Chapter – I

INTRODUCTION

Perhaps nothing could be more precious than soil and water when it comes to sustaining all forms of life. But these precious resources are subjected to great misuse and abuse, both domestically and industrially. This leads to grave environmental consequences in the long run. The Indian Eight Five Year Plan highlighted that the hills of the country are faced with certain peculiar problems inhibiting the process of development on account of the difficult terrain, variable agro-climatic conditions, distinct social cultural features; the hill areas have remained backward. Proper watershed management as well as its integral parts becomes the right approach to bring about overall economic development and in improving the socio-economic conditions of the resource poor sections of people in the hills of Manipur. The study area i.e. Upper Tuivai River watershed is endowed with rich biodiversity but the over exploitation and mismanagement of these resources by the people have resulted in degradation and decline in productivity. Shifting cultivation which once sustain the tribal economy have now become the initiator of the cycle of poverty. Poverty is the main reason behind the continuance of shifting cultivation; along with mass
timber, fuel wood and charcoal production both for domestic and industrial purposes. These have caused environmental degradation in the study area. Land degraded due to soil erosion is one of the important factors for declining productivity on fragile land area where the poor marginal farmers struggles for a living. This leads to grave environmental consequences which in turn have affected the socio-economic life of the people. Proper watershed management as well as its integral parts is projected to become the right approach in bringing overall sustainable development by bettering the socio-economic conditions in the hill region.

Watershed is closely related to the environment of the place. Environmental degradation and destruction of watershed are two sides of the same coin. Lately, there is a growing concern in the North East Region about the increased degradation of the environment specially caused by anthropogenic factors. Seventy percent of the region being hilly, it is felt that much of the deterioration is due to indiscriminate felling of trees and the unceasing practise of shifting cultivation commonly known as ‘jhum’. Thus the environmental challenges that the region is facing today are greater than any other time in the history. Due to increased human activities towards the forest land and its utilization of natural resources, the overall health and wealth of the hilly people has been affected.
Watershed is a natural geo-hydrological unit, water precipitating within which leaves its boundaries through a common exit in a concentrated flow. It is simply an area, a piece of land where people live, in which all the waters drains into a common point. It is also defined as a catchment’s area bounded by a ridgeline on three sides of valley or stream. All natural and anthropogenic activities within the watershed affect each other and have a definite bearing upon each other. Better resource management in the hilly regions can be achieved by taking the watershed as a unit of development.

The concept of Watershed Management is a holistic approach aimed to maintain geo-ecological balance and increasing productivity from farming and harmonizing ecology, economy, and equity. Therefore, this research work propagates main principles of watershed management as to how the utility of land according to its suitability, putting adequate vegetation cover on the soil during the rainy season, in situ conservation of rainwater, avoiding gully formation for control of soil erosion by construction of check dams, rock fill dams, terrace bunding and contour bunding at suitable intervals, how recharging groundwater by construction of percolation pitch or planting more trees, maximising land productivity, increasing cropping intensity, land equivalent ratio, safe utilization of marginal lands through alternate land use systems, afforestation, and
ensuring sustainability of the geo-ecosystem that will benefit man, animal, plant and water complex in the watershed.

Watershed development programme involves the treatment of the entire area- arable and non-arable, bounded by ridgelines on either side of the valley and in raising the level of ground water. Based on various reports by both the government and non-governmental organisations, analyses have shown that scientific watershed management is beneficial to the people and the entire area by reducing the inherent instability in agricultural production.

Manipur, having a geographical area of 22,327 Km$^2$ falls within the sub-tropical monsoon region. Forest area of the state constitutes about 67.8% of the total geographical area. But in the last few years, there is an increase in the rate of deforestation. As a result, there is a drastic reduction in the forest area in Manipur. As per the report of the National Remote Sensing Agency of 1998-99, the main forest area of Manipur is reduced to only 3.22% of the total area. The total degraded forest or scrubland is 64.05% and land under shifting cultivation is 21.97% as per the report on Land use/ Land cover Manipur State 1988-89. The total forest area of the state as per official figure of 2003 is 17,219 km$^2$ i.e. 77 per cent of the Total Geographical Area; 63.3 per cent of the total forest area are vested
with local tribal chiefs or local hill development authorities and are controlled by them.

