

## **SETTLEMENTS AS SOCIO-TECHNOLOGICAL SYSTEMS: STUDY OF SINGAPORE AS AN URBAN ECO-SYSTEM**

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### **Summary**

Rapid urbanisation and industrialisation have both taken heavy tolls on the environment in developing countries. The quality of the urban environment in much of the Southeast Asian region, for example, has deteriorated rapidly with the growth in the number of motorised vehicles as well as ineffective implementation or enforcement of environmental regulations to ensure that sources of fresh water are not polluted. There are cities however, which have gone against the trend of pollution with development. One example is Singapore. The small island and city-state of Singapore has been regarded by many as a quintessential developmental state that has transformed it from a former British colonial port city to the modern, industrialised economy and society that it is today. Completely urbanised, half of the city's land area is built-up but there has been careful planning and management of the impact of rapid industrialisation and urbanisation on the environment. The government of Singapore has held firmly to its belief that nothing comes naturally and that everything has to be engineered and planned. Technology, together with a highly centralised and closely planned social and political organisation, has been largely accountable for the success with environmental management. Part of the success with managing the impact of development on the environment has been the kind of economy that has been planned and developed by agencies of the state. Unlike many of the newly industrialising economies of the time—

Taiwan, South Korea and Hong Kong - the city-state of Singapore embarked on a process of cleaning up as it industrialised. It did not first go for growth with the view of cleaning up the environmental impact afterwards. This has ensured environmental standards that have kept well within those set by the United States Environmental Protection Agency and the World Health Organisation for air and water quality.

## **1. Introduction**

Ecologically speaking, cities are seen as open systems that are highly dependent on other systems, both natural and man-made, for their energy, materials and labour needs as well as for the disposal of their wastes. Just as there is a tendency to view cities as inherently unsustainable because of their huge ecological footprints, so there has been the equally strong view that cities should be considered sustainable. This is because cities can be highly dense and compact human settlements and hence far more efficient than less dense and widely distributed forms of such settlements.

The consideration of cities as ecosystems by interdisciplinary and inter-sectoral teams has generally agreed that cities as they are now planned, managed and governed within current economic norms are far from being sustainable. Where there has been celebration of successes with sustainability, these most often refer to discrete sectors of the system rather than the urban system as a whole. A more meaningful and comprehensive measure of sustainability would therefore consider not only discrete sectors of the city as a system but also how these sectors relate to the whole as well. Studies on cities as ecosystems have generally also neglected the human dimensions in cities including behavioural norms vis-à-vis urban transport services for example and such dimensions are crucial to consider in the most human of systems.

This discussion therefore focuses on the management of a small urban eco-system by considering the island and city-state of Singapore in Southeast Asia. In many respects, Singapore, with the environmental challenges that it has faced, is similar to cities in developing countries and particularly the cities in Southeast Asia. Yet because Singapore is an island-state and a city-state, it has been able to more effectively project and plan for the population base that the city has to accommodate. This is an aspect of city and environmental planning that few other cities have been allowed given the scale of rural-urban migration. Then again, given that Singapore is an island and a city-state, it does not also have the hinterlands which Southeast Asian cities would belong to in their respective countries. This is particularly pertinent in the supply of water to which cities have access. For Singapore, the supply of water has to be negotiated with another country and national government.

## **2. Case Study of the Island and City-State of Singapore**

The city-state of Singapore at the end of the Second World War was an overcrowded and highly congested urban area not unfamiliar to many visitors to cities in developing countries in Asia and Latin America. Some one quarter of the city's population was living in an area comprising about 1% of the total land area on the island. A study conducted in the late 1950s highlighted the congestion and dismal living conditions in which the majority of the population was living at the time. The majority of the

population (56%) lived in single cubicles shared by two or more households. Only 15% lived in two or more cubicles. Open sewers and poor drainage exacerbated the poor living conditions as did the spillover onto streets of activities such as laundry, street hawking, and family recreational areas—even play space for children.

The city had not always been in such a bad shape environmentally since, within a month of his arrival in Singapore in 1822, Sir Stamford Raffles had initiated measures to control flooding by building up a riverbank and filling up a swamp. Steps were taken to protect green space and biodiversity. Admittedly this was through setting aside 48 acres for a botanical garden and through the regulation of land use through a Town Planning Committee. Subsequently, a body of Municipal Commissioners was created in 1856 which then eventually took on the responsibility for health and sanitation problems. In addition, a Municipal Health Department was created in 1887 with a focus on controlling infectious diseases and inspecting food. The first water-borne sewerage network in Singapore was completed in 1917. Efforts were also initiated in the 1920s to manage solid waste and maintain drains. By the 1950s, the net result of these activities was a visible improvement in the standards of public health.

