

SYNOPSIS

Cleaning of the Singapore River and Kallang Basin in Singapore: Human and Environmental Dimensions

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INTRODUCTION

While much of the attention in recent years has been paid to water scarcity issues, the problem that is more likely to precipitate a major water crisis in the coming years is not physical availability of the resource but regular deterioration of its quality because of continuing neglect in most parts of the world. All over the developing world, rivers and lakes within and around urban centres are already grossly contaminated with known and unknown pollutants. It is indeed a development paradox that people are clamoring for a better quality of life, and yet their economic, social, and environmental conditions are not improving according to their expectations, many times because of steady degradation of the environmental conditions.

Throughout decades of international debates on environment and development-related issues, one of the very few countries that have laid the foundations for its growth through sound and consistent environment and development policies has been Singapore, even when the term “sustainable development” was not in vogue. The results of these policies are best reflected in the overall growth of the city–state, one that is among the very few examples of sustainable development in the world. Unlike the earlier newly industrializing economies of East Asia like South Korea, Taiwan, and Hong Kong who adopted the “industrialization first and dealing with consequences later” approach, Singapore decided to follow a different path which was economically efficient and environmentally

sound. Realizing the fundamental importance of their limited natural resources, the city–state implemented very early sound environmental policies that would conserve its natural resources base in tandem with planned economic growth and development (Ooi 2005).

One of the many actions Singapore implemented as part of its strategy for sustainable development was the clean-up of its several river systems which were grossly polluted when the city–state became independent in 1965. The then Prime Minister Lee Kuan Yew viewed river pollution not as an isolated problem, but as the end result of other development and social-related problems. He realized that if the nation was to develop as a successful industrial society, its population should have an improved quality of life and the environment should be protected. The overall philosophy was thus that economic development of the city–state could not be sustained and the quality of life of its people could not be significantly improved, unless environmental factors were considered as important as development issues.

In March 1969, after decades of recommendations of committees and commission that had not been implemented mostly due to financial constraints, Prime Minister Lee called on the drainage engineers in the Public Works Department and water engineers in the Public Utility Board to prepare a comprehensive plan to solve the environmental problems associated with the waterways of Singapore. He stressed upon the importance of controlling river pollutants and emphasized the restoration of the river banks (National Archives 1969). A flurry of activities took place as part of this initiative and within 2 weeks, meetings between main agencies took place, pollution sources were identified and solutions to reduce the river pollution levels were proposed.

By early 1977, much of the environmental work and control activities of river polluting sources had already been planned or were under consideration by various authorities. The cleaning of the several waterways had progressed already close to the mouth of the river, but the mouth itself and the catchment areas still represented a major challenge: more than 40 000 squatters were still living in unsanitary conditions in the vicinity of the rivers and liquid and solid wastes from the hawkers, vegetable vendors and markets and unsewered premises, continued representing a serious source of pollution. Furthermore, 610 pig farms and 500 duck farms were still draining untreated wastes into the waterways, especially into the Kallang Basin (Loy 1986; Dobbs 2003).

Disappointed with the slow progress of the several government departments whose main concern was financial, in 1977, Prime Minister Lee gave them 10 years to complete the operations. True to Singapore style, once the political decision was made, the strategy to clean-up the Singapore River (historically the most important trade artery) and the Kallang Basin, was implemented within 10 years. A cursory analysis on the benefits of the clean-up, including the phenomenal increase in commercial and industrial activities and land values around the banks of the rivers, in addition to the significant overall health, social and environmental benefits, indicates the wisdom and the foresight of the Prime Minister.

THE CLEANING OPERATION: 1977–1986

On 27 February 1977, during the opening ceremony of the Upper Peirce Reservoir, Prime Minister Lee Kuan Yew

gave a definite target to the Ministry of Environment to clean the Singapore River and Kallang Basin. His urgency and seriousness was clear to every government agency. This was evident from the fact that the requests sent by the Ministry of Environment for funds for proposed tasks to clean the rivers were agreed to by the Finance Ministry immediately (Hon 1990). The Master Plan for the Cleaning of the Singapore River and Kallang Basin was drafted after 8 months of study (Chou 1998). After identifying major sources of pollution, the Ministry of Environment became the coordinator of the action plan that was formulated jointly with the Drainage Department. This plan recognized the complexity of the problem and the need to involve various ministries and government agencies. As the catchments represented ~30% of Singapore's area, it was a challenge for the planners to propose how to prevent polluting activities of very varied nature which were also located far from the rivers (Tan 2009).

