GENESIS OF WATERSHED MANAGEMENT IN INDIA

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ABSTRACT: *The importance and scarcity of water has been identified with an increase of human population who are responsible for industrialization, urbanization, exploitation of natural resources to the maximum advantage of human resources. Any resource will not yield till it is protected, developed, conserved and utilized. Hence, the improved utility of water needs efforts, time, space and money for balancing, improving, conserving, retaining, etc. With the increase in population, process of development, industrialization and urbanization, the quality and quantity of water and its accessibility decreases day-to-day, this leads scarcity. It is expected to accommodate about 11 billion human population in this planet within short period from current human population nearer to 8 billion, which will lead water a scarce resource in course of time. Hence, there is a need to conserve moisture/water for supply necessary food to ever growing population as well as utilize effectively and judicially that reduce the social conflicts which can arise by failing to this (Reddy, et al. 2008). Watersheds play a critical role in the natural functioning of the Earth thus considered as one of the primary planning units in the field of natural resource management. Watershed approach is more rational because land and water resources have optimum interaction and synergetic effect when developed on watershed basis. The hydrologic unit boundary is important for determining what areas are involved in contributing runoff, sediment, and pollutants. The watershed or hydrological unit is considered as scientific and appropriate base for necessary surveys and investigations for assessment of natural resources and subsequent planning and implementation of various development approaches.*

Keywords: *Watershed, Integrated Watershed Mangement Programme (IWMP)*

Water is an essential resource for the development, maintenance and sustainability of agriculture and every living organism. Since the existence of this planet the importance of water has been known very crucial for fulfilling prime necessities of all living organisms. Thus land, water, air, fire and sky (PANCHMAHABHOOTAS) are very important for the development of mankind. Among them land and water are the most precious natural resources, they are vital for sustaining life and its importance in human civilization needs no elaboration. At present, the soil and water resources of the planet are under intensive use and misuse, so these resources are becoming more limited and crucial. The total available land area in the state sets the limits within which the competing human needs have to be met. The needs of agricultural, industrial, domestic and others often result in diversion from one use to the other. Diversion of land from agriculture to non-agriculture uses adversely affects the growth in agriculture sector. Even the available land is subjected to soil-erosion of varying degrees and degradation problems of different magnitudes. Where, water is fugitive. It flows under gravity. The purpose of soil conservation is not only to preserve the soil but also to capture the rainfall, slow down the water flow and to enhance infiltration. These are not new insights. The Upanishad states: if water is running, make it walk; if water is walking, make it stand; if water is standing, make it sit; if water is sitting, make it sleep (S. Vishnudas 2006).

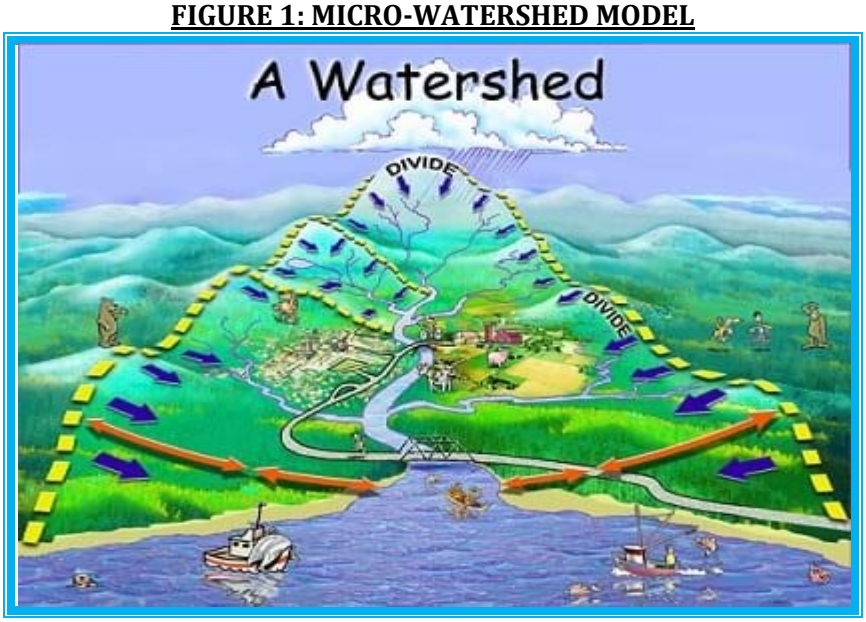
Water supports all forms of life on this mother earth. It is an essential constituent of all living organism. Unlike most other natural resources, water does not have any substitute in its main uses. Water seems over-abundant on this planet: three quarters (75.00 per cent) of earth's crust is covered by water. The 1,400 million cubic kilometers of water so present can cover the entire area of the earth to a depth of 3,000 meters. Out of the total available water, around 98.00 per cent of the water is in the oceans of earth's surface while the fresh water constitutes a very