The Upper Tuivai River in Churachandpur district is drained by five main rivers namely Tuila River, Tuivai River, Tuili River, Tuilak River and Tuima River and a network of channels and small streams called ‘Luis’ and ‘Vachas’, which makes up the tributaries of the rivers. A few decades ago there was no imminent problem of soil and water mismanagement and poverty as such in the watersheds of these rivers and streams mainly because the population was low, forests were intact, soil erosion was least and the flow of the rivers normal. But now the situation is just the reverse. This is basically due to lack of awareness among the masses about the basic important of the land and its natural resources. Ninety per cent of the region being hilly, it is felt that much of the deterioration is due to indiscriminate felling and cutting of trees; and the unceasing practice of shifting cultivation commonly known as “jhum” and locally known as ‘Bu-Lei’, ‘Chang-Lei’ or ‘Thing- Lei’. The sustaining nature of shifting cultivation could no longer be seen today. But the very ill effects of it are being tabled every now and then in almost every discussion relating to forest and environment. Thus, the environmental challenges that the hills are facing today is greater than any other time in the history known. Due to increased human activities towards massive unscientific and unmindful
utilization of natural resources, the nature of the land and its climate has been affected. So, there is an urgent need to restore the productivity of shrunken resources, developing and managing of the resources and enhancing the productivity of available resources to achieve sustainability without affecting the environment.

1.1 Statement of the Problem

Gone are the times when hills were green and covered with bountiful forest, birds and animals have space and the people works in their fields with gaiety, brooks and streams were in its natural ambience and perennial throughout the year. The waters in the rivers then were never too much during the rainy season and never too less during the dry season both in the hills and valley. However, in the last few decades, the anthropogenic pressure on forest and land has denuded and degraded the watershed beyond one’s imagination. Given the ecological importance of watersheds and the extent of human dependence on the services provided by them, watershed degradation has potentially enormous environmental and socio-economic costs. The dwindling forests are suffering serious losses at the hands of the local farmers, logging operators and charcoal makers. The underlying causes of deforestation are rooted in the complex web of social, economic and institutional problems both within and outside the forestry system. They include the combined effect of poverty, skewed land
distribution, insecure land tenure, low agricultural productivity, rising population pressure, increasing demand for tropical timber, fuel wood, and fodder and food grains (Dent, 1990). The desperate search for more and more agricultural has forced small farmers to cultivate marginal, unproductive lands located on steep slopes and hill sides and to denude vast areas of forest cover. And this is exactly what is happening in all parts of the study area.

But now faced with various problems of environmental degradation, consciously or sub consciously, this indigenous people could no longer mitigate with their traditional knowledge of sustaining and conserving their surroundings as they have in the past. This is wholly because of the influences of cash economy thereby over exploitation. Howsoever they tried to go with development, they still lack behind.

Forest depletion has accentuated further soil erosion, decline in land productivity and amounting dearth of fuel, fodder and water resources over a period of time and they have further eroded the resource base on which they must subsist (Owen et al.1998), this is what is happening within the study area. Trees have been cut down massively citing any reason they like. The people are backward and ignorant about the consequences. Once the medium of the plant growth is degraded, the path to recovery is rather slow and difficult. The deteriorating in soil fertility, productivity and
quality has become a matter of serious concern. The efficient management of natural resources would largely determine the prospects of increasing and sustaining productivity in the seasonally dry tropical and sub-tropical ecosystem (Swaminathan, 1980).

