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# Watershed Management: The Path Traversed and the Way Forward

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## Introduction

At the outset it is appropriate to deliberate on what watershed management encompasses. Though this term is extensively used, it yet tends to restrict itself to land use management in the past. Watershed is an area which drains into a common drainage outlet. Therefore, once this point is decided, it is easy to define the boundary and demarcate the area. The resources, both natural and man-made within this area can be considered as resources within the watershed. All living beings within this watershed, and sometime outside of it (e.g. transboundary water transfers) use these resources to transport and provide goods and services. Sustainable watershed management is assured as long as these goods and services can be produced continuously over a period of time without degrading resources, specifically the natural resources within the watershed. The reason for bringing watershed management to the top of an agenda is because these watershed resources continue to degrade over time and hence the apprehension of not being able to produce the goods and services in required quantities in time to come. This is a much broader issue in relation to the survival of future generations.

There is evidence that sound watershed management practices existed in Sri Lanka before the colonial period which began in the early 1800's. The central hills, from where all Sri Lanka's major rivers originate, were under natural forest cover whilst the valleys were under agricultural production watered by an intricate system of irrigation reservoirs and canals. The degradation of watershed resources began with the large scale clearing of the central highlands for plantation crops in the latter part of the nineteenth century.

Serious concern about land degradation in general and soil erosion in particular has been expressed since the 1880's. As early as 1927, the Director of Agriculture in his Annual Report drew attention to the need to check soil erosion. A few years later a committee on soil erosion documented the damages caused by plantation crops. The Government's interest in addressing the problem became evident with the passing of the Land Development Ordinance in 1935. The ordinance among other things included the prevention of soil erosion and the protection of the sources of streams.

After passing the Land Development Ordinance and until the late 1970's the government was primarily concerned in controlling soil erosion and relied heavily on regulatory measures to achieve its objectives. A numbers of regulatory measures were adopted including the enactment of the Soil Conservation Act of 1951. By the late 1970's the government began to realise that none of these Acts had been very effective in controlling soil erosion. The pressure of escalating and competing demands on the land and the resultant degradation made it imperative that there should be a shift of focus from control of soil erosion to the larger issue of environmental protection and management. This led to the development of more comprehensive, "watershed-basis" action programmes compared to more segmented soil erosion control activities.

## Watershed Management Projects

The induction of watershed management projects in Sri Lanka was triggered in order to guarantee the investments to be made on the Mahaweli Development project. The series of projects which followed the FAO-UNDP project is shown in Table: 1. They used the same justification with few additional benefits.

This is clear since nearly all the project, except SCOR project, was physically located within the upper Mahaweli watershed. Initial projects were mainly sectoral, owned and implemented by the state institutions. There has been a gradual change from the state-planned and driven watershed management focus to the participatory, people-driven and implementation focus. This change occurred over the years and, in certain instances the changes are so subtle that it is difficult to draw a line when different watershed management projects were classified into different categories. However, an attempt was made to categorise watershed management projects into state owned sectoral projects, integrated, and participatory and institutional development projects for the clarity of discussion.

**Sectoral Projects**

Sri Lanka's first watershed management project, the Watershed Management Project, was established in the Upper Mahaweli watershed in the central hills of Sri Lanka in 1976. It was set up in response to the problems caused by the gradual expansion of non-plantation agriculture and the implementation of the Mahaweli Development Programme. This programme was carried out for multipurpose development of the country's largest river, the Mahaweli Ganga to provide electricity from hydropower and to open up and develop irrigated land in Sri Lanka's dry zone. The Land and Water Use Division of the Government's Department of Agriculture implemented this project with assistance from the United Nations Food and Agriculture Organisation (FAO). The main objective was to study the impact of differing land use practices on soil erosion and rainwater runoff.

The first set of watershed management projects were directly implemented by the state's institutions carrying out almost all planning, implementation, and monitoring functions. An important feature of these initial projects was to develop institutional capacities by supporting higher level officials to be trained at MSc level in the UK (FAO Project) and USA (USAID Project). The establishment of experimental watersheds in the first two projects provided crucial baseline information. The only involvement of local personnel was as labourers to carry out the project work. The implementing agencies focussed on achieving the project's physical targets. There was hardly any 'benefit monitoring' and evaluation and no identification of project beneficiaries.

