

## **CHAPTER IX**

### **CONCLUSION**

Balason watershed, in the Darjeeling district of West Bengal, is a basin drained by river Balason and ten major tributaries. All these rivers rise in the Himalayas and flow either southwards, southeastwards and southwestwards to reach the plain land. All the rivers flow through deep gorges as the terrain is mountainous. The hard gneissic rock in the northern part of the basin is resistant to erosion whereas southern part has comparatively softer rock, less resistant to erosion. The difference in elevation in the basin is very high with elevations ranging from 300m to 2300m. In few places the land is steep whereas in others it is rolling. The area of the basin is 229 km<sup>2</sup>. Such vast area has rocks of Daling series and Darjeeling gneiss. In the southern part of the basin all the stratas of rocks are inclined towards the north at rather high angles. In the central part, the dips are rolling and irregular and towards the north the dips are southerly. This suggests that there is complete inversion of rock stratus due to the synclinal thrust of the Himalayan uplift. The rock layers are extremely folded and crumbled in many places making it loose and vulnerable. From Kurseong to Ghoom on the eastern side of the study area, the gneiss lies as a continuous belt. The presence of gneiss in the study area has a very profound effect on the other parameters having bearing on the soil and the development of drainage on such soils. The fast flowing mountainous rivers have easily cut their valleys on such rocks by the method of corrosion. Severe down cutting has resulted in the formation of 'V' shaped valleys. The homogeneous nature of rock has helped in the development of dendritic pattern of drainage all over the Balason basin. Where the rock is hard, the slope formation takes the shape of convex slope. In many cases knick points are present on the course of the rivers as a sign of upliftment. The Balason and its tributaries drain the tea gardens in the area. The land has steep slope

ranging from 15° to 30°. Medium sloping land is more in the area where land is sloping. Usually, high relative relief zones coincide with high steepness of slope, which indicates that the rivers in the basin are in their youthful stage with more erosive power. Climate of the basin have typical monsoon type of characteristics with temperature ranging from 7.8°C to 23°C. Incessant rainfall occurs in between June and September. During this time the surface run off causes maximum soil erosion in the watershed area. For the last few years snowfall is also causing severe problems to the crops but attracting tourists from different parts of the world and India itself. Humidity in the air is always high. Heavy rainfall accompanied by comparatively low average temperature causes podzolization and leaching in soil. Soil forming process is slow and in most places skeletal soil layers are formed. Where the slopes are gentle mature soils are found and such places are ideal for tea plantations. The vegetation type is mainly dominated by humid temperate forests along with few scrubs. Though forests are getting highly degraded due to increase in the number of population and livestock, they are the most valuable natural resource of the study area. Other than forests, human resource is the most important resource in the area.

The villages where people reside are mostly small to medium in size. In tea garden villages, people had scattered settlements to take advantage of the limited resources available in such areas. The khasmahals mainly developed as places of residence, are densely populated and few are congested due to smaller size. In such khasmahals people has to struggle for resources though its availability is adequate due to improved socio-economic conditions. Khasmahal like Sonada, has the highest population and Maujha Forest, the lowest. Whether population is high or low is not much important as the availability of all the basic amenities provided to them is important. The area being covered by tea gardens, it is the authorities of the tea gardens who are responsible to take care of the problems of the local people and providing them the basic amenities. Rural lifestyle

dominated by women and men both working in the tea gardens control the rate of socio-economic development of the area. Sex ratio is moderate with maximum villages having 1000 females per 1000 males. This is because, tea gardens employ more females than males. Among the SC's and ST's, SC's dominates the study area. ST's are mostly found in the Khasmahals where they are engaged in all sorts of non-farming activities. Literacy rate in the study area is high because in the vast forested areas, two persons out of three residents are literates. Since population less literacy is high. Males have a high rate of literacy than the females. Though free meals are attracting children to the schools but they are interested more about the meal and less about the education. Children are also engaged in works in the tea gardens. Literacy rate is increasing through the last three decades inspite of all these constraints in the educational system. Many schools do not have teachers and there is no inspection done by the authorities on a regular basis. Population density ranges from 332 persons / hectare in Sukhiapokhi to 1 person / hectare in the forested villages. The population distribution is very haphazard in pattern. The village of the basin has high positive growth of population which needs to be controlled for the proper planning and development of the study area. The percentage of cultivators and agricultural labourers are low compared to other workers. Other workers include people working in the tea gardens. The percentage of marginal workers in the study area is low because percentage of total main workers is very high. Since the tea gardens employ maximum permanent workers, marginal workers in the form of casual staff are less in the tea gardens. All these groups of workers are engaged in different activities like agriculture, forestry, tea garden labourers and other non - far activities.

