Chapter 9
Community Stakeholder Viewpoints on Issues of Urbanisation Along the River Ma Oya, Sri Lanka

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Abstract Rivers situated in peri-urban landscapes are prime natural resource bases supplying the construction industry associated with urbanisation. The study analyses and presents the river Ma Oya community stakeholders views on the impacts of river resource uses. Systematic stakeholder consultations revealed that while the river is the source for water supply for many cities, sand and clay mining for construction industry and dumping waste are the major sectors causing negative impacts. Essential remedial measures proposed are fair and effective intervention of Government authorities, stakeholder (including politicians) education together with technical measures and economic instruments to internalize the externalities caused by social and environmental degradation.

Keywords Stakeholders • Peri-urban landscapes • Urbanization • Economic instruments • Water supply • Waste dumping

9.1 Introduction

Sri Lanka has a relatively low urban population compared to other countries of the world which is at 15.1 % of the total population in 2011 with a rate of urbanization at 1.36 % (CIA n.d). Nonetheless, the cities and the urban areas of Sri Lanka are growing fast in the post internal conflict era. The urban growth of Sri Lanka is primarily due to regeneration of cities. Another reason for urbanization is the designated development of new and existing cities and townships rather than the urban sprawl that can be seen in some other parts of the world, for example in Australia.

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Fig. 9.1 Location of River Ma Oya

Rapid development of construction industry including housing, roads and infrastructure facilities is a key feature in these urban development programmes of Sri Lanka. Construction being one of the principle activities in the newly urbanised areas directly impacts the natural resource bases which supply the building materials.

The river Ma Oya discussed in this chapter forms the northern boundary of the Western province of Sri Lanka in which the commercial capital city of the country, Colombo, is located. Colombo is also the most populated city of the country. The Western province also contains the two most populated districts of Sri Lanka; Colombo (2.48 millions) and Gampaha (2.15 millions) (UNFPA n.d). Gampaha district at the northern part of the Western province is bounded by the lower reach of the left bank of River Ma Oya. Ironically, Kurunegala, the third most populated district of Sri Lanka bounds more than three-fourth of the right bank of the lower reach of this river. Figure 9.1 illustrates the location of the river with respect to the district boundaries of Sri Lanka.

The river valley areas of the lower reach of Ma Oya have been the habitat for rural communities whose main livelihood is paddy and coconut cultivation. The towns and population centres along the river were small and far apart. In the recent years, in addition to the development of existing and new urban areas in the Western province, the Urban Development Authority has identified a number of areas along the Ma Oya river banks, which are presently under going development of various foams including Townships, Free Trade Zones and Education hubs. Close proximity to the cities and town areas under the on-going urban development in Colombo, Gampaha and Kurunegala districts and the existing villages on both river banks qualify the lower reach of this river to be considered under peri-urban landscape.

Ma Oya riverine area is a major supplier of three building materials; sand, bricks and clay roofing tiles for the construction industry. The objective of this chapter is to analyse and present the views of community stakeholders on the impacts of development on different natural resource uses along the lower reach of Ma Oya river valley under peri-urban landscape.

9.2 Ma Oya River Basin

River Ma Oya is one of the largest river basins within the 103 river basins of Sri Lanka with a total catchment area of 1528 km^2 (Ratnayake 2003). Its importance lies in its location – the economically vibrant western part of Sri Lanka. It is also one of the seven major river basins in the south west quarter of the island (Panikkar 2008). It originates in the central hilly terrains and flows 130 km before falling to the Indian Ocean just north of the city Negambo. The river basin is spread in four provinces: Central, Sabaragamuwa, North Western and Western, and five districts: Kandy, Kegalle, Kurunegala, Puttlam and Gampaha.

9.2.1 Catchment Characteristics and Resource Uses

Highly stressed surface water resource situations are experienced up to 12 weeks during the dry season, though an annual average rainfall of 2219 mm is received in the basin (Ratnayake 2003). The river flows are mainly used for supplying drinking water for 17 cities. The next use of the river is as the carrier of pollutant from cities, industries as well as from private dwellings located on the river banks. The other significant uses of the river resources include sand and clay mining, which have become thriving industries of the river valley areas. There is much potential for industrial development especially along the valley of the river basin due to the impact of immigration of industries from the Western Province.