Table 1: Selected watershed management projects in Sri Lanka 1975-2008

| Project and donor | Implementer | Duration | Project activities/components/outputs |
|---|---|---|---|
| **Sectoral projects** | | | |
| Watershed Management Project (FAO/UNDP) | Department of Agriculture | 1975-1981 | Two experimental watersheds set-up and monitored to find effect of land use on runoff and soil erosion.<br>Staff training for MSc in UK |
| Reforestation and Watershed Management Project (USAID) | Forest Department | 1980-1988 | Established 10,000 ha of pine plantation in upper watershed areas<br>Set up 4 micro-watersheds to find effect of pines on runoff and soil erosion<br>Staff training for MSc in USA |
| **Integrated watershed management projects** | | | |
| Upper Mahaweli Watershed Project (GTZ) | Mahaweli Authority of Sri Lanka | 1987-1996 | Promotion of sloping agricultural land technology (SALT)<br>Promotion of crop-livestock integration for income generation<br>Farmer training<br>Coordination with 25 other agencies |

| | | | |
|---|---|---|---|
| Forestry/Land Use Mapping Project (ODA) | Mahaweli Authority of Sri Lanka | 1989-1998 | Develop capabilities (GIS, databases etc) to provide information for planning and managing watersheds<br>Monitor sedimentation of 4 large reservoirs in upper watersheds |
| **Participatory and institution building projects** | | | |
| Participatory Forestry Project (ADB) | Forest Department | 1993-2002 | Empower users<br>State provided policy, legislation, credit and extension support<br>Land given to farmers on long-term leases<br>Annual and tree benefits directly to farmers |
| Shared Control of Resources (SCOR) Project (USAID) | International Water Management Institute (IWMI) | 1993-1998 | Increase user control over natural resources through state-user partnerships<br>Create farmer companies |
| Swedish Co-operative Centre's Project (SCC) | Department of Co-operatives (National Cooperative Council) | 1995-1997 | Provide services, such as soil testing, input supply, marketing to farmer groups<br>Farmer training<br>Independent NGO was formed after project period to continue activities |
| Environmental Action 1 Project, Pilot Land Management Project (World Bank) | Ministry of Environment | 1997-2000 | Micro-watersheds selected to pilot test appropriate techniques and treatments for rehabilitating degraded land through community participation<br>Implementing agencies work together with villagers to prepare and implement plans across micro-catchments |
| Upper Watershed Management Project (ADB) | Ministry of Environment | 1998-2005 | On-farm and off-farm soil conservation<br>Forest gardens and buffer zone planting<br>Relocating farmers from environmentally sensitive areas<br>Giving landowners title to their land<br>Drafted National Policy on Watershed Management |

**Integrated Projects**

The GTZ-supported Upper Mahaweli Watershed Management Project introduced a number of new initiatives (GTZ, 1993). The setting up of user communities to run project activities was one of the projects main features. These activities included establishing sloping agricultural land technology (SALT), promoting income generation by integrating crop and livestock farming. The benefits of project went directly to farmers. This project also tried to win the support of line agencies to coordinate its activities.

Relatively little involvement of communities in planning, executing and obtaining the benefit generated to encompass a larger community were the major drawbacks of the state-owned and integrated projects. Realizing these shortcomings, the next phase of projects was designed to be more people-friendly. A

participatory approach and the empowerment of communities to reduce poverty became important in formulating the objectives and the participatory approach was adopted in planning, executing and monitoring the projects.

**Participatory Projects**

The projects launched in the early 1990's were based on working in partnership with farmers. This came about after it was realised that the state alone could not manage and protect land, water, and forest resources. The participation of local land-users was built into watershed management projects. The need was recognised to formally recognise and promote these partnerships. One important aspect was to spread benefits over a large number of people to alleviate rural poverty. This thinking to a large extent was led by the recommendation of the Rio Declaration on Environment and Development, and the statement of principles for the sustainable management of forests. This declaration was adopted by more than 178 Governments at the United Nations Conference on Environment and Development (UNCED) held in Rio de Janerio, Brazil in June 1992.

The ADB-funded Participatory Forestry Project (PFP) promoted the participation of local communities in forestry development. Its objectives were to:

- Reduce poverty and rehabilitate environmentally degraded areas by promoting tree planting by rural communities; and
- Strengthen the institutional capacity of the Forest Department to expand its programmes to plant non-forest trees; carry out non-farm research, extension and education as well as to develop the capacity of rural people to run village tree nurseries.

This project, which began in 1993, took an innovative approach. It promoted participatory reforestation by setting up a cadre of volunteer motivators to motivate farmers in the process reforestation. It gave incentives for reforestation located on private holdings and state lands and trained local people in plant production so that they could grow trees for private sale once the project terminated. The success of this project was shown by its target of planting 15,000 ha with trees in 1993 to 46,000 ha in 1998 with an actual achievement at the end of 2002 of 52,782 ha (Sathurusinghe, 2003).

