Case Study 40

Integrated Urban Coastal Management: the Singapore Model

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Key Message

- The integrated coastal management (ICM) system is fully relevant to a highly urbanized coastal city that had all along been developed through sectoral management.
- The ICM system was adopted by Singapore in recognition of its usefulness in enhancing management efficiency and effectiveness of the coastal city-state towards achieving the goals of sustainable development.

Abstract

Singapore's rapid economic growth and development transformed the small island nation from a quiet tropical outpost in the early 1800s to the bustling modern cosmopolitan city that it is today. The use of its limited sea space is intense with increased competing needs. Governance of the coastal area traditionally followed a sectoral management approach with the stronger agencies having a larger influence compared to the rest. While this kind of management contributed to stronger economic growth, the conservation of coastal natural habitats and marine biodiversity received low priority. However, effective pollution controls on land and sea prevented marine water quality from unhealthy deterioration.

From the mid-1990s, greater attention was given to the management of coastal natural habitats and biodiversity conservation. In 2009, Singapore adopted an Integrated Urban Coastal Management (IUCM) strategy, recognizing that integrated management of the coastal area is more effective at balancing competing needs and more efficient at harnessing the whole of government resources and collaborative action for addressing new issues that are relevant to the nation's long-term sustainability. This case study examines the relevance of ICM in a highly urbanized island nation that is now focused on sustainable development.

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Background

The island nation of Singapore, made up of a main diamond-shaped island and over 50 mostly small offshore islands is limited in its size, both land and sea. Although land reclamation has increased its total land area by almost 24% (from 581.5 km^2 before 1960 to 719.1 km^2 in 2015), it can only be done within the restricted territorial sea space of about 740 km^2, most of which are within port limits. The entire country is considered to be coastal because of the comparatively short distance of 13 km from the middle of the main island to the north or south coast. It supports a high population density of 7,697 persons/km^2 (2015 population was 5.53 million). Economic growth has been phenomenal with gross domestic product per capita rising from US$428 in 1960 to $56,284 in 2014 (DOS, n.d.).

Situated within the major shipping trade routes, Singapore's confined harbor supports one of the world's busiest ports. According to the Maritime and Port Authority (http://www.mpa.gov.sg/), a ship leaves the port every two to three minutes; 60,000 containers are loaded or unloaded every day; and the port itself is a focal hub of 600 ports from 120 different countries.

The coastal area is intensively developed to support the maritime sector as this has and still is contributing significantly to the nation's economic growth. The sea space is heavily utilized for shipping and as most of the territorial sea is under port jurisdiction, the Maritime and Port Authority (MPA) effectively manages the entire sea area to ensure safe shipping. Other activities include the marine industry (ship and oil rig building and repair); petroleum industry (refining, storage, trans-shipment); and power generation, aquaculture, housing, and recreation (Chia, et al., 1988). Almost all of the country's entire natural coastline has been altered and replaced by coastal reclamation and seawall construction, eliminating original coastal habitats and biodiversity (Chou, 2011).

These swift changes, accelerating over the last half-century, have radically affected both land and sea use patterns. For one, almost all of Singapore's coastal area has been modified and developed, and is now dominated by infrastructure representative of an urban city state catering to diverse maritime activities, together with oil refining and petrochemical industries located among some of the many offshore islands. Undoubtedly, the coastal environment supports maritime activities that have contributed immensely to the country's economic growth. Singapore's port is among the busiest in the world.

The legacy of sectoral management left Singapore with a coastal environment that was drastically physically modified to favor economic development. Shipping and marine-related industries dominated the seascape, while other sectors like aquaculture and recreation in restricted locations were left with little scope for expansion. Natural resource conservation and protection received, at most, scant attention from development agencies reluctant to commit to protecting coastal habitats that were within their areas of operation. Sectoral management also failed to address the increasing sedimentation of the sea. However, marine pollution control was successful, and marine water quality was adequately managed with the National Environment Agency (NEA) taking responsibility for land-based discharge and the MPA for sea-based sources.

In the mid-1990s, management attitudes widened to include marine habitat protection, a highly critical principle. The use of sediment screens to prevent damage of coral reefs and replanting of mangroves to compensate for those lost from the development of the country's first offshore sanitary landfill marked the first instance of positive protection of habitats from development impacts. All marine development projects since then have taken effective steps to minimize damage

to natural habitats, implement necessary restoration, and put in place a real-time Environmental Monitoring and Management Programme throughout and beyond the project's implementation. In 2006, the National Biodiversity Centre was established under the National Parks Board (NParks) with a mandate that included the conservation of both terrestrial and marine biodiversity.