small proportion of this enormous quantity available on the earth. It is only about 35 million cubic kilometers or 2.50 per cent of this total volume. Of these 68.90 per cent or 24 million cubic kilometers lies frozen in the form of ice and permanent snow cover in mountainous regions, and Polar Regions of Antarctic and Arctic. Another 29.90 per cent is present as groundwater (shallow and deep groundwater basins up to 2,000 meters). What is effectively available for consumption and other uses is a small proportion of the quantity available in rivers, lakes (0.30 per cent) and 0.90 per cent in soil moisture, swamp water and permafrost atmosphere. The crisis about water resources development and management thus arises because most of the water is not available for use and secondly it is characterized by its highly uneven spatial distribution. Accordingly, the importance of water has been recognized and greater emphasis is being laid on its economic use and better management (Ministry of Water Resource, 2008 and 2010).

Definition and Meaning of Watershed:

Watershed may be defined as "A hydrological unit which covers all land and water area which contribute runoff to a common point". Runoff is that portion of the precipitation, which finds its way into stream, lake or ocean as surface or subsurface flow. The excess rainwater flowing over the land surface is overland flow and flowing in a defined channel is a stream flow (See Figure 1). The disposition of the precipitation is partly a function of watershed factors such as size, shape, slope and topography, physical properties of soils influencing infiltration and permeability and water storage capacity, land use and vegetation.

FIGURE 1: MICRO-WATERSHED MODEL



Source: *Technical manual, GSWMA, 2011.*

BRIEF HISTORY OF WATERSHED DEVELOPMENT IN INDIA:

1. Traditional Water Harvesting Techniques:

India has a valuable heritage about water harvesting technologies from their ancestor's years ago. Rain water harvesting practiced in India for centuries and traditional system of rain water harvesting proved more successful. Some of the following popular traditional water harvesting technologies utilized for soil and moisture conservations as well as for drought proofing listed as per location-specific:

- ✓ Tank Methods in South India.
- ✓ 'Phad system' of Maharashtra.
- ✓ 'Paar' system in Western Rajasthan.
- ✓ 'Nadis' (Village Pond) in Barmer and Jodhpur region of Rajasthan.
- ✓ Roof Rain Water Harvesting Tank in Gujarat.

- ✓ 'Vav' or 'Vavdi' in Gujarat and 'Baoli' or 'Bavadis' in Rajasthan and Northern parts of India.
- ✓ 'Khadin' and 'Johad' in the hyper arid parts of Rajasthan.
- ✓ 'Bhoogarbh Tanka' in Dwarka and Ahmedabad region of Gujarat.
- ✓ 'Kund' or 'Kundis' in sandier tracts of the Thar Desert of Western Rajasthan as well as in some parts of Gujarat and Uttar Pradesh.
- ✓ 'Baoris' or 'Ber' made by Banzaras of Rajasthan for drinking water.
- ✓ 'Jhalaras' for ground water utilization in Rajasthan and Gujarat.
- ✓ 'Ahar-pyne' system for agriculture irrigation.
- ✓ 'Talab' or 'Bandhis' in Bundelkhand region.
- ✓ 'Saza-kuvas' in Desert areas, etc.