This study defined the lower reach of the river as the 87.5 km stretch from the river mouth up to Polgahawela bridge, which is at 80 m altitude and with an average riverbed gradient of 0.7 m per kilo metre.

Table 9.1 Declared urban development areas in Ma Oya downstream reaches

	Development area	Type	Approx. distance (km)
1	Colombo	MC	38.0
2	Negambo	MC	7.0
3	Gampaha	MC	20.0
4	Minuwangoda	UC	12.0
5	Ja Ela	UC	22.0
6	Peliyagoda	UC	34.0
7	Wattala-Mabole	UC	32.0
8	Divulapitiya	DS	8.0
9	Katana	DS	1.5
10	Mirigama	DS	6.0
11	Warakapola	DS	4.0
12	Ja Ela	DS	22.0
13	Wattala	DS	32.0
14	Wennappuwa	DS	8.0
15	Dankotuwa	DS	1.7
16	Pannala	DS	1.0
17	Giriulla	DS	00
18	Narammala	DS	15.0
19	Alawwa	DS	00
20	Polgahawela	DS	1.5

Source: UDA (n.d)
MC Municipality Council, *UC* Urban Council, *DS* Divisional Councils (Pradeshiya Sabha)

9.2.2 Urbanization

Ma Oya River flows through Mawanella town in its upper reach, and Alawwa, Kotadeniyawa and Giriulla towns in its lower reach. Polgahawela, Pannala, Dankotuwa and Katana are the other key towns situated along the river banks. Most lands on the lower river banks are used for paddy and coconut cultivations in a rural village set up (Thoradeniya 2005).

The economic policies adopted in the last three and half decades have resulted in fast development and urbanisation of some of the river valley areas on both banks. The left bank areas are subjected to fast urbanisation, since the river forms the boundary of the Western province which is the most developed province of Sri Lanka. The major developments include industrial parks and education hubs. As a result, the existing townships on both banks have regenerated and expended in their sizes while new population centres have emerged (Table 9.1). Rapidly developing tourism sector is also evident by the large number of hotels and other leisure areas.

9.3 Conceptual Framework

This study has drawn two ideas from the literature to develop the conceptual framework to identify the resource use sectors which will be impacted by the urbanisation and hence create issues for the stakeholders of the river valley. They are (i) the Educated Trade-off Framework concept and (ii) Stakeholder identification.

9.3.1 Identification of Resource Use Sectors

For the identification of the different sectors that use the same natural resources, this research uses the first step of the five-step Educated Trade-Off (ETO) framework developed by Thoradeniya and Ranasinghe (2006) and Thoradeniya (2010). The ETO framework was developed for educating stakeholders of competing resource uses to make informed decisions with regard to the trade-offs between their uses. In this framework, the stakeholders of a natural resource are educated on technical, economical and environmental aspects of their resource use, for rational trade-off decision making in resource scares situations which can occur during the development phase or in the management phase of any project.

The first step of the framework identifies the resource uses of a given spatial area and the stakeholders in the natural resource uses/issues that need stakeholder involvement for educated or informed decision making. The next three steps of the framework estimates the amount of the natural resource uses depending on their technical requirements at their critical bounds and the economic and environments values of such bounds respectively. The final step thus allows estimating the combined (economic and environmental) value of each natural resource use at its critical bound of the technical requirement, thus allowing for educated trade-offs between the different uses of the resources.

The valuation of environmental costs of different resource uses in the ETO framework is based on the "Total Economic Value" concept. According to Munasinghe (1993), the value of the environment arises because people (either as individuals or as society) wish to consume it due to its "use value" and "non-use value." Drawing from this concept the first step of the ETO framework identifies the full range of uses of a given resource as shown in Fig. 9.2.

Sectors that contribute to the use value can be further subdivided as direct (these sectors directly use river resources such as water and sand), indirect (these sectors use river resources indirectly) and option (the use sectors that are yet to develop). Sectors contributing to existence value (preserving the river in its present state, habitats and endangered species) and bequest value (the altruistic values of individuals desiring to preserve the wildlife, their habitats, biodiversity and so forth to be enjoyed by future generations) form the two sectors contributing to non-use value.

