

## Watershed Management: A Sustainable Strategy for Augmenting Water Resources and Mitigating Climate Changes

Crispino Lobo

*Watershed Organization Trust (WOTR), Ahmednagar, Maharashtra 414 001, India*

**Abstract:** The relationship between environmental degradation, increasing rural poverty and climate change induced impacts has, in recent years, been increasingly dominating developmental and political discourse. Controversies apart, it is widely accepted that these three issues are intricately interwoven. Adverse changes in the one have a ratchet effect on the others. Of particular concern is that the already precarious existence of people living in ecologically fragile areas will be further jeopardized, in some cases, irretrievably. This paper outlines the case that in rain dependent rural areas, participatory environmental regeneration of living and livelihood spaces, along watershed lines, offers a promising way not only of building into the local economy a measure of resilience, but also of enhancing the productive capacities of natural resources.

**Key words:** Climate change, watershed development, poverty reduction, drought, participation, natural resources.

It is generally accepted today that changes in climate patterns are well underway globally. The Inter-Governmental Panel on Climate Change (IPCC) in its Third Assessment Report Predicts that the global temperature will rise by about 1.4 to 5.8°C by the year 2100. These changes will significantly impact (irreversibly, in most cases) the environment as well as livelihoods and quality of life. While all people and countries are vulnerable, those living in low-lying coasts, deltas, islands and resource fragile areas such as arid and semi-arid regions (drylands) in developing countries are particularly vulnerable.

This is because the bulk of people living in these areas draw their sustenance and livelihood from land, water and biotic resources which would be the first to be impacted by climate-induced changes.

While rising seas will inundate and submerge these low-lying areas, atmospheric dynamics will subject drylands to even more variable and scantier rainfall regimes. The vast majority of people living in these vulnerable and fragile areas are poor and often at the edge of survival. When one considers that over 2 billion people live in drylands (40% of the world's population), of which 1.5 billion live in Asia alone (Anonymous, 2001), one can well imagine the magnitude of the problem – the sheer scale of likely dislocations (and attendant hardships and misery) and the daunting enormity of resources (particularly political) that have to be mobilized and sensitively brought together in a relatively short time, if a meaningful and effective solution is to be obtained.

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Already over 1.7 billion people – a third of the world's population – live in water stressed countries, a figure expected to rise to 5 billion by 2025 (Anonymous, 2002). If time hasn't already run out, there is precious little of it left if we are to initiate any significant action.

### **From Macro to Micro Areas of Survival**

While the sheer complexity and enormity of crafting a coordinating response to the challenge at the global level can seem impossibly daunting, it is possible to make a meaningful, significant and replicable intervention at the level of primary stake holders- those who are most directly affected, particularly the poor. If these are mobilized at the level of their habitations and their area of survival, namely, the area from which they draw their sustenance and livelihood, then a real step forward can be made. For, these people do not have the luxury of attractive alternative sources or areas of livelihood. Their survival depends on protecting, regenerating and managing sustainably local resources – land, water, biotic – obtaining within the environmental and ecological space they inhabit and interact with. And they do not have the option of postponing these decisions and actions because their todays are already at risk.

### **The Context**

Therefore, if any significant movement or progress is to be made at addressing the issue of increasing desertification, rising sea levels, increasing water scarcity, environmental degradation and livelihood loss in resource fragile and vulnerable areas, one must begin by involving the poor living in these areas in crafting solutions and

interventions that help retrieve desertified living spaces or stabilize fragile ecological areas, through regeneration and mobilization of the environment.

In this paper, I shall describe one such effort being implemented in the semi-arid/arid drought-prone regions of Maharashtra, a state on the western seaboard of India. Maharashtra's geographical area is 30.7 million ha. supporting a population of 96.8 million. Of this area, about 70% is hot semi-arid to arid with agriculture largely dependent upon the monsoons. These rains fall during a few months in the year, but rainfall is highly variable (ranging from 100 mm to 3,000 mm) both in frequency, intensity and spatial spread. In the dry rainshadow areas, (rainfall between 100 mm to 500 mm) there are not more than 10 days of harvestable rainfall. Even though agriculture contributes only 30% of Maharashtra's GDP, nevertheless these drylands support 65% of the rural populace and are the principal suppliers of coarse cereals, pulses and oil seeds. Hence the importance of rainfed agriculture in terms of providing rural employment, sustenance and livelihood for the majority of the people cannot be sufficiently underscored. Since Maharashtra is prone to regular droughts systems and livelihood sources is of utmost importance.