Following the attainment of self-government in 1959, many environmental services were combined and services consolidated. A Public Health Division in the Ministry of Health was given responsibility for all aspects of environmental health. Sewerage and drainage works were carried out by the Ministry of National Development. Water supply was the responsibility of the Public Utilities Board. In the early 1960s, these government agencies participated in two projects that were keys to Singapore's economic future. The first was the Jurong Industrial Estate (for promotion of industrial growth) and the second was the Toa Payoh New Town (the first of Singapore's planned new towns in its public housing programme). Environmental health staff helped formulate approaches for controlling industrial waste from Jurong where the industries were clustered. The Ministry of National Development ensured that sewerage and sewage treatment were developed as part of the new town.

After independence in 1965 when Singapore officially separated from Malaysia and became a city-state, environmental planning for the remainder of the decade focused on the following areas.

- Public cleansing, especially of drains and street vendor sites
- Licensing and control of street vendors
- Control of key disease vectors, especially for malaria and dengue fever
- Flood control
- Expansion of the sewer network
- Greening of the cityscape within the garden city framework

Despite the early start on environmental management and the many initiatives to manage sewerage treatment as well as urban waste, Singapore at the end of the 1960s was faced with a number of environmental problems linked to urbanisation and economic growth - air and water pollution, industrial hazards, dust, and noise. In the early 1970s, environmental legislation and regulations became important tools for

environmental planning.

The transformation of the island of Singapore into the modern city-state that it is today has been attributed to what has been described as the quintessential developmental state. Economic growth and competitiveness have been deliberately planned and engineered through strategies implemented by the national state. In Singapore, the government has provided industrial and business infrastructure; industrial estates, reclaimed land, port and air transportation facilities, telecommunications, auxiliary services for business transactions, and a myriad other types of programmes without which Singapore's highly successful economy would simply not exist. It might be added that effectiveness of maintenance and management not only of the urban infrastructure but also environmental quality have also been driven by the national state and its agencies.

Given the complexity of urban ecosystem problems, Hawley (1986) has emphasised that addressing these problems effectively requires people to come together as a polity to deal categorically with their needs for growth and development and their associated problems. Such an approach has not been characteristic of the way cities and newly industrialising economies in much of the developing world have been managing the impact of urbanisation and industrialisation on their environment. Singapore's relatively successful effort at balancing urbanisation and environmental management has been recognised as one in which decision makers and firm as well as effective government have planned and worked to ensure the successful management and sustenance of viable urban ecosystems.

## **2.1. Institutionalisation of Urban Planning and Environmental Management**

The development of Singapore has been planned and implemented based on a series of concept plans and first quinquennial reviews as well as subsequent revisions once in every ten years. Towards the end of British colonial rule, a Master Concept Plan was drawn up which has since the late 1950s closely prescribed land-use development in Singapore in terms of density, plot ratio and zoning. Given legislative status, the plan and its subsequent reviews have provided a relatively transparent documentation process by which the private sector and society generally have been able also to develop their business decisions and schedules. Following on the Master Concept Plan of the late 1950s, there has been the State and City Concept Plan of 1971 which was drawn up with the help of the United Nations Development Programme. This plan improved upon the prescriptions of the Master Concept Plan since, with technological development, it became possible to run projections of population and the industrial development expected for a specific planning period. The State and City Concept Plan was able to refine the prescriptions of the Master Concept Plan by enabling planners to provide for schools and other urban facilities.

Institutions were established not only for the planning process but also for the implementation of the urban plans. The Urban Redevelopment Authority was a statutory board created within the Ministry of National Development to oversee the reviews of the concept plan as well as its implementation. In 1960, the Housing and Development Board, another statutory board set up within the Ministry of National Development, assumed the responsibility of planning and developing public housing estates and new

towns. Similarly, the Jurong Town Corporation was instituted with the Ministry of Trade and Industry, in order to oversee the development of the Jurong Industrial Estate.

In environmental management, Singapore was among the earliest countries in the world to set up a Ministry of the Environment in 1972. Prior to the establishment of the Environment Ministry, the government had set up an Anti-Pollution Unit in the Prime Minister's Office. More recently, the Ministry has also worked on a Singapore Green Plan which is also regularly reviewed.

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### **Biographical Sketch**

**Giok Ling** has a Ph.D. from the Australian National University in Canberra. She is Senior Research Fellow at the Institute of Policy Studies which is a Singaporean think-tank focused on providing a forum for Singaporeans to discuss policy concerns and issues of interest to both Singaporeans and Singapore. Currently she is also Associate Professor (Adjunct) at the National University of Singapore. Giok Ling has worked for the Housing and Development Board and more recently was on secondment as Director of Research at the Ministry of Home Affairs in Singapore. She has also taught at different universities including the University of Malaya. Her research and publications have been on the environment, housing and urban studies including local governance issues and ethnicity and health care in Third World development. Among her publications are *Environment and the City* (Times Academic Press, 1995) which she edited and *State-Society Relations in Singapore* (Oxford University Press, 2000) which she co-edited.

Giok Ling is a member of committees in non-government as well as government organizations in Singapore. She has also been consultant to the UN-ESCAP and UNCRD as well as local ministries. Giok Ling is also a member of the advisory board to the urban environmental programme of the Far Eastern University in Manila.