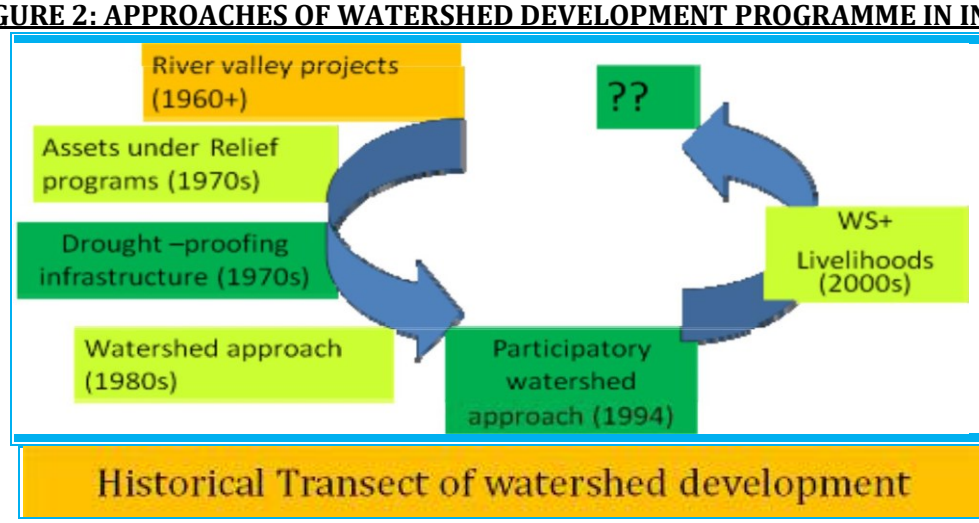
Most of them used for drinking water purpose and some of them built to irrigate the agricultural field. Past research also mentioned that majority of these structures were built and maintained with people's participation. Also there were certain holistic rules and regulations for sharing and distribution of benefits.

2. Genesis of Watershed Management in India:

The concept and history of watershed management in India was started since 1880 with the Famine Commission, and then with the Royal Commission of Agriculture in 1928. Both of them laid foundation for organized research in watershed. After Independence, the Government supported programme started in mid-1950s, when the focus on watershed programmes was sharpened with the establishment of the Soil Conservation Research, Demonstration and Training Centres at eight locations. In 1956 the Central Soil and Water Conservation Research and Training Institute (CSWCRTI) was established by linking all the eight centres as a notable decision. The Centre started watershed activities in 42 locations on small-scale to understand the technical processes of soil degradation and remedies for soil conservation (Samra 1997).

The first large-scale government supported watershed programme was launched in 1962-63 to check siltation in the multi-purpose reservoirs as 'Soil Conservation Works in the Catchments of River Valley Projects (RVP)' followed by another mega-project 'Drought Prone Area Development Programme (DPAP)' in 1972-73 with the main purpose of mitigating the impact of drought in vulnerable areas. Similarly for the development of desert and for drought management in the fragile, marginal and rainfed areas 'Desert Development Programme (DDP)' was added (Approaches shown in Figure 2). These programmes were implemented in 45 watershed catchments of 20 states with inclusion of 96.10 million ha area (Government of India, 2001).

FIGURE 2: APPROACHES OF WATERSHED DEVELOPMENT PROGRAMME IN INDIA



Source: *Training module of IWMP, WASSAN*

CSWCRTI also started demonstration of its technologies in actual village conditions at selected 4 locations from 1974 onwards (Samra 1997). With its success led the scheme of propagation of water harvesting and conservation technologies in rain fed areas in 19 identified locations by the Department of Agriculture and Co-operation, Ministry of Agriculture. This in turn inspired to the CSWCRTI and the Central Research Institute for Dry land Agriculture (CRIDA) jointly with the State Departments to take-up additional 47 Operational Research Projects (ORPs) to validate soil and water conservation technologies under different agro-ecoregions and demonstrate the benefits of watershed activities to the farming communities in the rain fed as well as hilly areas. Besides recognizing importance of watershed programmes the Ministry of Rural Development also adopted approach in 1984 in 22 locations in the rain fed areas. During 1980s, several projects assisted by Bilateral Donors, International Funding Agencies like World Bank and number of Non-Government Organizations (NGOs) were started in different parts of the country.