**Institution Building Projects**

The Participatory Forestry Project was very successful. However, it has been realised that it may not be possible to replicate it in the non-forestry sector because of the greater complexity of the issues and the larger number of institutions involved. The Shared Control of Resources Project (SCOR) was implemented by the International Water Management Institute (IWMI) from 1993 to 1998 to improve the productivity of land and water resources by piloting institutional mechanisms for sharing the management of watershed resources. The institutional arrangement included resource user groups at the lowest level. A few such groups formed a resource organization, which ultimately formed into a resource user council. The Farmer Company was the top of a pyramid and was supposed to work as an independent business entity. The farmer companies that emerged from this project have continued and have mostly been successful for sometime. However, the project's mid-level institutions, such as its resource user groups, resource user organisations, and resource user councils have failed (Jinapala *et al.,* 2000). An important lesson from this was that the long-term sustainability and impact of new technologies and new production and conservation practices are largely a function of the long-term effectiveness of supporting institutional arrangements.

The Swedish Cooperative Centre's Project of 1995-1997, was implemented in four watersheds in two districts. It also attempted to develop local institutional mechanisms by organising farming communities through cooperation and collective action (Gibbon et al. 1998). A key part of the project was its intensive

training programmes. An independent Non Government Organization (NGO) was formed at the end of the project end to continue activities.

However, the SCOR's farmer companies and the Swedish project's NGOs have found it difficult to sustain their work. Inability to sustain institutions has been one of the main failures in watershed management projects.

**Upper Watershed Management Project**

The evolution of watershed management projects during the last four decades is shown in Table: 2. The recently concluded Upper Watershed Management Project (UWMP), implemented by the Ministry of Environment and Forestry with the assistance of ADB adopted most of the present day approaches.

Table 2: Past and present approaches of watershed management projects

| **Previous approach** | **Present approach** |
|---|---|
| Uni-sectoral with no need for coordination | Multi-sectoral with high level of coordination |
| State owned | State and user owned |
| Implemented by paid state employees | Implemented by users, NGOs, and the state |
| Capacity building of state employees | Capacity building of beneficiaries and state employees |
| Beneficiaries are not clear | Beneficiaries are known |
| No involvement of users | Involvement of users at planning, implementation and monitoring stages |
| Gender concerns not included | Gender concerns included |
| Cost-recovery is not a concern | Emphasis on income generation and cost recovery |
| Hierarchical governance | Distributed and market-led governance |

UWMP in 1999 began to address forest and land degradation problems in four critical watersheds where it aimed to:

- Promote the conservation, upgrading and use of natural resources
- Improve the economic and social condition of farmers
- Strengthen institutions

The projects design took into account the lessons learned from previous watershed management projects. It was clear on promoting participatory processes for integrated management (Sharma *et al.*, 1997). The projects was successful in two aspects, namely promoting conservation, upgrading and use of natural resources; and improving the economic and social condition of farmers. However, it could not come up with an institutional arrangement to continue to sustain the interventions undertaken through the project. The training of farmers in conservation, production, and entrepreneurial skills was supposed to be a major UWMP activity (ADB, 1997). It was intended to be packaged to help develop local institutions. However, the project implementers did not succeed in implementing this very important component of the project. Therefore, another opportunity to innovate a new institutional arrangement was lost.

**National Watershed Management Policy**

One of the important outcomes of the UWMP was the first National Watershed Management Policy which was drafted by the Ministry of Environment and Natural Resources, Government of Sri Lanka in July 2004 (MENR, 2004).
The major objectives of the policy were:

- conserve, protect, rehabilitate, sustainably use, and manage watersheds while maintaining their environmental characteristics with people's involvement
- justify the continued provision of funds in the national budget for sustainable watershed management by evaluating the services provided by watersheds
- coordinate and monitor all activities in watershed areas and secure a system of integrated watershed management

To achieve these objectives, policies have been formulated on (a) conservation and protection, (b) watershed management, (c) watershed management investment and (d) coordinated and integrated management.
The policies on coordination and integrated management included:

- coordinating the activities of all agencies at rural, divisional, district, provincial and national levels through watershed management committees which include representatives of rural committees and officers of the government institutions
- establishing watershed management units under chief provincial secretaries
- eliminating policy gaps in managing natural resources in relation to watershed management to bring all related sectors closer to each other
- giving watershed management its due place in the national educational curricula

This 47 page watershed management policy can be identified as one of the 'state of the art' policy documents which included the latest thinking in this particular discipline. Valuation of environmental services, incorporating this into the national accounting system, coordination of watershed management activities among stakeholders at all levels, both laterally and vertically, conflict resolution, inter-sectoral linkages are some of the innovative features in this policy. In theory, this sounds very impressive, though no one knows how it is going to be operational. This raises a question as to whether policy models must be tailored to local situations and be based on what is feasible and practical rather than what is considered ideal or desirable.