All the rivers in Manipur are rain fed. This implies that our rivers are solely dependent on rainfall and the sustained availability of water in the rivers is affected by our own activities. Our forest is dwindling at a rapid rate and rainfall from this source is rapidly diminishing. If deforestation remains unchecked at this rate then we will surely be in a dead-end one day. Consequently, the study area has remained far behind the race of development. What is therefore, noted fact is the backwardness of the region is not caused by lack of resources but by the problems of resource development and management. The crux of the problem lies therefore, in the use and conservation of environmental resources at the grass roots level. Therefore, if remedial measures are not pursued rigorously and expeditiously, both the resource base and agricultural economy suffer (Singh, 1984).

Besides, the land-use changes in the study area have simultaneous impacts on the land-use pattern and the expanding urban areas in Churachandpur Town. Moreover, the approved Tipaimukh Dam to be constructed in the southwestern part of the district could also affect the
study area as and when the construction works once begin. In order to understand this process, it is important to take a look and understand the whole socio-cultural on which the traditional forest and biodiversity management was based in the region and a comparison with the rest of India too. A look at various stakeholders in forest and other natural resource management can help one to identify its possible causes.

In the context of above, the most prevalent challenge, to understand and address, is the ongoing process of rural transformation in its face value though not in its truest sense of the term. These include rapidly disintegrating socio-cultural value system, indigenous knowledge and practices, and local institutions. Thereby, this has led to intensive migration of the educated and skills or semi-skills from remote rural areas to the urban centers within and outside the region. And this created multifarious social and environmental problems ranging from changes in land use to health and hygiene and loosening of linkages of inhabitants with natural resources resulting into deteriorating state of resource protection and this has ultimately led to eroding of genetic resources, especially from traditional farming systems.

Now, the key task is to strengthen the existing forms of community participation and local governance in the management of natural resources. Thus, protecting resources and at the same time to explore alternative and
more participatory ways to reach this objective in order to seek sustainability. Hence, the main aim of watershed approach is to ensure a holistic view of water and resources and to prevent further degradation of this ecologically fragile area. Reforestation, afforestation, check land degradation, reclaiming wasteland, mitigating increasingly vulnerable periods of drought and increasing the carrying capacity to sustain the livelihood of rural populace is highly demanded. The study area continues to be the major procuring region especially timber and non-timber, firewood and fuel wood and most importantly charcoal and fuel wood produce for markets. Therefore, poverty is the greatest threat to environmental protection. The people still lives in the most vulnerable conditions and lack of mineral resources have led them to be totally dependent on their immediate surrounding and their environment. For their existence they have to generate greater pressure on the natural resources, on which they have little control. Therefore, this resource shrinks with time due to unscientific and over exploitation nature along with the population pressure and more demands for household consumption as well as for industrious purposes. The carrying capacity of the land is becoming less which in turn threatens all the forms of life. Economic growth should be made the prime condition in the study area to contain poverty and also for effective environmental protection. And the instruments of economic growth should be on the basis of need base and the welfare of the people
should be given due priority without causing serious damage to environments. Low productivity of upland paddy and other crops is prominently witnessed in the study area. Land degradation displayed particularly in soil erosion is a prime control on sustainable agricultural development on which the economy of the study area depends on. The local population of the study area regarded earth as the cradle of their existence. They considered the earth as the giver of foods, feeds, nourishment and sustenance of life. To them environment includes not only the environment around them but also the environment within them – the total environment. It also includes all the conditions that affect their lives. In short, environment refers to all ‘surroundings’, physical and biotic, of organisms. The government as well as non-governmental organization also conceived this degradation as a threat. In any watershed, mismanagements and unscientific land use within often changed instead of giving better yields there is watershed degradation as excess demand breaks balancing tool of the renewal resources. Further, the increasing pressure of population also lead to food and fuel scarcity, resulting to demand for more land and water, hence depletion of resources and creating a problem chain of watershed degradation. The Government of India also implemented Integrated Watershed Management Programme (IWMP), almost in all parts of the country and the study area also falls under this. Therefore, this research will incorporate the programmes implemented as well as attempt
to propose land use and its conservative measures and seek sustainability for the people in this region.

1.2 Objectives

The main thrust of the present study is on the following objectives:

(i) To evaluate the spatio-temporal changes of Land use pattern in the study area.

