

Ecological Sustainability and Economic Growth through Green Economy

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ABSTRACT

Himalayas support the life and livelihood of millions of people and are an important source of vital ecosystem services. Total value of ecosystem services is estimated at US\$ 33 trillion per year globally and US\$ 2.4 billion per year for Uttarakhand, India alone. Globalisation, technological advancements ,economic growth, increasing demand is increasing the pressure on natural resources thereby creating a situation of stress leading to conflicts for rights, services, monetary benefits. Any disturbance in the normal functioning of this ecosystem will hamper the services it provides and the impact of this will be seen ecologically and economically at local, national, and global level. For sustainability as well as for maintaining the global ecological and economic balance it is essential to ensure that the people living in the region are motivated to continue their efforts in conserving the ecosystem services required to address the current global challenges.

Keywords: Ecology, Global Green Economy, Himalayas, Uttarakhand, Sustainable Development, Value, Ecosystem Service.

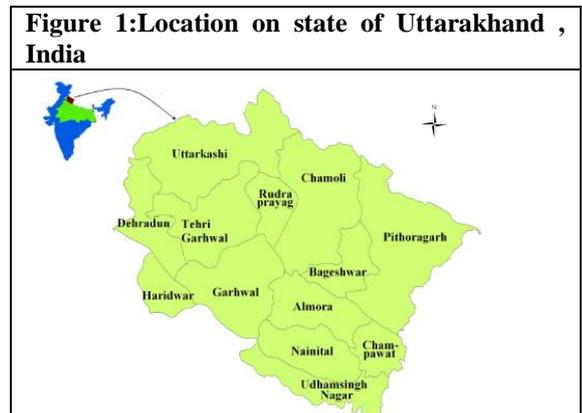
1. INTRODUCTION

Himalayas support the life and livelihood of millions of people. The resources of the mountains are vital for both upland/upstream and down land/downstream people. The deterioration of the mountain ecosystems, changing climatic conditions and the changes in socio economic conditions in mountain region has brought the focus on the sustainable development of the mountains. There is no doubt that Himalayas are an important source of vital ecosystem services .They play a significant role in the human wellbeing through ecological and environment sustainability and economic development. The Himalayan region has undergone change socially as well as ecologically and there is more than one factor that has contributed to the change. Conservation of Himalayan ecosystem lies in the hands of the local people more than the policy makers. The people have been the guardian of the nature because their life and livelihood depend on nature and its services. The developmental activities globally have impacted the natural functioning of the ecosystem and also the development interventions have in a way increased the demand on resources and have modified the existing natural systems. The development in the mountains, therefore, requires a different approach because of its uniqueness, fragility and vulnerability.

The formal first recognition of the importance of mountains came in year 1992 at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, Brazil .Agenda 21 became a guide for the sustainable development in the mountains. Chapter 13 in Agenda 21 described the role of mountains in global sustainable development. The framework conditions for sustainable development have changed significantly since 1992, with climate change, globalisation, increasing urbanisation, institutional evolution, and other changing conditions.

The economic development has increased the demand for goods and services from mountains and it is still growing

because the population is increasing and so is the need. These pressures create new challenges and threats for mountain ecosystems and mountain people, such as natural disasters, threat to food security, looming energy crisis, water scarcity, degradation and depletion of forests, biodiversity loss. What is to be noted here is the impacts on the ecosystem has impacted the economic, environmental, and social implications of the population living in Himalayas as well the larger population which is living in the downstream areas.



The impact of changing climate and depleting resources is being felt globally but it is not same everywhere .It is disproportionate. The communities in the hill are finding it difficult manage the livelihood in the changing scenario. The difficulties faced in the form of low productivity, depleting resources, hardships, vulnerabilities and harsh conditions, high rate of migration rate in the region.

2. PROBLEM

This paper analyses the ecological and economical issues of Uttarakhand, importance of linking economy at local level for achieving ecological sustainability. It also examines the priorities that can enable the state to achieve inclusive growth through green economy.