**Next Generation of Watershed Management Project**

Before discussing the new directions on watershed management, particularly in Sri Lanka, it is worth considering what is basically recommended in the Asian context. A regional workshop organized by FAO from 11-13$^{th}$ September 2003 in Kathmandu reviewed watershed management concepts, approaches and assessed experiences from the 1990's and came out with recommendations for the next generation of watershed management projects. Table 3 summarises the recommendations of the above workshop.

Table 3: Preliminary Recommendations of the FAO stocktaking exercise

| **Present scenario** | **Future scenario** |
|---|---|
| 1. Treating the symptoms of watershed degradation(i.e. deforestation, soil erosion, siltation, decreasing production) | Identifying and treating the underlying causes of watershed degradation (i.e. lack of knowledge, poverty, population increase, demand for resources, improper land use). More focus on prevention than cure. |
| 2. Priority focus on off-stream costs and benefits of watershed management (i.e. downstream infrastructure risk, decrease in floods and sedimentation, increase in water quality and quality for downstream users) | At minimum equal priority to on-site costs and benefits of watershed management (i.e. improving and maintaining upland agriculture, forest and rangeland productivity, water quality). |
| 3. Inadequate project designs that often | Project design that provides for adequate government |

| | |
|---|---|
| overestimate government capacity and assume policy changes will occur | capacity and assures policy changes. |
| 4. Top-down research and development, and transfer of technology to local stake holders that is driven by donors and education and research institutions | Emphasis on stakeholder participatory learning and technology development process that builds on indigenous technologies and addresses local research needs |
| 5. Diffuse focus on watershed management, which often maximize production of resource/commodities other than water and soil | Sustainable multiple-use management of watersheds that combines water resources development with compatible economic land-based production systems (i.e. trees, crops, livestock, fish, recreation). |
| 6. Diffusion of integrated rural development approach with multisectoral steering committees and line agencies (which, for the most part, has been a failure) into the integrated watershed management concept. | Multiple-use management of natural resources (renewable and non-renewable), with emphasis on water and soil resources in upland watersheds and with development responsibility given to the relevant line agency. |

(Source: Tennyson, 2003)

The recommendation at the Asian level does not deviate substantially from the approaches that have been followed in the recent past in Sri Lanka. A closer look at the recently concluded watershed management project in Sri Lanka during last decade has most of the above features recommended embedded in them.

Therefore it is logical to assess the present status of watershed management issues and come up with the new directions to be followed for future watershed management projects in Sri Lanka. However, what is given in the following sections have to be considered as only the opinion of the author only. The legitimacy of such suggestions is therefore limited, since future directions have to be decided and agreed through a more participatory consultative process.

**The Status at Present**

a) Institutional Issues

Two institutions, namely the Departments of Forest and Wildlife had the largest extent of forest areas under their mandate. They have visions, long-term plans, capable staff and clear implementation programmes. In addition, these two institutions are in the forefront in exercising the authority vested under their jurisdictions through various legislation. However, this cannot be said about many other institutions in Sri Lanka, especially the local authorities, thus paving the way for degradation of watershed resources at an alarming rate.

Many technical institutions which have been involved in watershed management activities have been weakened over the years due to various reasons. Retirement of qualified staff, lack of systematic recruitment and training, inadequate resource allocations, political interference, absence of long-term planning are some of causes for this unfortunate situation.

For example, soil conservation has been identified as a major activity that has been carried out since 1956 after creating an institutional mechanism with the introduction of the Soil Conservation Act of 1951. The Department of Agriculture was able to control soil erosion to a greater extent through its soil conservation division which had more than 65 staff in the 1960's. The Department of Agriculture also has the mandate

to control soil erosion and necessary powers have been granted to the Director General of Agriculture though the same Act. The Natural Resources Management Centre, which now looks after the implementation of the soil conservation act does not have adequately trained technical staff as well as physical and financial resources. This is applicable to many other institutions which in the past have played a major role in watershed management activities.

Over the past three decades, as mentioned earlier, watershed management projects in Sri Lanka have evolved to become much more people-friendly. However, one of the main failures of such projects was the inability to set up a sound institutional mechanism to sustain project activities after their completion. The success of watershed management crucially depends on having an effective hierarchical institutional setup in place (from rural to the national level). The performance of the proposed watershed management committees remains to be seen as this policy is contrary to the Government's overall policy of reducing government expenditure by not setting up new public institutions.