(ii) To appraise the factors responsible for watershed degradation and its impact.

(iii) To assess the progress of the projects taken up under the Ministry of Resource Development, DLR

(iv) To give a rational watershed management and sustainable development strategies and also to utilize the study as the basis for planning and development and for future researches.

1.3 Data Base and Methodology

In the present study, the physical parameters like slope and drainage are generated from the topographical maps 83H/7, 83H/8, 83H/11 and 83H/12 (SOI) at 1:50,000. The data pertaining to the land use map and its temporal changes that have occurred during the period from 2000 to 2007 were derived from IRS-IC/ID LISS III of 2000 and 2006 respectively.
Besides, the land degradation maps of ten sub-watershed are also prepared based on NRSC guidelines. The Google Earth high resolution images (source - http://www. Google Earth.com) and field checked data collected through field in the month of February, 2010 were also used for validation of generated map. Codification of watersheds has been adopted in accordance with the scheme prescribed in Watershed Atlas of India, developed by AISLUS. Socio-economic data and IWMP information were collected from the Census 2001 and DRDA Office, Churachandpur respectively. Various other primary information were gathered through household survey discussion with the key informants like the village Chiefs and village elders. They were asked about their experiences and observations on the rate of changes of land use, effect of soil erosion from the upland areas, etc.

1.4 Review of Literature

A watershed is the area of land where all of the water that is under it or drains off of it goes into the same place from a higher level to the lower level. John Wesley Powell, scientist geographer, put it best when he said that a watershed is, "that area of land, a bounded hydrologic system, within which all living things are inextricably linked by their common water course and where, as humans settled, simple logic demanded that they become part of a community."
Watershed management involves harmonious development and utilization of land, water, vegetation, human, animal and other resources on an integrated manner. Development of any area on a watershed basis presents an ideal example of integrated approach. Watershed is the natural and most effective unit for management of rain water and other resources of an ecosystem. There are three stages of management planning unit- macro, micro and meso watersheds. The macro-watershed is a large area comprising watersheds of several tributaries of a main river. Micro-watershed comprising the catchment of a stream and meso-watershed approach represents the catchment of a tributary. Soil is a finite and non-renewable resource. Degradation of the soil resource may lead to severe economic, ecological, social and political problem. Therefore, it is a plain truth that a woeful neglect of land and total absence of calibrated management of the two vital natural resources i.e. soil and water leads to environmental degradation. The Watershed approach would support the cause of sustainability which requires the best use of natural resources as well as ecological sustenance. Therefore, Watershed may be considered the ideal unit for the most effective and gainful management of these resources and protection of the environment. Watershed development and management programmes have emerged as an appropriate strategy to manage natural resources (land, water and forests) and to provide sustainable livelihood to the rural poor. It is a holistic concept which tries
to integrate several components like soil and water conservation, forest
development, agriculture, horticulture, livestock development, etc. it has
led to (several dimensions of sustainable development, e.g. ecological
sustainability (check in soil erosion, check in rate in silting, groundwater
recharge, etc.), economic sustainability (increase in crop intensity and crop
productivity, milk production, etc.) and social sustainability, (equitable
distribution of common property resources like water, forest produce and
ensuring people’s participation). Watershed management is an integrated
and interdisciplinary approach involving manipulation of natural,
agricultural and human resources of a watershed to provide sustainability
of resources to the watershed community. It must consider the social,
economic and institutional factors operating within and outside the
watershed. Watershed management usually involves the use, by the people
of the watershed area, of the watershed natural resources, with their active
involvement and in harmony with the ecosystem. It takes into account the
benefits likely to accrue to the people living within and in the vicinity of

S. Sudhisri et al. 2005 in "Tribal Watershed Development through
Community Participation in Orissa" stated about the watershed concept, its
history and evolution. Watershed is not merely a geo-hydrological unit as
defined by the hydrologists, rather, it is a landmass bounded vertically by
the area influenced by human activities and horizontally by the water that drains into a point in the channel. Within this area we have a system consisting of a number of very dynamic and interrelated physical, social and economic factors. In terms of resource development, it covers development and collective, effective and efficient management of natural resources, like soil, water, vegetation and other associated components.