This approach allows identifying a complete list of use sectors as possible in the current scenario and helps to identify the impacts caused by one resource use sector on all the other use sectors.

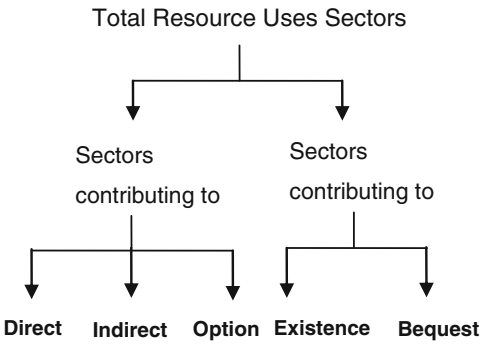

Fig. 9.2 Total resource use sectors (Adapted from Munasinghe 1993)

9.3.2 Identification of Stakeholders

Generally, stakeholders of a development project using river resource are spatially widespread; local, regional, national and international levels. Nevertheless, the scope of this study is limited to local (community) stakeholders of the river resources. Since, the interest of stakeholders could be many; the way they link themselves to the resource, use of resources and restrictions faced by them, awareness of negative impacts of their uses, concern for environment and other uses etc., there may be many different stakeholders with divergent views and expectations (ICH 2005; ODA 1995; Grimble 1998).

The approach for the involvement of stakeholders within a considered spatial entity of a river basin needs to be suitable for integrated and complex use of the resources, as against the approaches used for sector based resource uses such as hydro-power projects and irrigation development projects.

Identification of stakeholders for the study is therefore an important step which impacts upon its outcome.ICH (2005) advocates a Stakeholder classification depending on the impact (importance) and influence (power) of a stakeholder (Fig. 9.3).

Further, ODA (1995) has shown that the influence of primary stakeholders can arise due to;

- Social, economic and political status
- Degree of organisation, consensus & leadership in the group
- Degree of control of strategic resources significant for the project
- Informal influence through links with other stakeholders
- Degree of dependence on other stakeholders

Therefore, categories A, B and C types of community stakeholders have been involved in this study. Category D was not involved for the reasons that neither they are heavily impacted by any change in the resource uses nor they would represent any other stakeholders.

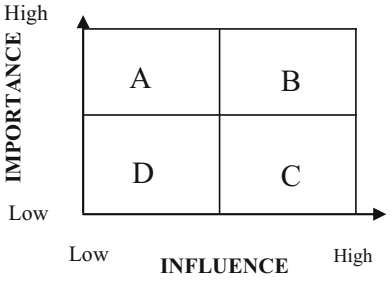

Fig. 9.3 The stakeholder classification

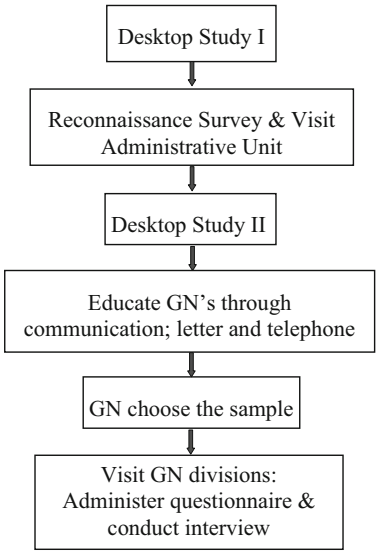

Fig. 9.4 Six-step approach for community stakeholder consultation process

9.4 Community Stakeholder Consultation Process

This study utilized a 'questionnaire survey' followed up with 'interviews' to elicit data from the stakeholders about their resource uses. The stakeholders in this study were restricted to the community stakeholders living along the river bank villages. Systematic consultation of representative stakeholders required us to develop a methodology which will neither repeat the spatial areas nor ignore any spatial locality. The methodology designed for the selection of local community stakeholders and conducting the questionnaire survey was the six-step approach given in Fig. 9.4 (Thoradeniya 2010).

The importance of this approach is the prominence given to the Government's local administrative mechanism. Establishing connections with the local community stakeholders through the 'Grama Niladhari – GN' (lowest level Government administrative official) was advantageous to develop a trustful attitude towards the research.