These were the conditions prior to the adoption of IUCM in 2009. Management was clearly sectoral with stakeholder influence linked to a sector's contribution to economic growth. As the shipping sector played an active role in the development of Singapore's economy, the MPA exerted a huge influence in managing the sea, most of which was within port limits. Other sectors like aquaculture and fisheries were restricted and confined. Commercial fisheries did not exist in Singapore's seas. Natural habitats and biodiversity were neglected until the mid-1990s when preventive measures against development impact were instituted. While the marine sedimentation problem fell through the cracks between agency jurisdictions, chemical pollution was effectively managed.

The term "IUCM" takes into account the highly urbanized setting of the country with its well-developed infrastructure and the port's bustling nature. At such an advanced stage of the country's development under a mostly sectoral management regime, the question was whether the ICM (or IUCM) system was applicable and relevant, and if so, what could it achieve? After all, Singapore's coastal area development had worked well under sectoral management with its semblance of a functional zonation concept that allowed it to develop into one of the world's busiest ports and yet maintain acceptable marine environment quality.

Approach and Methodology

In 2008, the government established the Inter-Ministerial Committee on Sustainable Development (IMCSD) "to formulate a national strategy for Singapore's sustainable development in the context of emerging domestic and global challenges." In the following year, "The Sustainable Development Blueprint" was presented, which identified key targets and initiatives to "improve resource efficiency and enhance Singapore's urban environment for the next 10 to 20 years." Next, a Sustainable Development Policy Group (SDPG) was established to oversee and monitor implementation and progress towards the blueprint targets. Within this framework, an interagency Technical Committee on the Coastal and Marine Environment (TCCME), co-chaired by NParks and NEA, was established to focus on the coastal area. Representatives of ministries and agencies dealing with pollution control, shipping, food security, conservation, and coastal protection as well as academic institutions sat in the committee (Box 1). Its role was to provide technical advice to the Coastal and Marine Environment Policy Committee, an interministerial group that provided "coordinated, holistic and strategic policy direction for CME-related issues" (TCCME, 2013).

Box 1. Agencies represented in the TCCME.

Agri-Food and Veterinary Authority of Singapore
Building and Construction Authority
Maritime and Port Authority of Singapore
Ministry of the Environment and Water Resources
Ministry of Foreign Affairs
Ministry of Transport
National Environment Agency
National Parks Board
National University of Singapore
Public Utilities Board

This paved the way for a formal integrated framework on coastal management. Organized by NParks, an interagency workshop on ICM in 2009 introduced the concepts and principles to government agencies and involved them in planning the ICM implementation. With their input, an ICM Strategy and Implementation Plan, which charted the course of the framework, was developed.

The ICM system was accepted by stakeholder agencies following the reported success and efficacy of coastal and marine management in the PEMSEA demonstration sites within the region. This was in direct response to the need for more effective management of the multiple uses of Singapore's restricted coastal area and the threat to its marine biodiversity. The experience of the demonstration sites indicated that while sectoral management allowed line agencies to manage specific issues often successfully, the important aspect of coordination and integration of the various action plans to reduce conflicts within a defined area was certainly lacking.

Results

In recognition of the need to enhance the management of the coastal area, Singapore adopted the IUCM strategy in 2009, which took into account the very advanced stage of urbanization. It closely collaborated with PEMSEA to develop IUCM for sustainable development of an urbanized coastal area. This framework aimed to enhance active partnerships and synergies among stakeholders and was meant to address the complex nature of coastal management issues in an urban environment. The formalization of the coordinating committee (TCCME) and the adoption of IUCM were meant to facilitate management that took into account emerging issues such as climate change and blue economy development, and that was more responsive to international commitments, primarily the goals of sustainable development.

The acceptance and adoption of IUCM was a mainly top-down process, but public awareness (focusing mostly on habitat loss and water quality) raised by civil action groups and activists contributed to ready acceptance by the public. No segment of society depended on coastal/marine resources for subsistence or well-being, but the general public was openly receptive to improving environmental quality and nature.

Global issues such as climate change, biodiversity loss, and energy sustainability provided the impetus for the government to focus on sustainability. In establishing the Inter-Ministerial Committee on Sustainable Development, the government recognized the importance of integrated management that leveraged on cross-agency collaboration. The committee itself was co-chaired by two ministries (Ministry of Environment and Water Resources and Ministry of National Development) with members representing the Ministries of Finance, Transport, and Trade and Industry.