Watershed Management is an approach of area planning of natural resources; especially land, water and vegetation to sub serve the socio-economic needs of human society or community concerned. It has to be sustainable on ecosystem principles, when the treated watershed would have to permit maximum possible stability through the process of production, consumption and regeneration (natural and induced). It has to be sustainable in terms of meeting sustenance and trade off needs of the household or livelihood of its members over the years to come (Das, 1994).

The watershed-based conservation of natural resources began during late 1930s in USA and in New South Wales, Australia. In India, this approach was first and mainly concerned with the management of resources on medium or large river valleys. The main focus was to prevent rapid runoff under concomitant, soil erosion, and so would slow down the rates of siltation and limits the incidence of potentially damaging flash flooding in river courses.
In India, watershed approach as applicable to the development of rain-fed agriculture was evolved in 1983 in the form of National Watershed Program with 47 watersheds developed by ICAR. Unlike the earlier approach, the entire strategy framework was holistic integrating soil and water conservation and standard agronomic practices against the backdrop of the alternate land uses. This resulted into two to three-folds increase in crop production, shift in area under more profitable oilseed crops from less remunerative course cereals (Hegde and Pandurangaih, 1989), and rise in income level, increase in cropped area and cropping intensity (Umrani et al, 1989) and a concomitant in number of working days per year (Satpathy and Bhoj, 1989). Although the farmers accepted the watershed program, but the impact was short-lived because the beneficiary farmers reverted to their traditional technologies once the benefactor withdrew the support (Walker and Rayan, 1990). Katya and Das (1993) opined that financial assistance was not adequate to encourage adoption; it was the farmers’ participation that ensured the success of watershed program.

In 1987-88, National Watershed Development Program for Rain fed Area (NWPRA) was launched which focused mainly on the delivery of technical inputs through government machinery on agricultural lands, without linking these with the uncultivated land and without sound people’s participation. The poor coordination and absence of people’s
participation in planning and implementation of the program impaired the desired impact.

Whereas the introduction of new guidelines (Anonymous, 1994) on watershed development, based on Hanumantha Rao Committee findings, which took effect on 15 April, 1995 has taken care to overcome the above shortcomings. Several government programs, such as DPAP (Drought Prone Area Programme), DDP (Desert Development Programme), IWDP (Integrated Watershed Development Programme), now provide for the development programs for harmonizing the synergies of different planned resources to realize the livelihood aspirations of the agrarian communities.

The earlier watershed development programs were mostly land and water resource based and emphasis used to be laid mostly on technical aspects. The anticipated success, in most of these projects, was elusive, despite their well-planned and technologically sound interventions backed by political will, committed bureaucracy and financial resources (Douglas, 1997). Whereas, the new participatory watershed development approaches emphasis’s community participation on livelihood support, capacity building, planning and implementation, monitoring and evaluation towards equity, social justice and institution building.
In India several Ministries namely, Ministry of Agriculture, Ministry of Rural Development and Ministry of Environment and Forests have been involved in Watershed Development Programs with substantial variation in their approaches. The Ministry of Rural Development had been coordinating sector-wise flagship schemes such as IWDP, DPAP and DDP under Watershed Development Programmes. The main objective of the Watershed Development Programme (WDP) was to improve water conservation, irrigation facility, and land use pattern leading to increased agricultural productivity in drought prone and desert prone areas. Poverty reduction, better livelihoods and improved bio-physical and socio-economic environment would bring about sustainable development. Thus, it has become more than just water and soil conservation.