The Desktop study in step 1 began with the land survey maps of river basin and the urban development plans. It identified administrative units that should be visited

in the reconnaissance survey. The Divisional Secretariat Division (DSD) was identified as the administrative unit to be contacted directly to initiate the field studies due to two reasons: (i) the number being small enough to handle within the scope of the study (rapid assessment of resource uses) and (ii) these are the smallest administrative divisions available in the Sri Lanka Survey Department maps.

The objectives of the reconnaissance survey and the visits in the second step were threefold;

(a) To obtain the data required for planning the main survey such as maps showing Grama Niladhari Divisions (GND), stream network etc. which are not available centrally.
(b) To create awareness about the research at the DSD level and to create an initial awareness among the concerned GNs.
(c) To obtain the necessary support of the respective Divisional Secretaries for the survey.

The third step of the approach is another desktop study where the details of the questionnaire survey was planned using the data collected at step 2. Accordingly, the numbers of GNDs on the left bank and right bank of the river in its downstream reach were 44 and 46 respectively. These belong to five DSDs on the left bank and six DSDs on the right bank. In addition to the identification of the river bank GNDs and planning the questionnaire survey, preparation of documents to educate the GNs is an important objective in this step.

Community stakeholder consultation process at the field level began with communication efforts with the GNs. A written communication articulating the purpose of the study and the expected coordination efforts to contact three to four community stakeholders who belong to categories A, B and C described earlier, was followed up by telephone. This step also allows to verify that they have received the written communication and to clarify any doubts.

Strengthened with this education, the GNs then selected community stakeholders representing different use sectors of the river resources. At the final step the researcher visits each GND and administered the questionnaire among the community stakeholders representing different use sectors of the river resources (Fig. 9.5).

Fig. 9.5 Interviews with stakeholders

The total number of stakeholders interviewed was 301 within 90 GNDs, where 12 % (36) were female. 85 % (256) of them were over 35 years and 47 % (143) were over 50 years of age.

9.5 Resource Uses and Issues

The community stakeholders first identified different uses of the river resources within their villages (GND), which finally resulted in 14 different uses of river resources in this reach of the river. These uses categorised under the different use sectors are given in Table 9.2. Few years back, the only source of potable water for some villagers had been the river. As the water quality deteriorated this number has decreased with only a very few poor peasants using river as their potable water source. Similarly, two to three decades back majority of the villagers of the river banks and people from neighbouring townships used river water for bathing and washing. It was found that the number of people making use of river for these purposes have also drastically reduced due to unsafe access with the sand mining activities and poor water quality.

One of the sectors which had increased river resource uses was 'water supply' despite the degradation of water quality. There are a number of points of extraction along the river in the downstream reach for water supply schemes. The extracted water is treated before supplying to the users. While there are proposals for new intakes the capacity of the existing intakes are also being increased.

Water extraction for industrial sector had increased with the establishment of industrial parks. This region has at least five industrial areas; Polgahawela,

Table 9.2 Resource use sectors identified by stakeholders

	Resource use sector	Direct	Indirect	Option	Existence	Bequest
1	Drinking water	√				
2	Bathing/washing	√				
3	Water supply source	√		√		
4	Industrial use	√	√	√		
5	Sand mining	√				
6	Dumping waste	√				
7	Inland fishery	√				
8	Animal rearing	√				
9	Agriculture		√			
10	Dug-well users		√			
11	Clay mining		√			
12	Tourism industry		√	√		
13	Recreation	√		√		
14	Irrigation			√		
15	Environment sector				√	

Fig. 9.6 Industrial waste discharge

Thulhiriya, Meerigama, Pannala and, Dankotuwa. Some industries located on the river banks use direct water intakes for potable and production uses while others located in the vicinity use both shallow and deep wells (boreholes) to obtain their water requirement for production. Latter is an indirect use of river (groundwater usage).

The survey established sand mining as the most popular single river resource use sector which was reported in all GN divisions of the study area. Some of the cities and townships are in the habit of dumping their garbage in the lands adjoining the river, even though this practice is illegal as garbage is washed into the river during the rainy periods. The situation is aggravated with industries both large and small discharging their untreated or partially treated industrial waste into the river (Fig. 9.6).