Can an integrated management framework work in an urbanized coastal city that until now has been planned and developed under a sectoral management regime? The focus on sustainable development with the establishment of the IMCSD and formalization of SDPG paved the way for stronger interagency cooperation and coordination of efforts towards a shared purpose. The adoption of elements of an integrated management approach for the cleaning and restoration of the Singapore River and Kallang Basin watershed in the past demonstrated very clearly how it effectively contributed to the project's success at a time when management agencies had all along worked within isolated sectoral boundaries (Chou, 1998; Box 2).

Box 2. Cleaning up the Singapore River through integrated management approach.

The ten-year project began in 1977 when then Prime Minister Lee Kuan Yew announced the intention to keep all streams and rivers clean and free from unnecessary pollution as a way of life (Lee, 2006). He identified the Ministry of the Environment as the lead agency and specified a ten-year time span for Singapore to achieve the vision of being able to fish in these water courses by then. The project required the participation of many agencies from various ministries in a coordinated effort to effect the change, transforming these grossly polluted biologically dead zones that were treated as an open sewer and garbage disposal dump into a clean, aesthetically pleasing, and ecologically vibrant habitat (Figures 1 and 2; Chou, 1998).

The project was indeed a great challenge, considering that these aquatic bodies accounted for a watershed as large as 20% of the main island with divergent issues including resettlement of people, rezoning and relocation of activities, effective management of pollution sources, infrastructure investment, public education, and implementation of new and relevant policies. The success of this project can be attributed to the adoption of the integrated management framework in as far as interagency coordination was concerned. The experience has been applied to the restoration of other water courses throughout the country. The project was motivated by strong political will. However, ICM was not institutionalized until 2009 when it was felt that a holistic management framework was essential for accomplishing sustainable development goals.

Figure 1. Singapore River before the cleanup.
(Source: Italian Association of Singapore)

Figure 2. Singapore River after the cleanup.

Benefits of IUCM and Lessons Learned

Although the entire city state is considered coastal, the institutional arrangement most relevant to the coast and sea at the present time is the TCCME operating within the concept of sustainable development under the SDPG. High priority is placed on the impact of climate change on the country's sustainability with coastal vulnerability receiving much attention. Such emerging issues can be more efficiently addressed by an ICM system (IUCM in this case), as more agencies secure greater appreciation and deeper understanding of the implications and agree on the best and most relevant responses.

It can be argued that Singapore's coastal area has in the past been managed adequately and has been successful under sectoral administration. Seawater quality and pollution levels have been effectively managed, and functional zonation of activities were based on a long-range concept plan that is

periodically reviewed. This, however, did not mean that conflicts and issues were nonexistent. Chia (1992) suggested that conflicts in coastal resources use were due to rapid rate of change and insufficient response to solving problems generated. The root cause was identified as the unisectoral approach of development agencies, as well as their overlapping responsibilities in managing coastal resources and space within their jurisdiction. As a result, natural habitat loss and degradation, and high sedimentation remained neglected problems, while strong pollution management did contribute to slowing habitat degradation prior to IUCM adoption.

The TCCME, in its eight years of existence, created a platform for the relevant agencies to acquire a better understanding of what is necessary to make the coastal environment more sustainable. It paved the way for a more coordinated approach in considering management and research gaps that will result in better rationalization of coastal use and planning. An example of a more holistic outlook arising from IUCM is the declaration of Singapore's first marine park in 2014 (Straits Times, 2014). The strength of coordination and integration in the management of the watershed was clearly demonstrated in the successful cleanup of Singapore River and Kallang Basin. Once restored, they could be converted into freshwater reservoirs and enhance the country's self-reliance on freshwater. Many rivers have also been dammed and converted to freshwater impoundments.

The adoption of IUCM (or ICM system) was facilitated top-down with the opportunity introduced by the government to focus on sustainable development. While TCCME comprises government agency and academic representatives, channels are open for the public to provide their input. There are no coastal communities dependent on coastal resources for their livelihood and neither is there a commercial fishery due to busy shipping in the restricted sea space. The socioeconomic, biophysical, and political settings of Singapore as a highly urbanized coastal city may be different to other coastal cities. Still it is essential to note that IUCM is considered relevant to the further development of the country as it strives for elevated levels of sustainability and climate change resiliency.

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