World Bank, 2006 on “Sustainable Land Management (SLM): Challenges, Oppourtunities and trade-offs” in Agriculture and Rural Development explicitly cited how sustainable land management could bring successful benefits to the individual households or community by emphasizing enhanced agricultural productivity, food security, and income, rather than land degradation per se. Land degradation and its relation to rural poverty remain poorly understood, though the link remains very much evidence. A downward spiral of land degradation and poverty may be occurring-a kind of physical-technical equivalent to Lewis low-income
trap—with land degradation causing declining agricultural productivity and worsening poverty, and poverty causing households to further degrade their land. It overall talks about the opportunities of SLM where intensification of land use and integrated resource management, exploiting the production and environmental functions of land, mechanisms and incentives for improved land management at the watershed level, trade-offs and in SLM strategic options the policy and sector work, research and technology development, knowledge. Protecting and investments in watershed management are critical to the sustainability of land and water resources. It thrust upon the causes of degradation into three categories, one of being that of whose roots are behavioral towards the local land use practices as the driving forces behind degradation. These driving forces can be reversed by identifying the perverse incentives and underlying economic forces. The authors quoted Geist and Lambin (2002), “causal synergies”- associations of proximate and underlying causes of deforestation such as the macroeconomic forces that create the incentives to which individuals respond than “single factor”. It also highlighted about the lesson learned through review of investment experiences in natural resource management and conceptual framework used by the OED to evaluate successful NRM based on three principles which were: 1. Sustainability is likely when renewable resources are properly used and conserved rather than depleted.
2. Economic efficiency is essential and the resulting benefits must be equitably distributed. Therefore, the Bank is very alert to safeguard issues - social and indigenous rights, environmental protection, development policy lending, and environmental impact assessments.

T.L. Zhang, X.X. Wang, B. Zhang and Q. G. Zhao (2000) in their paper, “Soil Degradation in relation to Land Use and its Countermeasures in the Red and Yellow Soil Region of Southern China” in “Integrated Watershed Management in the Global Ecosystem” edited by Rattan Lal talks about the urgent need to adjust and optimize the land use structure as the key to prevent the land from continuing degrading and to restore the degraded system. The authors methodologically took parameters of soil erosion, decline in soil fertility, soil acidification to see soil degradation. It also takes into consideration that the interaction of land use and soil degradation and assess its effects on Land Use and soil erosion, soil fertility and its acidification. It went on to developed as to how to counter the land for sustainable land use and suggest on optimization of sustainable land use in the form of diversified landscape level and stereo-ecological land use system, which rationalize and optimize the temporal and spatial disposal of biophysical resources through adjusting the agricultural structure, namely, changing from mono-and valley-cropping agriculture to an integrated development of agriculture, forestry, animal husbandry, and
fishery. It also suggests restoration of soil fertility on the low-yield lands and wastelands by increasing the cropping intensity and adopting the cropping systems and tillage methods and also increasing the nutrient inputs and the utilization efficiency. These management practices proved very efficient like conversion of uplands into paddy fields in the areas with good access to irrigation, rotation of paddy rice with upland crops in the paddy fields, adequate techniques for nutrient recycling in agro-ecosystems, and new techniques for exploiting the untapped wastelands. And it also suggests stereo-conservation system such as contour trenches and check dams, terracing, strip planting, etc.

Rattan Lal. (2000) in his paper “Managing Watershed for Food Security and Environmental Quality: Challenges for the 21st Century” presented the on-site and off-site adverse impacts of soil degradation with emphasis on the magnitude of yield reduction, incentives and approaches that facilitates adoption of improved technology, and ability of soil/land to restore itself under agricultural intensification. It went on to note the success story of watershed management and participatory strategies. Nevertheless, it also mentioned about the knowledge gaps and researchable priorities and laid out the constraints of watershed strategies in lacking the appropriate base line data of natural resources in relation to all its aspects i.e., biophysical, socio-economic and cultural aspects. And he also said that
watershed management research remains an expensive one as it requires equipment for monitoring and evaluation.