### **A Local Response**

Faced with this challenge, Watershed Organisation Trust (WOTR), an NGO established in 1993, decided to organize villagers to regenerate the watersheds they lived in. The unit of intervention chosen was a micro watershed because it represents a complete natural, human and biotic ecosystem nourished by the hydrological

cycle – precipitation, runoff, recharge, and evapotranspiration. People in rural areas live in watersheds. These watersheds were barren, heavily eroded and supported only a subsistence level of livelihood. The poorest of the poor usually inhabit these degraded watersheds.

WOTR emphasized self-help, ecological regeneration and “catching rain wherever it falls”. A ridge-to-valley approach was followed so as to ensure ecological revitalization and maximum capturing of rainwater in-situ.

### **The Process**

As precipitation occurs and rainwater flows down the hillsides increasingly gathering speed, a series of continuous trenches dug along the contour serve to act as speed breakers, control erosion as well as harvest water. Harvested water in these trenches percolates into the ground and recharge aquifers. Surplus water is allowed to spill out into naturally occurring rills, gullies and streamlets. On these, further barriers such as gully plugs and stone bunds are built. In the lower reaches of the drainage network, larger structures like earthen nallah bunds, gabion structures, checkweirs and percolation tanks (at the discharge point of the watershed) are built. These serve the purpose of slowing and harvesting water, trapping silt and accelerating groundwater recharge. On farmland or gently sloping land, contour bunds and boundary bunds are built with water surplusing outlets. On the trenches and bunds, trees (to meet a variety of needs both ecological and of the human community – fiber, fodder, fuelwood, etc.) as well as grasses are planted. Grasses and planting

of shrubs and fibrous plants also stabilizes waterways.

The net outcome of such an integrated approach results in significant in-situ conservation and harvesting of water, accelerated groundwater aquifer recharge, control of erosion and regeneration of the ecological basis of the watershed. These measures can be considered as ecological revitalization infrastructure that results in the stabilization and development of the watershed. However, while these do enhance the productive capacities of the environment and augment water availability, they, of their own, are not sufficient to address the needs of the community living within the watershed. Hence, in addition to these physical and structural measures (soil, land and water management), other value addition and income generating measures must be undertaken, such as improved and new crop establishment and management practices, pasture/fodder development, livestock upgradation, household fuel and energy provisioning, horticulture development, floriculture, pisciculture (as applicable), other social development and income generating activities. Since most of these activities require an integrated community-based approach, WOTR places great emphasis on community mobilization and organisation, capacity building, skill training and upgradation. To this end, WOTR has a well-developed participatory pedagogy for capacity building, which progressively empowers the villagers to direct, organize, maintain and implement the watershed effort.

In order to facilitate diversification and upgradation of livelihood and income sources, women are organized into Self-Help Groups (SHGs) and microfinance is

provided to these groups. Women play a crucial role in the development and maintenance of a watershed since they are the primary resource providers of a rural household. About 80% of a rural household's basket of consumption (food, fodder, fiber, fruits, water, and biofertilizers) comes from the environment and from the watershed.

Women and gender are actively mainstreamed from the onset of a watershed development effort. For, unless space is created for women to actively participate in decision making process both in the watershed development effort as well as in the institutional life of the community, it is unlikely that sustainability of created assets and resources will be ensured once the development phase is completed. For, if women don't consider the effort as their own, they are not likely to imbue into their children those values and understanding necessary for the continued conservation of a regenerated watershed.

### **Outreach and Impact**

#### *Watershed level impacts: Improving lives, rehabilitating living spaces*

Of particular importance and significance is the impact watershed development and management has had on the lives of the villagers, especially the poor and women. In all areas, the local ecology and environment has begun to recover and stabilize. Barren hills have now a cover of grasses, trees and vegetation. Natural flora and fauna (rabbits, deer, birds, jackals, foxes, etc.) which had all but disappeared have begun to reappear. Springs and streams that would run dry shortly after the monsoons have now got a lease of life, some becoming

perennial and others flowing till the onset of summer. Previously, drought meant hunger and migration because crops would wither for lack of water; now at least one crop is secured because of improvement in the soil-moisture regime and availability of protective irrigation due to increased water table.