Two of the minor uses of the river are 'inland fishing' and fetching water for animal rearing. The survey revealed that the activities of these sectors have diminished over time not due to deteriorated quality of river water and the risk of accessing the river. Rural nature of the downstream areas is perceived by widespread rain-fed agriculture (paddy and coconut) and dug-well users. Both these sectors fall into the category of indirect users of the river resources. Clay mining which is more concentrated in the lower downstream meandering areas of the river is another indirect use of river resources. The clay deposits on the river banks are mined for the manufacture of clay roof tiles and bricks needed for the construction industry. The rapid constructions around Colombo as well as its suburbs have increased the demand on the rural clay industries and the extraction rates of clay.

Tourism industry and recreation sites are building up in the lower reaches with an enormous potential for future development, thus qualifying for uses with optional value. Irrigation is another use sector with optional value even though three lift irrigation schemes had been abandoned during the past two decades due to the increasing depths of the river.

The stakeholders input did not reveal any use sectors that would contribute to Bequest value of the river. A plausible reason would be the lack of areas designated for wildlife, biodiversity etc. in this region of the river. However, 90 % of the stakeholders expressed either their concerns about the impact of diminishing river

Fig. 9.7 Deep sand mining and excavated river banks

resources on the eco-systems or identified environment as a sector which depends on river resources for its conservation.

9.5.1 Conflicting Issues

Some of the identified resources uses have created conflict situations. For example, during the low flow periods the two major direct uses of the river waters (water supply and pollutant carrier) are in conflict with each other and results in critical water stressed situations due to the inadequate quantity and poor quality. Over 89 % of the respondents from all DSDs view their resource uses are threatened or are in conflict situation at present. Ninety one percent of stakeholders believe their resource uses to be threatened in the near future under the assumption that no change will take place in the river system.

The stakeholders were requested to identify the user sectors, which have created conflict situations with other uses or are already threatened by other use sectors. Three resource use sectors emerged as being principally responsible for negatively impacting the other resource users. Sand mining is identified by a large majority 60 % (180) as the single resource use sector which impacts the other users (Fig. 9.7). This was followed by clay mining on river banks and dumping waste which were identified by 17 % (51) and 13 % (40) respectively.

Interestingly, all of the above three sectors have a direct relationship to the urbanisation taking place in the surrounding areas. In the first two uses (i.e. Sand and Clay mining industries) the beneficiaries are mostly away from the river basin itself. With the rapid increase in urban construction activities both types of mining have been mechanised during the past two decades resulting in severe negative social and environmental impacts.

The unregulated sand mining has increased the depth of the river bed almost 15 m at some places. The most cited direct issues by more than 50 % of the consulted stakeholders are:

- Risk of drowning for those who use the river for bathing/washing/fetching water for drinking due to slippery and deep river bottom, poor accessibility; and
- Erosion of river banks; uprooting bamboo and other trees, and collapsing roads and railways on banks.
- Sand mining has also lowered the ground water table in the river valley. In certain areas the ground water table is lowered by 10–15 m. More than 50 % of the stakeholders stated that a considerable number of private dug wells of the community have either dried-up or have deep drawn water levels which are unable to reach easily.
- The agricultural lands located in the lower river valley which were once fertile are losing their productivity. The productivity of these lands was mainly due to the deposition of fertile suspended matter brought by the annual floods and the high ground water table. Increased depths of riverbed due to sand mining have resulted in low flood frequencies with zero floods in some years.
- Adverse impacts to the environment such as rising temperature, air pollution and low humidity were pointed out by a smaller number of stakeholders.
- Clay mining on the other hand has contributed to more social and environmental issues. These include poor health conditions of the villagers due to excessive dust when transporting clay and diseases such as malaria due to mosquito breeding in the open clay-pits which are not re-filled after mining activity. Heavy vehicles used for the transportation of clay have severely damaged the village road system consisting of gravel roads which are not designed for heavy loads. The damaged roads with large depressions filled with water make the roads impassable during the rainy seasons bringing many hardships to villagers and school children. Clay mining has also resulted in loss of habitable land due to cave-in effect when mining is carried out in adjoining lands. Social issues such as increases in the rates of theft and drug addiction due to migrant workers were other issues highlighted by the stakeholders.
- The third use of the river as a source for dumping waste is directly related to the industrial parks and townships within the river basin close to the river. The low dry weather base flow of the river combined with waste disposal from cities and industries without treating at outlets are in conflict with the intakes for water supply schemes. Poor quality water, unsuitable for drinking, bathing and washing, is the main issue, which is followed by stagnant pools of water in the river emanating foul smells and causing health hazards.
- Tourism which has emerged with urbanisation of the areas within close proximity has also adversely impacted the environment and the local populations.