The cleaning operations of the Singapore River and Kallang Basin were carried out in tandem with the urban development of the several areas. In terms of housing requirements, despite the fast pace of construction of flats by the House Development Board (HDB) to relocate the population, in 1977 there were still 46 187 squatter premises, majority of whom used nightsoil buckets and pit or overhanging latrines, that discharged wastes directly into the streams and the rivers (Chou 1998). The industries on the banks of the rivers, such as trading, lighterage, cargo handling and boat-building and repairing were housed in old and congested buildings (Fig. 1). Due to the absence of pollution control facilities, oil, sullage water and solid wastes were discharged to the river which contributed to its already severe pollution.

Fig. 1 Singapore River, 1971.
Photo by John G. and Ma.
Teresa Chamberlain



Meanwhile, the port facilities had developed exponentially throughout the 1970s. While the port had become one of the busiest harbors in the world, with technological improvements playing a major role in this rapid transformation, the vital role of the Singapore River in terms of trade became insignificant becoming a “graveyard for derelict lighters” (Dobbs 2003, p. 110). Once the river lost the key role it once had in Singapore’s trade, and thus on its economy, it became easier for the government to proceed with the cleaning operations.

When the clean-up programme was started in 1978, some 21 002 unsewered premises were identified in areas that were densely populated and which made the cleaning operations almost impossible (Chiang 1986). Most of these unsewered premises were served by nightsoil bucket, pit and overhanging buckets which were unsanitary, a source of smell and a source of water pollution. All the 11 847 nightsoil bucket latrines identified were phased out except for 533 that were seweraged; the last nightsoil bucket was phased out in 1987. Similarly, all 621 overhanging latrines were phased out. Some 3961 unsewered premises which discharged sullage water into the waterways in 1977 were reduced to 36, and 710 premises without refuse-removal services were reduced to 129 by September 1981 (National Archives 1981). Sand-washing was controlled by phasing out private sand quarries and by centralizing them under a public holding company.

The aim of the action plan to restore the Singapore River and the Kallang Basin was so that aquatic life could thrive. The objective was expected to be achieved basically in terms of five major activities: removal or relocation of polluting sources and phasing out of polluting industries; development of suitable infrastructure for those affected by relocation; awareness of the overall development programme; strict law enforcement; and cleaning and dredging of the waterways.

ACHIEVEMENTS AND LESSONS LEARNT

The massive operations related to the overall clean-up activities implied numerous changes and challenges, but

also innumerable positive outcomes, achievements and lessons learnt in terms of social and economic development as well as protection of the environment (for a detailed analysis on the overall strategy for water-related development of Singapore, see Tortajada et al. 2012).

In terms of direct impacts on the population affected, more than 26 000 families were resettled. Most of them moved into public housing constructed by HDB, which improved their living conditions very significantly. All 4926 hawkers were relocated into food centres built by HDB, the Urban Redevelopment Authority (URA) and the Ministry of the Environment. By 1986, the 46 187 squatters had been relocated (Table 1).

More than 2800 industrial cases of backyard trades and cottage industries were also moved, most of them into industrial estates built by the HDB and Jurong Town Corporation.

In terms of agricultural activities, by March 1982, the Primary Production Department had phased out all pig and duck farms from the catchment areas. By September 1983, lighterage activities involving some 800 lighters were relocated to a new area where mooring and upgraded facilities were provided by the Port of Singapore Authority at a cost of S\$25 million (US\$19.9 million) (1 Singapore \$ equal to 0.799 US dollars). Once the lighters had been relocated, the task of physically cleaning the rivers became easier. From 1982 to 1984, 2000 tonnes of refuse were removed from the Singapore, Kallang, Geylang, and Rochore rivers (Poon 1986). The Drainage Department dredged ~40 000m³ of sediments from the stretch of the Singapore River and about 600 000m³ from the Rochor and Kallang rivers (Yap 1986). In December 1986, the charcoal trade was also relocated to a new area where appropriate facilities were constructed by HDB at a cost of S\$5.66 million (US\$4.5 million).