Among the different land uses, unirrigated land covers maximum area. This indicates that both tea plantations and agriculture are rainfed. Forests occupy the second major share of land though its exploitation has led to its destruction and degradation. Culturable waste occupies the third position and there is lot of scope to utilize

these lands for sustainable economic development in future. Area not available for cultivation is being utilized to its optimum level whereas irrigated land is the least with no proper system of irrigation available in the area. The tea gardens are taken on lease from the Govt. for 99 years. All other lands are owned by the people themselves. Revenue system is prevalent and all land owners have to pay taxes. Alienation of land from Nepali farmers to plainsman is legally prohibited and the Govt. controlled the optimum size of holdings. Most of the farmers are owner cultivators. The incidence of rent was tolerable in the study area.

Except paddy all other crops are grown depending up on rain. Cropped area under cereal crops is the highest in the basin whereas production wise potato has the highest yield. Production in the tea gardens fluctuates every year. Among all the tea gardens, Gayabari shows a steady rise in production. Optimum utilization of land can only be possible if people have knowledge and experience in the same field.

Socio-economic condition of the people is in a deplorable condition with insufficient number of educational institutions present in the area. Though primary education is available in most of the villages yet middle schools, secondary schools and other schools are very few in numbers. Low participation of girls in educational institutions indicates that girls are still neglected in the society. Govt. funded free education is often threatened by private school because they teach in English medium which is in great demand in present day society. Medical services are inadequate in the study area. People have to travel 10kms to avail improved medical facilities. Villages where there are medical services do not have either doctors or medicines. Compounders and untrained nurses attend the patients in most cases. For serious cases patients have to be rushed to nearby hospital located in the towns. Transport system is also poorly developed with the prevalence of the more unmetalled roads which becomes dangerous during the monsoon months due to heavy rain. Undeveloped transportation system incurs economic loss not only to the farmers but also to the others because they have to purchase daily commodities at

high price. About 43% of the villages, those are located on the Hill Cart Road, have bus services while the rest depend on jeeps and cars. Very few villages have banking facilities. About 70% of the villagers have to travel more than 5kms to avail such facilities. Tea is the only industrial sector in the study area and lives of the local people are mainly dependent upon tea industry. Electricity still did not reach many of the remote villages. The supply of electricity is also irregular in the villages those are connected with electricity. All the tea gardens in the basin have their own generators to cope with the shortage of electricity supplied by WBSEB. Hydel power is the main source of electricity in the region. Electricity is not used in the agricultural sector at all. Drinking water is available in all the villages though its supply is insufficient during the lean season i.e. December to April. Other than tap water supplied by the Govt., people also fetches water from nearby springs. People of the basin lead a very merry life inspite of having less advantageous life. They entertain themselves by playing football, cricket; by organizing cultural programmes; by gardening; by attending religious prayers by Sat Sangh, Satya Sai etc. People enjoy drinking local liquor and celebrate all local ceremonies and cultural functions with pomp and splendor. Though there is scope to develop tourism but tourism is not developed in the study area due to non availability of basic amenities. Only places around Mirik and Kurseong have gained some importance with respect to tourism.

The study area being situated in the hills with steep terrain, thin layer of soil, harsh climatic conditions, posses lot of problems. The most thought provoking problem is the erosion of top soil. Soil is an important natural resource and it supports life by growing tea and crops in the study area. Since soil is being eroded at a faster rate it is not only threatening the agrarian economy but also existence of life. Any type of fast flowing surface run off is causing severe soil loss in degraded forest areas, cultivated land, practicing faulty methods of cultivation like improper terracing, lands with thin layer of soil, areas with thin tea cover and land having improper method of disposing

excess water. Heavy monsoon rainfall causes all such problems. Landslides in the basin are quite frequent and cause maximum soil erosion. Landslides also affect life and property with immense loss of agricultural land. Overgrazing makes the soil loose and over settlements also exert pressure on the agricultural land and forest. Rugged topography, uneven distribution of rainfall and infertility of soil are the main causes for limited agricultural development in the study area. Fragmentation of land, lack of irrigation, poor economic condition of the farmers, less availability of credit all add to the existing situation of backwardness. Inadequate socio-economic facilities provided to the people, is in itself a major problem. Lack of education institutions, medical facilities, communication, transport etc. needs special attention.