Dennis P. Garrity and Fahmuddin Agus. (2000) in their research paper, “Natural Resources Management on a watershed Scale: What can Agroforestry Contribute”, talks about the strategic issues in Tropical Watershed Management and how “Agroforestry” could be an ultimate potential in achieving social, economic and environmental benefits. In Indonesia, they found that the villagers have often evolved complex agro-forest land-use systems by cultivating mixed perennials with their food crops after slash and burn as their logical part of their livelihood strategy. These agro-forests are predominantly based on rubber, dipterocarp resin, or fruit species, with timber species husbanded as a component. And in Thailand, the sloppy areas are converted into fruit tree gardens and this have contributed in higher and more stable income and at the same time, it also highlighted the importance of compaction by human traffic in tree based systems as a determinant of the water conservation value of an agroforestry practices. They concluded that Watershed management requires an integrated and multi-sectorial approach to sustainable development. It labeled Agroforestry as a highly integrative field on the interface between the agricultural, forestry, social and environmental sciences to play a critical central role in helping to provide key technical
and institutional innovations at the landscape scale. As a natural resources management system that involves the increasing integration of trees into the agricultural landscape, it will play a major role, holistically and comprehensively, in the process of providing options that provide rural livelihood, and yet are conducive to the conservation of fragile watershed resources.

Eric T. Craswell and Chalinee Niamskul (2000), in their paper ‘Watershed Management for Erosion Control on Sloping Lands in Asia” reviewed the major changes needed in the approach to research and development activities to promote sustainable land management in developing countries which were highlighted in an international meeting in Zschortau, Germany in 1995. Therefore, it reviews the changes and highlights the case of land and water resources in the hilly and mountainous areas of Tropical Asia where population pressures and economic growth are significantly affecting land use. It also describes a new consortium on managing soil erosion that brings together scientists from eight Asian developing countries and several developed countries with the common goal of combating soil erosion through integrated watershed management. The consortium has developed comprehensive guidelines for the selection of sites for the model watershed studies. An interdisciplinary site-selection team has visited ongoing studies in China,
Indonesia, Laos, Nepal, the Philippines, Thailand and Vietnam. The sites visited vary widely in social, economic, and biophysical characteristics, and in the capacities of national scientists in different fields, but the new research paradigm can be applied to all of them. The ultimate goal is a quantum leap in the capacity of watershed research in the region, which will increase awareness of the scope of the erosion problem and develop effective ways of combating it.

Jasbir Singh, Narinder Deep Singh and Rakesh Sharma (2005) in their research paper on “Watershed Management Approach in Shivalik Hills: A Study of Chenani Watershed, J&K”, in “Watershed Management and Sustainable Development”, described about the need for Watershed approach in bringing a visible benefits in rural areas and attracting people’s participation. It studied about the present situation of topography, geology and soil types, land use and agriculture, forest and its types, level of soil erosion. It also studied on the work done during the project (1992-97), where nearly 1,300 hectares of ecologically fragile area was treated, and nearly 2,000 hectares of degraded land were regenerated. These were achieved by closure formation, soil and moisture conservation, vegetative measures, employment generation, usufructs of the project and people’s participation. Besides, it suggested planning on the basis of its actual needs of the inhabitants, to increase income level so that dependence on natural
resources is lowered, to maintain the assets created during the project, more people’s participation and cooperation, to raise the carrying capacity of the area and to mitigate the bio-mass requirement of people in a sustainable way, better coordination among government organization for efficiency and timely release of funds as the pre-requisite for successful implementation of projects.

K.G. Tejwani (2005) presented a paper on “People and Watershed Management” in “Watershed Management and Sustainable Development” wherein he talks about people’s participation as a sign of forward movement in natural resource management and focus on how all the developmental actions are anthropocentric. It also talks about how people are the agents of change and how the management of resources is achieved by faith, trust or force, and by their own wisdom and traditional knowledge. Therefore, it calls for identifying the broad spectrum of benefits at the planning stage, then consulting and discussing the local needs to deliver the goods and services in time.