3. METHODOLOGY

The present report is primarily based study, involving compilation and analyses of information and data from official documents, research papers/reports, media reports and articles.

4. STUDY AREA

Uttarakhand state is spread over between 28°- 43' to 31°-27' North latitude to 77° -24' to 81° -02' East longitude (Figure 1) . Situated on the southern slopes of the Himalayas, the northern part of the state is in greater Himalayan ranges and southern part is in the foothills. It has 13 districts, accounting for about 86 percent of the total area of the state, are mountainous.(Table 1). Nine districts are mountainous while the remaining four southern districts have substantial portions that are plains. Its inner mountain region is remote, fragile, marginal but rich in biodiversity.

Table 1: Brief profile of Uttarakhand

Area (in sq km)	53, 485
Population (in 2011)	10,116, 752
Rural (%)	69.44
Sex Ratio (F/1000M)	963
Density (per sq km)	189
SC Population (%)	15.17
ST Population (%)	2.56
% Designated Forest Area of Geographical Area	64.79
% Pasture Land of Geographical Area	3.51
% Net Sown Area	13.29
% Total Fallows	1.87
Rainfall (mm)	1550
Sources: Census of India 2011, State of Forest Report 2011, Uttarakhand State Perspective and Strategic Plan 2009–27	

5. ECONOMIC GROWTH RATE OF THE STATE

Studying the state of Uttarakhand it is found that the communities should be the focus of the conservation of resources. The communities have the knowledge, experience, and capacity for managing the fragile environments and this fact offers significant opportunities for addressing the problems. All the issues have revolved around the economy and it is still the economic conditions that will decide the state of the ecosystems in the hills. Agriculture being the

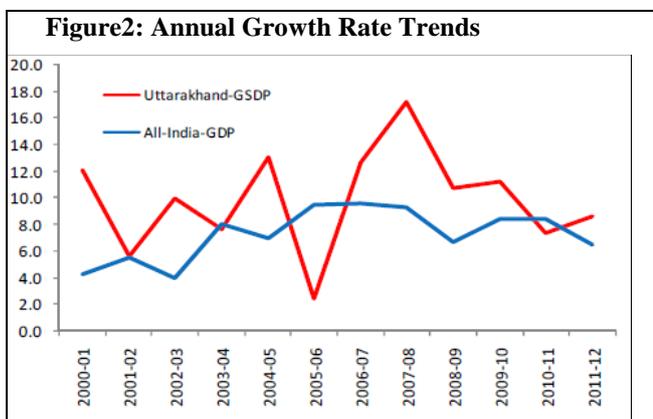
mainstay of the state, it is important to focus on agriculture keeping in mind the concept of green economy which emerged few years ago.

The estimates of Gross State Domestic Product (GSDP), generally known as State Income, are considered as the most important macro-economic aggregates to measure the economic development of the state. Thus, in the context of planned development of the economy of a state, the estimates of state domestic product and its derivative, per capita income plays a vital role since these estimates help government in formulating the policies and programmes as per critical economic analysis.

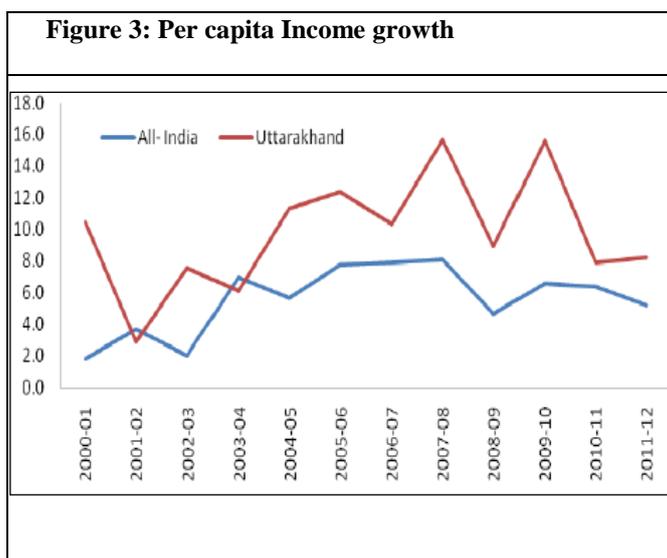
In order to estimate the GSDP and State Income, the whole economy of a State is divided into 3 major sectors comprised of 13 sub-sectors as follows:

Primary Sector	Secondary Sector	Tertiary Sector
(i) Agriculture (including horticulture) & Livestock (ii) Forestry & Logging (iii) Fishing (iv) Mining & Quarrying	(v) Manufacturing (vi) Construction (a) Registered (b) Un-Registered (vii) Electricity (viii) Gas & Water Supply	(ix) Transport, Storage & Communication, Trade, Hotel & Restaurants (a) Railway; (b) Transport by other means; (c) Storage; (d) Communication (x) Banking & Insurance (xi) Real Estate, Ownership of Dwelling, Business & Legal Services (xii) Public Administration (xiii) Other Services
Source: Directorate of Economics & Statistics, GoU, 2013		

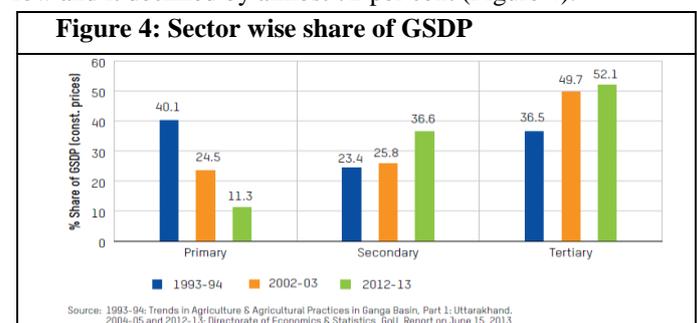
The state has registered higher growth thus emerging as one of the fastest growing states in India. (Figure 2) The growth acceleration in the State was also reflected in the per capita income which increased by 168 per cent from 19,457 in 2001-02 to 52,125 by 2011-12.



The increase in the State per capita income was much sharper as compared to the all-India per capita income which increased by 81 per cent from 20,943 to 37,851 during the same period (Mohanty 2012) (Figure 3).



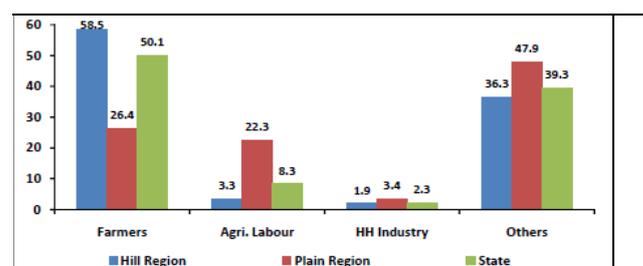
From 1993-94 to 2012-13, the GSDP emanated mainly from industry and services. Agricultural growth however remained low and it declined by almost 72 per cent (Figure 4).



This is also a point of concern because according to population census 2011, more than 58 percent of main workforce directly depends on agriculture for their livelihood. The proportion of such workers is much higher in the hill region (61.8 %) than the plain region.

Hence the per capita GSDP share of the households that are mainly engaged in agriculture is much lower than those working in the secondary and tertiary sectors. Thus, the income generating sector has gradually shifted from agriculture and allied activities to non-farm activities, there has not been a commensurate decline in the dependence of workers on agriculture.

Figure 5: Proportion (%) of Main Workers by Occupational Category, Uttarakhand, 2011



Despite these impressive macro numbers, Uttarakhand also reports very high poverty incidence (Mohanty 2012). Despite high literacy and high per capita income, there is high incidence of poverty and life expectancy rate is lower as compared with the national average. The State ranked 14 among the 23 States in terms of Human Development Index 2007-08.