Treating all the problems with scientific planning and methods will lead to more economic development of the Balason basin. Water management system like conservation of soil moisture, conjunctive use of both surface and ground water, peoples participation for recycling and reuse of water can bring havoc changes in all the sectors of development in the study area. Rain water harvesting is very important in the hills but storage tanks to store rainwater are not available. Water management in the tea gardens include proper shading by planting more trees in the gardens, mulching is done by straw in gardens which has young tea bushes. Among the soil water management systems different agronomic practices like planting cover crop, contour farming, intercropping with legumes, strip cropping would be beneficial. Grassed water ways, diversion drains, gully plugs, trained *jhoras*, retaining walls - all artificial ways of soil - water conservation must be maintained and repaired at regular intervals of time. Natural resource management including social forestry, farm forestry, joint forest management etc. should be practiced to a large extent by the people of the study area. Livestock rearing for the production of milk and meat can be done in the study area because it gives additional income and nutritious food to the people. Human resource management is also equally important

because it helps to raise the standard of life and awareness about self and regional development. This can be done by imparting true education to the people both academic and technical. Training in agricultural activities like horticulture, floriculture, is gaining ground over the last few years.

Development of an area can not be done without proper scientific planning and people's participation. Past strategies adopted for the development of the study area were partly successful. Rural development strategies like Community Development Programme, Employment Oriented Programme and Programmes for the development of Backward Classes were all implemented. But people were mostly unaware of the functioning of such projects. Past strategies for forest development were very stringent and did not allow people to share the benefits of forest which in turn forced them to exploit the forest illegally and lead to its further degradation. Social forestry was only successful on private lands, the commercial interest of tree growing being the prime motivator. The tea gardens were the most backward areas with illiterate people dominating the society. The tea garden owners exploited these people and provided them with less than what they deserve. Most of the machineries were old and those were not modernized due to financial and administrative constraints. To develop the entire agricultural and tea growing sector, help of Govt. and NGOs are essential.

Spread of education and awareness in recent years made the people of the study area comparatively conscious and they are gradually getting involved in all the developmental activities meant for them. Though, this percentage is very low. Rural developmental strategies like NREGA assures 100 days of guaranteed unskilled wage employment to each rural household opting for it. The focus of such programme is on works relating to water conservation, drought proofing (including afforestation), land development and rural connectivity in terms of all weather roads. Panchayat plays the key role in planning, implementing and monitoring of the scheme by preparing active plan,

approving self projects and executing works at least to the extent of 50% in terms of cost. Child development projects executes schemes like Integrated Child Development Scheme, under which Anganwadi centers take care of and assists, expecting and lactating mothers. Advice is given on practicing different measures of birth control. Children within the age group 0-6 years are given APL & BPL nutritious meal, once a day. In the agricultural sector farmers are provided with HYV seeds, pesticides at 50% subsidy under different agricultural programme. Training programmes to teach different new methods of cultivation are conducted by the village panchayats. Irrigation facilities, have improved than before but is inadequate. Under National Horticulture Mission, 50% subsidy is given for the cultivation of flowers like gladiolus, liliun, carnation, orchids etc. Farmers were supplied with plastic crates, sprayers etc. Aged farmers are given Rs. 500 per month under the West Bengal Farmers' Old Age Pension Scheme. In the tea gardens, their requirement is mostly fulfilled by the garden authorities. But presently panchayat system is introduced in the tea garden area so that they enjoy both the facilities provided by the tea gardens and the Govt. In the rural sector organizations like NABARD, World Bank is financing indirectly through the various commercial banks. Self help groups are formed to develop banking habits and financial self sufficiency among the people. For the construction of roads, houses and for starting different non farm activities, loan is sanctioned if projects showing high profit returns can be submitted to the Govt. All the above mentioned schemes which are running in the study area has few problems in common for which their implementation can not be done successfully and needy persons are not really getting the benefits. The fund flow for successful running of the schemes is extremely less. Many projects are shifting their funds to carry out other projects. There are many loopholes and defects in the plans. Above all the authorities have to be honest, sincere and less corrupted so that the plans can be successfully executed. For all these, new and less defective strategies need to implemented for the future.

