

The initiatives are for the development of the energy efficiency regulations and the code of practice for energy efficiency and renewable energy in buildings. Demonstration of energy efficiency practices in government buildings are:

i) MECM Low Energy Office (LEO) building
ii) PWD Public School Buildings


6. Barriers and Challenges

Generally, the major barriers holding back the development of building and construction of sustainable buildings in South-East Asia are:

- the lack of awareness of sustainability issues in related professions and a lack of capacity amongst planners, architects, engineers, contractors and related stakeholders
- a lack of research and professional networks
- a lack of political motivation and incentive. It is very difficult to establish sustainable development as a national priority for areas in poverty and with economic problems
- a lack of well documented references, tools, techniques, case studies and demonstration projects which are relevant to local conditions.

There is a clear need for stimulation of activities to break down these aforementioned barriers in promoting sustainable building and construction in the region.

The Conference on Sustainable Building South-East Asia is being organised to address some of these barriers, particularly in raising awareness, in building capacity, in sharing and exchanging knowledge and in building partnerships, regional and international networks for the future.

7. Conclusions

The construction industry in South-East Asia faces its most serious challenge over the next two to three decades in finding appropriate solutions to overcome many environmental issues caused by its activities. Its mode of operation will need to change in order to significantly reduce its adverse impact on the environment in areas such as energy consumption, CO₂ emissions, use of non-renewable raw materials, water consumption, land use, soil degradation and waste generation. Although the awareness on sustainable building and construction is generally low, some progress has already been achieved on a number of fronts, with outcomes providing not only specific technological solutions but also a volume of new information useful for better understanding of the nature of the problem, as proven by existing projects. However, the problem is far from being resolved, in reality it is just beginning. The construction industry has a long way to go in order to adequately address pertinent environmental issues affected by its activities.
References