More and more people are leaving farming because it is less productive. The increasing climate variations and unpredictability, increased soil erosion, disasters does not allow the farmers to even meet the household requirements. The high migration rate of mainly males in search of employment outside the state is also alarming. A news report states that 1,065 villages in Uttarakhand have become 'ghost villages' because hardly anyone lives there (Umar 2012). The migration is leading to fields barren. There are not enough people to look after nature or who worked in harmony with nature. Migration is leading to a great loss of economy and livelihood that was based on ecosystem functioning including agriculture, horticulture, non timber forest produce and so on. It is this important to strengthen ecosystem based livelihood so that the local economy stabilises and ecosystem also remains healthy. The more we work in harmony with ecosystem the more sustainable the system becomes. The sustainability of the ecology lies in a stable economy. The economic growth needs to be inclusive and balanced and focusing on decreasing the migration rate would require interventions in agriculture and allied services. This is where the state needs some intervene through inception of the Green economy through agriculture based local economy.

5.1 Green economy:

According to the United Nations Environment Programme (UNEP 2011), a green economy is one that results in improved human wellbeing and social equity, while significantly reducing environmental risks and ecological scarcities. The green economy agenda seeks to promote an economic system which increases human wellbeing over the long term while maintaining natural capital and environmental resources so that future generations do not face significant environmental risks and ecological scarcities.

5.2 State of Uttarakhand and green economy

In Uttarakhand the green economy needs to be implemented in a way that sustains the ecology and maintains the economy of the people. It is to be kept in mind that the concept of green economy provides new opportunities for investment in ecosystem services, creates employments but it has its own challenges. There is a need to have balance between economic, environmental, and social development. This balance requires appropriate policy and institutional measures to avoid increasing pressure on an already fragile environment and scarce resources.

Agriculture and allied sectors require intervention to look into the new challenges, threats and opportunities in the region. This is critical for the region as well as for other areas.

Globalisation, technological advancements, economic growth, increasing demand is increasing the pressure on natural resources thereby creating a situation of stress leading to conflicts for rights, services, monetary benefits and so on.

The impact on the functioning of ecosystem is also dependent on the global externalities. The impact also changes the social capital or social system in the community. For e.g. the search for better opportunities in terms of economy, education etc is leading to increased migration of mostly men. This is increasing the role of women in mountain agriculture. There is increased incidence of deprivation, poverty, food insecurity, and social conflicts in mountainous areas. Local people are the guardians of the ecology as they understand it better and are dependent on the health of the ecosystem for their own sustainability. In the absence of these local guardians who are migrating in huge numbers or are looking for other livelihood activities urgently require the focus to be put back into uplifting agricultural sector.

The region due to its global importance on the form of the ecosystem services that it provides need to look for coping mechanisms at local level. For greater global well being, global green economy needs to be promoted and mountain ecosystems are the basic units that must be conserved and developed to ensure a sustained flow of resources and services and sustainability. Mountains are a global commons and natural capital whose heritage value must be recognised and valued. The green economy model presents this opportunity.

6. ECOSYSTEM SERVICES THAT THE STATE PROVIDES

The main ecosystem services that are provided by Uttarakhand to rest of the nation and world are:

a) Hydrological services and water availability downstream

The first and foremost role of the mountains are in providing the water and hydrological services. More than half of humanity relies on freshwater from mountains to grow food, produce electricity, sustain industries, and provide drinking water (MA 2005). This recharges the groundwater and provides water downstream for uses various uses.

b) Energy (Hydropower /clean energy)

Hydropower is identified as one of the most important sector for revenue generation and for improving economic conditions of the people. Though other forms like solar energy is also being explored in the state. The pressure of hydro power on the rivers in the area and ecology has always seen protests by local people and environmentalist. The consequences of too many projects and pressure on the natural environment is seen in many forms. But the green economy aims at fulfilling the growing energy needs in the form of clean energy to maintain economic growth in a sustainable way and to improve the living standards of the vast number of people who still depend on wood fuels. Himalayan region, for example, has the potential to generate over 300,000 MW of hydropower and only 9% of this potential is developed (Tariq 2011). But the question is the ways there power projects are implemented the regions. Properly managed, mountain water can contribute significantly in the generation of clean energy and contribute to economic development of downstream communities.