9.5.2 Stakeholder Views on Remedial Measures

Stakeholders were able to identify and propose restoration and development work for the riverine environment. Majority of the stakeholders were of the view that issues created by excessive sand mining can be overcome with proper management of sand mining industry. While some wanted sand mining banned others

proposedimiting mining depths. The necessity of effective and fair intervention by the Government officials was the next proposal by the majority. Lack of a common platform for all stakeholders was also cited as a reason for uncoordinated sand mining.

On the immediate issues like bank erosion, many proposed construction of rock embankments or protective walls along the river. Even though 35 % proposed the construction of longitudinal embankments, a surprisingly large number (23 %) proposed construction of bunds across the river indicating the wisdom of community stakeholders.

Even though the number of views expressed on clay mining was comparatively low, the majority were of the view that clay mining on the adjoining lands to the river should be banned. Six persons proposed stakeholder education while just one person proposed re-filling the clay pits.

The third issue of urban development which impacts the river resources is the use of river for waste disposal. While 9 % proposed a ban on dumping waste to the river 4 % proposed stakeholder education and two respondents stated that the river banks need to be cleaned of dumped garbage as a remedial measure.

9.6 Discussion

The development of cities and townships through regeneration plans and in few places with slow urban sprawl, and establishment of industrial zones have had direct impact on the river resources, such as sand and clay as building materials. Compared to the other rivers supplying sand, River Ma Oya is distinctively in a disadvantage position due to its peri-urban location.

For restoration of the mined land, the first step is to evaluate the technical feasibility. The economic benefit from sand mining, clay bricks and roof tiles, are received by the urban community purchasing them at competitive market prices without the cost of environmental degradation. The externality caused to the environment should be internalised through economic instruments. For example, Ranasinghe (1997) proposed a deposit refund system on clay mining for restoration of clay pits. That study estimated the economic value of clay mined from a sample clay pit of 20 Ac. ft. at US $ 33,440 and the environmental cost it generates at US $ 9467.

Political interference at all levels is seen as a main cause for environmental degradation while corrupt Government officials with authority were the two reasons identified stakeholders. Majority wished for a fair and effective intervention by the Government authorities. The situation was also aggravated by the different laws adopted by the local government authorities on the two river banks. Therefore, it was proposed that education has to be provided to politicians and officials on the impacts of uncoordinated and unregulated resource uses.

9.7 Conclusions

This study investigated the resource uses of Ma Oya river in the peri-urban landscape due to the urban development taking place in the three most populated districts of Sri Lanka; Colombo, Gampaha and Kurunegala. Uncoordinated and uncontrolled use by multiple stakeholders was expected to diminish the river's valuable resources within next few decades.

Sand mining, Clay mining and Dumping waste were identified as the three major sectors which have impacted the local stakeholders of the river resources. Sand and clay mining activities are directly related to the urban development through construction industry which is supplied with river sand and clay bricks and tiles as building materials. The third, waste dumping was a result of expanding cities and establishment of new industries.

Community stakeholders were able to explain the issues of the resource uses in the development and urbanisation and to provide their views on sustainable development and restoration of the riverine environment. The key challenges identified were inadequacy of Government institutions including police, unwarranted pressures by the corrupt local political leaders and lack of a common platform for all stakeholders to discuss issues on both the river banks.

River bank protection work (both along and across the river) was the major technical proposal for restoring the river while proper management, honest involvement of Government officials and stakeholder education were the key proposals on management sphere. The study also identified the use of appropriate economic instruments to internalize the externalities caused by social and environmental degradation.

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