In the semi-arid region of Darewadi watershed (annual average rainfall 350 mm), drinking water had to be supplied by water tanker for 5 months in a year. It now enjoys piped water from a well that has become perennial. The ground water table has risen by 3 metres and increase in net cropped area by 117 ha. Around 342 ha has been brought under irrigation of which 13 ha is now perennial. Over 378,000 trees have been planted with a survival rate of over 90% despite the poor rainfall. Fodder availability has increased by 1794 tonnes (170%) and milk production to over 780 L day<sup>-1</sup>, an increase of over 1500% (WOTR, 2002). Similarly, in the Sherikoldara watershed (annual rainfall around 300 mm), the number of wells have increased by 9% (122 pre watershed to 134 post) and the number becoming perennial has gone up 300% (8 to 32). The drinking water problem has largely been solved. Perennially irrigated land has increased by 315% and milk production has increased from 100 L day<sup>-1</sup> to 1350 L (1250%). Over 250,000 trees have been planted (survival rate over 85%) and fodder production has increased by 2700% (WOTR, 2000).

In both these watersheds there has been considerable socio-economic changes. Mud huts have been broken down and replaced by brick houses. Consumables like television sets, radios, motorcycles have registered

significant increases. Those who formerly had no voice in village affairs have now gotten elected onto public bodies. And more importantly, despair has given way to hope; the helplessness that people felt with every drought has now been replaced with quite confident. They have found the key to mitigating its rigors and have acquired confidence in their ability to manage livelihoods even in years of scarcity.

#### *Going to scale: The micro-macro interface*

This community-based, watershed development approach to drought mitigation, environmental degradation, water scarcity, deteriorating livelihood sources and poverty alleviation has had a significant impact not only on those living in the watersheds, but also on the policy and national level. Since watershed development in India is viewed as a strategic input to stabilizing rainfed farming systems, the need for capacity building of various actors has increased significantly. The learnings, insight and methodologies developed by WOTR<sup>1</sup> and its partners have contributed significantly to shaping the way resources at the national level are allocated and spent for watershed development.<sup>2</sup> At the State level (Maharashtra), WOTR's experience has also informed and set the tone of the partnership in a large Government funded Watershed Development Program involving NGOs.<sup>3</sup> WOTR is today training people from all

over the country (and also internationally) in the skills and approaches for community-managed watershed management and self help group promotion.

#### **The Way Ahead**

With climate induced changes already underway, the increasing degradation of biotic resources and the corresponding immiserisation of those societies that depend on them cannot but get exacerbated further. This, coupled with the switchboard phenomena of drought-flood in the same year, protracted drought or repeated floods, is resulting in intolerable stress to both the human and environmental ecology. Skirmishes and conflicts over scarce water resources will, in the years ahead, erupt into full scale "water wars". And since the potential for large scale impounding of water (à la big dams) in most places is no longer feasible nor viable, the way forward is to undertake ecological rehabilitation of micro catchments and watersheds from a ridge-to-valley perspective, involving the people living in them, in its development and management. This would serve the multiple purpose of mitigating the impacts of climate-induced changes, augmenting water resources, stabilizing the livelihood base and providing employment to those living in these areas. The alternative is scary – sprawling megapolises, festering slums, crime,

<sup>1</sup> The "Guidelines for a Common Approach for Watershed Development" issued by the Govt. of India recommends adoption of the Capacity Building Approach of WOTR being implemented in the Indo German Watershed Development Program (IGWDP) in Maharashtra, India.

<sup>2</sup> Based on the experiences of the Indo German Watershed Development Program (IGWDP), the Govt. of India has established the National Watershed Development Fund in 1999 to spread the watershed effort to 100 districts in the country.

<sup>3</sup> The concept of "Mother NGO" to support and accompany the efforts of participating NGO's was based on the role WOTR played in the IGWDP.

violence and social unrest. We have nary a moment to lose!

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