In 1986-87, the National Watershed Development Project for Rain fed Areas (NWDPRA) was launched by Ministry of Agriculture for optimizing the production of important rain fed crops in 99 selected watersheds. The severe drought of 1987 forced the Government of India to give more thrust to rain fed areas. The Integrated Wasteland Development Programmes (IWDP) taken up by the National Wasteland Development Board in 1989 also aimed at developing wastelands on watershed basis. This Programme was brought under the administrative jurisdiction of the Department of Wasteland Development in the Ministry of Rural Development. During the Eighth Five Year Plan, an area of 4.23 million ha in about 2554 watersheds covering 350 districts in the country was treated and developed with an expenditure of Rs. 9,679 million. In the Ninth Plan, an outlay was raised to 10,200 million to treat 2.25 million ha. The Ministry of Rural Development also launched a new initiative known as Watershed Areas for Rain fed Agricultural System Approach (WARASA), allowing the participation of NGOs as implementing agencies.

The Ministry of Environment and Forest also implemented a programme on watershed basis for sustainable ecosystem development in rain fed and degraded areas of the country since 1989-90. The programme was launched as the 'Integrated Afforestation and Eco-development Projects scheme (IAEPS)' to promote afforestation and development of degraded forests by adopting integrated watershed approach. Also, to integrate all watershed programmes in 100 priority districts, a Watershed Development Fund (WDF) was established in 1990-91 at the National Bank for Agriculture and Rural Development (NABARD). The WDF was set-up to help the State Governments to augment their watershed development programmes over and above the support they receive through budgetary resources (Sharma 2001). There was equal share in funds by NABARD and Ministry of Agriculture for this purpose which spent total of Rs. 2000 million.

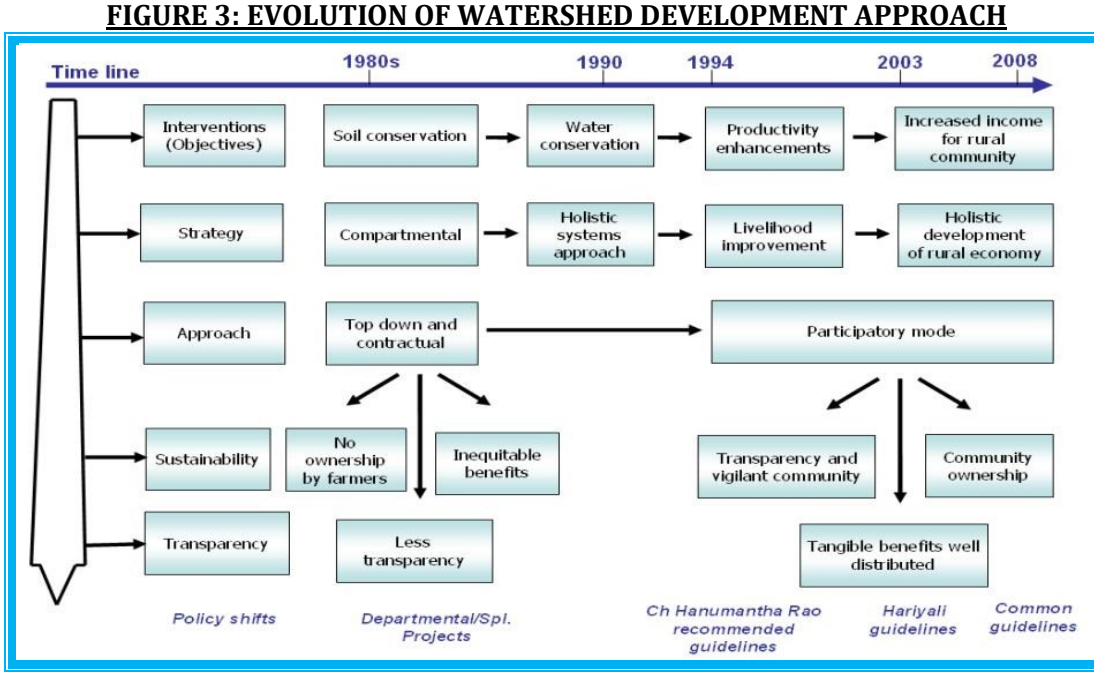
Hence, different ministries and national and international research and development organizations were involved in watershed research and development (R&D) programmes. These mainly include the Ministry of Agriculture (MoA), the Ministry of Rural Development (MoRD), the Ministry of Environment and Forests (MoEF), the Indian Council of Agricultural Research (ICAR), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), non-government organizations and international agencies. This resulted to take place these programmes in national level policy documents namely 'Agricultural Development Policy', 'Water Policy', 'Land Policy', 'Forest Policy' and 'Watershed Development Guidelines'.