c) Role in climate regulation at regional and global level

Mountain ecosystems contribute in regulating global climate through biogeochemical and biophysical processes that mediate the carbon, energy, and water balance at the land surface. Mountain climate regulation services extend beyond their geographical boundaries and affect all continental main land (Woodwell, 2004). Mountain ecosystems also have a significant role in carbon storage and carbon sequestration (Piao et al. 2006).

d) Maintaining Biodiversity

Himalayan region is one of the most rich region in terms of biodiversity. Mountain regions contain many different ecosystems and have among the world's highest species richness (e.g., Väre et al. 2003; Moser et al. 2005; Spehn and Körner 2005). Mountains support about one-quarter of the planet's biodiversity, and have nearly half of the world's biodiversity hotspots (Singh, 2011). Because of the wide range of altitude (3 to 4 km) and variation in climate, mountains support many types of forests. The Himalayas have more forest types than even the Amazon (Singh 2011). Mountains also have amazing agro biodiversity. In fact a number of domestic animals, such as sheep, goats, domestic yaks, llamas, and alpacas, also originated in mountain regions (Singh 2007). Mountains also serve as a bridge between continents, and provide a refuge for species migrating under the influence of global temperature changes (Singh, 2011).

e) Economy

Mountains effect the economy (Regional .national and global) directly or indirectly because ecosystem services provided by mountains maintain the economy in the region affect livelihoods and the economy downstream too. The contributions in the global economy are in the form of providing resources like forest, water for drinking and irrigation, and hydropower. The raw material for various economic sectors is provided by the mountains like food, pharmaceuticals: agriculture, forest, and hydropower generation; tourism etc. Pastures and rangeland, forests and forest produce provide direct economic benefits to local people in the form of herbs, medicinal plants, nuts, fruits, timber, fuel wood etc.

The Indirect contributions to the economy include the support and regulation of ecological functions and processes, such as carbon sequestration and storage, soil conservation, flood control, climate moderation, and wind and monsoon regulation.(ICIMOD,2011).

f) Value of economic services

Globally, the total value of ecosystem services is estimated at US\$ 33 trillion per year, almost double the global gross domestic product (GDP) (Costanza et al. 1997). In the context of Uttarakhand , based on Costanza et al.'s (1997) approach, Singh (2007) estimated the total value of forest ecosystem services in Uttarakhand, India to be US\$ 2.4 billion per year (Table 2).

Ecosystem service	US\$/ha/yr	% of total
Climatic regulation	167.6	14.6
Disturbance regulation	2.3	0.2
Water regulation and water supply	5.2	0.5
Erosion control	114.6	10.0
Soil formation	11.6	1.0
Nutrient cycling	429.6	37.4
Waste treatment	102.7	8.9
Biological control	2.3	0.2
Food production	50.7	4.4
Raw material	164	14.3
Genetic resource	18.5	1.6
Recreation	78.6	6.8
Cultural	2.3	0.2
Total	1,150	100
<i>Source: Singh, 2007</i>		

The food production and raw materials that have market values constitute only a small proportion (18.7%) of the total value. According to Green India States Trust (GIST) (Gundimeda et al. 2006) study, the per hectare ecological value of soil nutrient conservation, flood control, and water recharge in dense forest is of the order of about INR 6,255 (about US\$ 134) in Uttarakhand.

g) Food security:

The food is going to be the major concern in the time to come. By 2050, the global population is expected to increase to 9 billion. The challenge of feeding a growing population is daunting. While all economic sectors depend to some degree on ecosystem services, agriculture has the most intimate relationship with nature. Agriculture depends on healthy mountain ecosystems for water regulation and supply, pollination, erosion control, climate and wind regulation, groundwater recharge, and sustenance of wetland ecosystems. The genetic diversity preserved in mountain ecosystems helps to ensure the world's future food security. Thus a sustained flow of mountain ecosystem services is critical for feeding the growing population.

h) Role in protecting against hazards (Economic benefits)