Kh. Paradip Singh L. Lhingneilam and (2012) in their paper, “Assessment of Landuse/Landcover in the Upper Course of Tuivai River Basin” have studied and detected the landuse changes during the period of 1999-2000 to 2005-2006. This paper brought to light that Shifting cultivation and Charcoal production drives the main economy. Yet there is
a decreased in shifting cultivation which is not the ecological awareness of the farmers but decrease in the area under thick forests or locally called “Thingchaam”, now replaced by scrublands. Despite the perennial nature of the rivers, the springs and luis which are the sources of water for drinking and other domestic purposes, are drying up and needs specific mitigation. The study suggested that horticulture, medicinal plant cultivation, commercial tree plantation coupled with other integrated watershed management could be the possible way out to revive the forest cover and improve for the future of agriculture and sustainable development in the study area.

In the words of Thapa, in defining watershed management, the communities and their socio-economic activities are the prime concerns in endeavoring watershed management but it has been overlooked in all its kind of watershed management definitions. Ultimately, the unifying focus in watershed management is in how various human activities affect the relationship between water and other natural resources and the people themselves and thereby provides a basis for actions concerning the development and conservation. An interdisciplinary approach has been followed in the study, given the complex and diverse factors underlying WDPs, such as the bio-physical, social, ecological, institutional, economic and other factors, besides the regional variations. The programme is
operational across the country that involves multiple stakeholders. The Ministry of Rural Development (MoRD), Government of India encourages debates and discussions and has formed various Committees to solicit feedback for improving the programme implementation in the country. The schemes such as IWDP, DPAP and DDP were merged under the Integrated Watershed Management Programme (IWMP) in 2008, to bring about a comprehensive approach to sustainable development. The “Common Guidelines-2008” was developed for effective implementation of the project. This guideline entrusted the government of its state to work on and implement IWMP in the entire district for improving the socio-economic conditions of the people by taking care of their surroundings.

Iyer and Roy, 2005, in an introductory part of their edited book, "Watershed Management and Sustainable Development", highlighted about the concept of Sustainable Development. During the 1980s the concept of ‘Sustainable Development’ acquired prominence after it was formulated by the World Commission of Environment and Development (popularly known as Bruntland Commission, 1987) in its reports “Our Common Future”.

‘Sustainable Development’, is development that meets the needs of the present generations without comprising the ability of the future
generation to meet their own needs. This concept of sustainable development, projected that it has the implicit assumption i.e. development based on plunder of natural resources is inhuman and therefore, conceived that development with a human face is only sustainable. However, again, it does not define the basics of development with global equity within its ambit; it allows inequity; global inequity, inequity is an independent world system by its very logic sustains inequity in national, regional and local system. The concept of ‘sustainable development’ in the context of watershed development raises the issues of ‘inequity’ and advocates for ‘development’ with ‘people’s participation’ and ‘equity’ as the basic ingredient of sharing Natural Resources. This concept of ‘sustainable development’ as expressed by Gopal and Roy, 2008, is broad based as it incorporates ecological, economic and socio-cultural sustainability. The concept of ‘ecological sustainability’ includes regeneration of forest cover, increase in surface and ground water of potential and involving efficient natural resource management systems. Economic Sustainability would ensure sustainable livelihood in terms of economic productivity, food security, fodder security, fuel security and employment security to the community. The concept of ‘socio-cultural sustainability’ includes the formation of the new socio-cultural institutions, strengthening of the traditional socio-cultural institutions, promoting equity and social
empowerment through community. The ingredients of socio-cultural sustainability include social equity, social empowerment and strengthening of socio-cultural institutions.

It would be appropriate in this context to highlights the success experiences of Sukhomanjari Watershed Project in Haryana which was later on extended to whole of Punjab and Haryana in the Northern India. The concept of Social Fencing was involved in this project. As a result, water resources development and associated joint forest management activities the village has achieved ecological and economical sustainability. People have achieved food security. Tree density in the catchments area has increased. Run off has also decreased because of the increased in vegetation cover in different catchments and ground water level also increased.

S.B. Singh and Kabi P. Pokhrel in their paper Sustainable Development of Natural Resources through Integrated Watershed Management in MWDR, Nepal highlights the importance of integrated Watershed Development approach as an effective mechanism for efficient management of local resources and holding the key for sustainable development, in poverty alleviation, livelihood security and equitable access to resources in the region.