The public housing development programme had a significant impact on the provision of water supply and on the increase in the number of metered customers. The number of HDB units increased enormously from 19 877 in 1960, to 118 544 in 1970. Since each flat was provided with direct metered piped water supply, the number of

Table 1 Squatters relocated in the Singapore River and Kallang Basin

Catchments area	Target number of squatters to be relocated	By 1979		By 1981		By 1983		By 1985 (September)	
		No. of squatters	%	No. of squatters	%	No. of squatters	%	No. of squatters	%
Singapore River	3959	1097	27.7	1921	48.5	3213	81.2	3744	94.5
Kallang Basin	42 228	9657	22.9	24 781	58.7	34 596	86.9	40 830	96.7
Total	46 187	10 754	23.3	26 702	57.8	37 809	81.9	44 574	96.5

Source: Tan 1986

connections increased from 102 819 in 1960 to 264 314 in 1970. More than 90% of the increase in the number of meters was due to the new public flats.

The length of water distribution and supply main increased from about 1200 and 80km in 1960, to 1840 and 104km, respectively, in 1970. More than 65% of the increase in the length of the distribution mains was to serve villages and HDB estates outside the city area. During the same period, the number of standpipes decreased from 2224 in 1960 to 528 in 1970. Notably, this remarkable improvement was made before the creation of long-term plans such as the 1971 Concept Plan and the 1972 Water Master Plan. Even without these plans, the institutional coordination between HDB and the Public Utilities Board, allowed the Public Utilities Board to develop the necessary infrastructure for water supply to ensure that the new housing would be developed on time.

In terms of overall investment, Chou (1998) estimates it at S\$200 million (US\$159.8 million). He also cites some of the specific expenditures such as S\$21 million (US\$16.7 million) to form beaches in the Kallang Basin and S\$13 million (US\$10.3 million) including removal of mud and some structures and expenditures incurred by Port of Singapore Authority, HDB and other government agencies. Leitmann (2000) puts the cleaning cost at S\$200 million (US\$159.8 million), excluding the costs of public housing, food centres, industrial workshops and sewerage. According to Tan (2009), however, the clean-up cost the government nearly S\$300 million (US\$239.7 million), excluding resettlement compensation. It is not clear whether it included costs incurred directly and indirectly in manpower, time and education programmes targeting general public and schools, etc.

Since figures given by Tan (2009) are the most recent ones, one can conclude that Singapore paid roughly ten times the original price for delay in cleaning its rivers. This is an important lesson for any governments considering eradicating pollution from their waterways in the sense that delays or insufficient actions increase the associated costs exponentially.

When the costs of the river cleaning programme are compared with its benefits, it is clear that it was an excellent investment. The programme had numerous direct and indirect benefits since it unleashed many development-related activities which transformed the face of Singapore and enhanced its image as a model city in urban planning and development. The value of land and its demand along the water courses and catchments increased manifold and huge investment were made to attract tourism, recreation and related-business activities (Fig. 2). Economic development along the banks of the Singapore River, for example, or construction of a mass rapid transit tunnel under the Singapore River would have been impossible if the river and its surrounding areas had remained severely polluted and congested. The entire programme left a legacy for the future generations and gave the present one a refreshing sense of achievement.

In terms of activities that could be useful to implement in other geographical areas, there are many lessons both developing and developed countries could learn from the city–state that laid the foundations for its growth by coordinating sound environment and development policies. Singapore's journey is an excellent example that pragmatic policies, clear visions, long-term planning, forward looking

Fig. 2 Singapore River, 2006.
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Board of Singapore



strategies and political will are essential to lay the foundations for sustainable development.

The most important lesson that can be learnt from this case is the fundamental value that political vision and political will have in order to make any vision a reality. In the case of Singapore, its leaders envisioned and encouraged a sustained process of social and economic development within which the quality of life of the population could be improved, urban development could be achieved, the environment could be protected, and the city–state could be placed on the right path of sustainability. The visionary Prime Minister, Lee Kuan Yew, realized in the late 1960s that on a long-term basis it is much more expensive for a society to live in a polluted environment compared to a clean one. Nearly half a century later, most of the political leaders of the world have still not grasped this fundamental fact.

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