It seems that the proposed watershed management units under the new policy will have to be formed by restructuring existing institutions. The lack of institutional collaboration in the past has been a major weakness in managing watersheds. The proposed integration of rural-level organisations will be a very challenging task for the future watershed management activities.

b) Technical and political Issues

Currently, water pollution appears to be one of the main watershed management issues though there were some indications to this effect in the past (Gunawardena *et al*., 1998; Wijewardena, 2000). Increasing population, rapid urbanisation, intensive agricultural and industrial activities, along with the inaction of local authorities in exercising law and order (perhaps due to increased political interference) in the upper watershed areas has aggravated water pollution. Encroachment of reservations for intensive agriculture, housing and business premises, unplanned settlements, inability to address the lack of sanitary facilities, poor sewerage treatment, dumping of solid waste into water bodies, lack of institutional coordination are some of the causes for this problem. Pollution problem could end up in widespread protests due propagation of epidemics as shown in the Box 1.

**Box 1: Water Pollution in Gampola**

Headline news items on a Sri Lankan daily (Lankadeepa) on 26th May 2007 reported that Gampola city located 8 km upstream of the University Peradeniya had a protest rally on 25th May 2007. According to the article, all the shops in the city were closed and the banners displayed by the people who went through the city streets carried slogans against the National Water Supply and Drainage Board (NWSDB).

The problem was that water supplied to the city contaminated with Hepatitis bacteria (as a result of human excreta). Epidemiologists reported that 13 out 14 samples collected from the headwater sources were contaminated with human excreta as reported in the news paper. This was mainly due to the lack of adequate sanitary facilities to the community. The Medical Superintendent of Gampola Hospital has reported that the number of patients coming to the hospital varies from 50-100 per day. Patients have been sent to peripheral hospital such as Peradeniya, Nawalapitiya, Ulapane and Kuruduwatta and private hospitals too.

The findings from several investigations were used to facilitate a public information campaign in June 2007, where a media tour with involvement of 18 media units (both print and visual) was conducted with support from three NGOs ( Sri Lanka Water Partnership, *NetWater* and Centre for Environmental Justice) to increase national awareness on the need for an integrated remedial action plan. The resultant media coverage increased public awareness and brought the issue to the notice of political decision makers. As a direct result of the campaign and growing public outery, the NWSDB was called to a special presentation

before the President of Sri Lanka, who gave a directive that a catchment conservation plan bringing together all stakeholder agencies be formulated for Gampola and Paradeka. This process has to be replicated in other parts of the country to avoid repetition of similar incidents.
(Source: Athukorala *et al.*, 2007)

Increased contamination of water sources due to disposal of sewerage, agricultural pollution and soil erosion will continue to create problems in future. In addition, there are indications of inadequate quantities of water to meet future demand for domestic, industrial and irrigation purposes, let alone assuring reasonable environmental flows.

A closer look at watershed management issues shows its root cause to be due to political interference although very little on this aspect has been expressed and documented. As indicated in the Land Development Ordinance, headwaters had been delineated and protected in the past. However, this regulation is violated by allowing people to encroach and cultivate. Attempts by the bureaucracy at the very initial stages to contain this problem aid not succeeded for political reasons. Lack of intervention by the authorities to prevent continuous encroachment of reservations along streams is a common phenomenon. Direct discharge of sewerage and solid waste into streams from such unauthorised encroachments may have serious implications for downstream users.

**The Way Forward**

It is evident from the preceding sections that new issues have arisen and conventional approaches can no longer address these complex problems. In the past, only one water quality parameter, i.e. soil erosion was addressed. Now contamination due to sewerage and eutrophicaltion has surfaced as major water quality problems. Inadequate institutional capacity, inability to exercise law and order along with the increased politicisation are becoming more important factors for watershed degradation. Increased incidence of flood and drought associated with climate change has further aggravated the already exiting problems of watersheds.
Comprehensive planning at the river basin level (which can encompass typical components of watershed management projects) is identified as an approach to address the complex issue of watershed management (and also indicated in the National Watershed Policy). This approach is technically sound and very logical since resource constraints, demand management and upstream-down streams issues can be taken in to account. However, socio-economics and institutional issues are not explicitly include in this approach. This is where integrated water resources management becomes more relevant.

Integrated water resources management (IWRM) is defined as a process which promotes the coordinated development and management of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems (GWP, 2000). There is a global consensus to this approach, though many find it difficult to fully implement the protocol. Initiatives to implement IWRM have already been taken nationally, regionally and globally, though it is too early to comment on the effectiveness of this approach (Gunawardena *et al.*, 2008).

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