So far, these programmes had laid down their own separate guidelines, norms, funding patterns and technical components based on their respective and specific aims, i.e. DDP focused on reforestation to arrest the growth of hot and cold deserts, the DPAP concentrated on non-arable lands and drainage lines for in-situ soil and moisture conservation, agro-forestry, pasture development, horticulture and alternate land uses. The IWDP made silvi-pasture, soil and moisture conservation on wastelands under government or community or private control as their predominant activity. The NWDPRA combines the features of all these 3 programmes with the additional dimension of improving arable lands through better crop management technologies. While the focus of these programmes may have differed, the common theme amongst these

programmes has been their 'structural-driven compartmental approach' of land and water resource management for sustainable production. Except put efforts for maintaining soil conservation practices, i.e. contour bunding, pits excavations etc., most farmers weren't take much interest to adopt various watershed practices on their fields. It was felt that a top-down approach cannot make desired impact in watersheds and application of individual and community based interventions are essential.

The integrated watershed development program with participatory approach was emphasized during mid 1980s and in early 1990s. This approach had focused on raising crop productivity and livelihood improvement in watersheds (Wani, *et al.* 2006, See figure 3) along with soil and water conservation measures. The Government of India appointed a committee to assess the DPAP and DDP with the purpose of identifying weaknesses and suggesting improvements in 1994 under the chairmanship of Prof. C H Hanumantha Rao. The committee thoroughly reviewed existing strategies of watershed program and opined that the "programmes have been implemented in a fragmented manner by different departments through rigid guidelines, without any well-designed plans prepared on watershed basis by involving the inhabitants. The achievements have been sub-optimal, except in a few places. Ecological degradation has been proceeding unabated in these areas with reduced forest cover, reducing water table and a shortage of drinking water, fuel and fodder" (Hanumantha Rao Committee, 1994, Preface). So that, they strongly felt a need for moving away from the conventional approach of the government department to the bureaucratic planning without involving local communities (Raju, *et al*. 2008). The new guideline was recommended in year 1995, which emphasized on collective action and community participation, including participation of primary stakeholders through community-based organizations, non-governmental organizations and *Panchayati Raj* Institutions (PRI) (GoI, 1994, 2008; Joshi, *et al*. 2008).