Future strategies for the development of human resources in the study area are vital for the overall development of the Balason watershed. Educational institutions should be established in each and every rural area. All such institutes should have trained teachers who can impart education by teaching – doing – learning process. Education should be less bookish and more practical which the students will enjoy. High growth rate of population has to be checked by applying various methods of family planning. Street plays should be conducted to reach the masses easily and make them understand the benefit of having a small family. Smooth flow of Govt. and non Govt. funds and wise distribution of such funds can lead to proper functioning of any rural development project, implemented in the study area. Rural women should be encouraged to form Self Help Groups for generating employment. To conserve soil from getting eroded, conservation strategies like social forestry and joint forest management should be implemented. Afforestation along with post-afforestation management, to see that the planted seedlings can survive in the harsh natural environment, is more important. Forest Department should employ more local people to work in the forest. In agricultural land, various land management methods like proper maintenance of terraces, no activities on steep slopes, construction of rainwater disposal drains should be implemented. Govt. has to supply more HYV seeds, fertilizers, pesticides to the poor farmers. High priced cash crops should be introduced. Fruit cultivation should be done due to the presence of suitable agro-climatic condition, to raise the economic standard of the people. Training programmes for the cultivation of mushrooms, flowers, orchids and medicinal plants should be done extensively. Cultivation on high hills by constructing poly houses or green houses is becoming popular and such methods of cultivation should be adopted to increase production and earnings. Animal husbandry should be done by growing fodder in the wasteland. *Amlisho* should be grown for making brooms. Bamboos can be grown to start handicraft industry in the region. Organization like NABARD should more actively participate in financing

the rural development projects. In tea cultivation quality is more important than quantity, in the study area. Darjeeling tea being internationally famous needs to be produced without using any chemical fertilizers. More and more tea gardens should produce tea by applying organic fertilizers which can fetch exorbitant price in the world market. Tea industries should have modern energy saving machineries and should implement latest technology in tea production. Scientific packaging and publicity is also important to capture both local and international markets. Organic tea should be promoted as a health drink. Immediate patenting of 'Darjeeling Tea' is advisable. Tea research and management institutes should be opened in the study area so that local people can reap the advantage and get educated. This will open new avenues for employment for the locals in the managerial section rather than ordinary labourers. The tea garden authorities should take more care to develop the socio-economic conditions of the people by providing them with all the basic amenities needed to lead a standard life. The tea plantation workers should be judiciously used during the cold, dry months by engaging them in raising new tea plants, fuel tree, medicinal plants, which will add to the income of the tea gardens at no additional labour cost. In the tea gardens, preventive measure should be adopted to check soil erosion.

During monsoon, the Balason watershed is badly affected by landslide almost every year. Mostly these slides occur along the Hill Card Road and Pankhabari Road. These landslides lead to total destruction of roads and railway and traffic flow gets totally disrupted. During this time the price of all necessary commodities increases and it is beyond the buying capacity of the local people. To avoid such circumstances, proper disaster management measures should be implemented in the study area. Availability of bulldozers to remove the slide bedris from the road, rehabilitating the people who incurred great losses due to the slide, controlling price of the necessary commodities in the market so that poor people can survive and immediate engineering measures to stop further slide, should be the main disaster

management techniques which need to be implemented in times of need. Encroachment of settlements on the road and railway line should be stopped legally.

Balason watershed though under extreme pressure of population yet has lots of scope and potentialities for development if planning is formulated and executed properly. The region has high potentiality for the development of tourism. The economy of the hills of the Darjeeling district is largely dependent on tea, tourism and timber. Since Kurseong and Mirik are the only tourist centers in the study area, natural resource and environment is under excess pressure and threat in such areas. So tourism should be decentralized and alternative sites of natural beauty should be developed as tourist spots. Eco-tourism should be adopted where the benefits of tourism can percolate down to the village level and local communities. Eco-tourism conserves the environment and protects the ecology by spreading tourism to far away remote areas.

Since watershed is a manageable hydrological unit, integrated management of the watershed is the way to attain sustainable development of a region. Many plans were implemented but a micro level planning concerning the micro watershed can also be implemented. Thus, each and every part of the watershed can be taken care of, in the process of development, infrastructurally and economically. Though there are certain constraints in development in the hill area but it can be overcome considering the people and the potentialities of resources of the region. But the resources which are available in the study area are not properly utilized for the benefit of the people and development of the area. So, there must be an integrated plan in the area concerning the potentialities of rich natural and human resources. If all these are considered at the time of formulation of some development plans, the Balason Watershed may be one of the unique developed areas, in the state of West Bengal, in future.