FIGURE 3: EVOLUTION OF WATERSHED DEVELOPMENT APPROACH



Source: *Wani et. al (2005 and 2006)*

Watershed development guidelines were again revised in year 2001 (called Hariyali guidelines) to make the programme more participatory, sustainable and equitable as well as further simplification and involvement of PRIs more meaningful in planning, implementation and evaluation and community empowerment (Raju, *et al*. 2008) and guidelines were issued in year 2003 (DOLR, 2003). The total number of projects sanctioned, treatable area covered and funds

released for Watershed Development Programme from 1995-96 to 2007-2008 in India presented in Table 1 given below;

TABLE 1: NUMBER OF PROJECTS, AREA COVERED AND FUNDS RELEASED FOR WDP FROM 1995-96 TO 2007-2008 IN INDIA

Name of Programme	Number of Projects	Area covered (In Lakh Ha.)	Total Funds Released by Central Government (Million Rupees)
DPAP	27439 (60.9 %)	137.20 (42.5%)	28378 (36.7 %)
DDP	15746 (34.9 %)	78.73 (24.4 %)	21032 (27.2 %)
IWDP	1877 (4.2 %)	107.00 (33.1 %)	27976 (36.1 %)
TOTAL	45062	322.93	77386

Source: *National Portal Content Management Team, 2010* and *Gandhi, 2012: IIM, Ahmedabad*

Before commencement of the Eleventh Plan Period, there is main challenge to move nation in the direction of "inclusive growth". Out of the total geographical area of the country of 329 million hectares, about 146 million hectares are degraded. Whereas, out of 142 million hectares of net cultivated area, 85 million hectares are rainfed arable land and suffered neglect in the past. This includes degraded land not only under private ownership, but also the one with the departments of Panchayat, revenue and forest. These areas reveal a grim picture of poverty, water scarcity, rapid depletion of ground water table and fragile ecosystems. Land degradation due to soil erosion by wind and water, low rainwater use efficiency, high population pressure, acute fodder shortage, poor livestock productivity, underinvestment in water use efficiency, lack of assured and remunerative marketing opportunities and poor infrastructure are important concerns to decide policies. Therefore, the National Rainfed Area Authority (NRAA) has been set up in November 2006, keeping in mind the need to give a special thrust to these regions for improve rural livelihoods through participatory watershed development with focus on integrated farming systems for enhancing income, productivity and livelihood security in a sustainable manner. Subsequently, Neeranchal Committee (in year 2005) evaluated the entire government sponsored, NGO and donor implemented watershed development programs in India and observed that, the implementation of the programme has been effective for natural resource conservation by increasing the productivity of the land, bringing additional area under agriculture, employment generation and social upliftment of beneficiaries living in the rural areas. But these are inadequate, sporadic and intermittent. They also suggested a shift in focus “away from a purely engineering and structural focus to a deeper concern with livelihood issues” (Raju, *et al.* 2008).

It is in this context with in coordination of the Planning Commission "Common Guidelines for Watershed Development Projects" formed and applied to all watershed development projects in all Departments / Ministries of Government of India concerned with this. These Guidelines broadly indicate a fresh framework for the next generation watershed programmes known as "Integrated Watershed Management Programmes (IWMP)" with effect from 1st April 2008 to achieve following objectives.

- Conservation, up-gradation and utilization of natural endowments such as land, water, plant, animal and human resources in a harmonious and integrated manner with low-cost, simple, effective and replicable technology;
- Promote sustainable farming and stabilize crop yields by adopting suitable soil, water, nutrient management and crop management practices.
- Generation of massive employment; Enhance the income of individuals by adopting alternative enterprises.
- Reduction of inequalities between irrigated and rain-fed areas and poverty alleviation. Restore ecological balance.

- Conserve soil, rainwater and vegetation effectively and harvest the surplus water to create water sources in addition to groundwater recharge.
- Cover the non-arable area effectively through afforestation, horticulture and pasture land development based on land capability class.

The department of Land Resources (Government of India, 2015) has taken up a numbers of initiatives for strengthening the implementation of integrated watershed management programme with the following promotional activities:

- ✓ "Neeranchal" – World Bank assisted Watershed Management Project
- ✓ Project Financial Management System
- ✓ Third party concurrent monitoring and evaluation
- ✓ Use of Remote sensing and GIS technology
- ✓ Use of Bhuvan Geo Portal of Integrated Watershed Management Programme
- ✓ Convergence of Agriculture and allied sector schemes with integrated watershed management programme, and
- ✓ Benchmarking of watershed management outcomes.

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