Mountain vegetation plays a significant role in reducing or mitigating risks from natural hazards – for example, in protecting against erosion, landslides and local flooding. Mountain forests, for instance, protect people and property from avalanches and rock fall, and their water-holding capacity reduces peak stream flow. The huge value of mountain ecosystems in protecting against hazards can be deduced from the economic and social costs of natural disasters in the eastern Himalayas and downstream. Global

economic damages estimates in 2013 were US\$ 118.6 billion. It is important to note that amongst the top 10 countries in terms of disaster mortality in 2013, five countries are classified as low income or lower-middle income economies (based on World Bank income classification)¹. Disasters hinder the development process in countries with limited resources and capital. It degrades the economic conditions of the people and induces poverty and economically weaker communities are more vulnerable so more affected by any disaster event. So, a strong economic condition is essential for better preparedness against disasters.

i) Protection of mountain ecosystems from climate change

Loss of mountain ecosystem function due to climate change can thus impose great economic, environmental, and social costs both to mountain and downstream populations and impede the goals of green economy and sustainable development of the world. Protection of mountain ecosystems from climate change is therefore critical for avoiding these costs and ensuring that mountains continue to provide global benefits and protect downstream regions from hazards.

7. ISSUES AND CHALLENGES FOR THE STATE

First issue is the lack of compensation for Ecosystem Goods and Services. In spite of the importance for global economic growth and human wellbeing the services do not receive adequate recognition in national economic decision-making, including development planning and resource allocation (ICIMOD, 2011). GDP does not account for depletion of natural capital, which is the fundamental basis for all economic activities. Keeping in mind the agriculture sector, for the state the main issue are:

7.1 To decrease or stop the migration of people from the hills

Agriculture and allied services are not profitable. Harsh climatic conditions, unpredictable weather, vulnerability to disaster and lack of other basic services are forcing people to leave their villages for better opportunities.

7.2 Unclear Property Rights over Ecosystem Services

The global market and its growing needs, especially in the market of carbon credits, hydro power, medicinal plants and other economically viable services has exploited Uttarakhand or any hill region for profit. The regulations and rules for the protection of resources have separated the people from the right over their resources. At the same time outsiders are making most of the profits out of the mountain resources in various forms in Uttarakhand. The people thus feel cheated and debate continues over who has the right over the resources and who will decide it. Without clear property rights, mountain farmers cannot negotiate and benefit from voluntary markets for environmental services such as carbon sequestration and storage, biodiversity, food security, water protection. To negotiate and exchange these resources in the market requires new regulations, including clear property and use rights and access and benefit sharing, among others (ICIMOD).

7.3 Socio economic conditions

The poverty is grave in the hills. There is increasing rate of migration, especially men folks, move out for other employment opportunities. The remaining populations, mainly women folk, involved in farming and other activities. Due to remoteness they are deprived of new technology, market linkages and new areas of development. Adding to the difficulties the community faces the disasters regularly and face huge losses in terms of resources, money and life. According to FAO (2003), only about 22% of mountain lands are suitable for agriculture. The pressure on land for agriculture and other uses, combined with forest destruction, overgrazing, and inappropriate cropping practices, results in irreversible loss of soil and ecosystem functions that increases environmental risks to both mountains and downstream areas. Hardships in the mountains, along with low economic opportunities in rural areas, have driven large-scale outmigration from mountain areas (Banerjee et al. 2011), increasing the difficulty of maintaining traditional conservation measures. Livelihood security, economic growth and equity in mountains are required for sustainability.

7.4 Lack of Market linkages for ecosystem Services for community

The market in Uttarakhand is still not well developed. The state has the advantage of producing niche products but market for products and ecosystem regulation and support services are not yet well developed. It still is big task and requires complex rules and regulations.

7.5 Vulnerability and fragile Ecosystems

The state is highly fragile and vulnerable to disasters due to geographic and climatic features. Vulnerability in the region is increasing due to increasing pressure from both anthropogenic and biophysical factors and, with some notable exceptions, mountain ecosystems shows symptoms of deteriorating health (MA 2005). The state along with the rest of the mountain regions of the world has been experiencing loss of biodiversity, degradation and depletion of forests, degradation of soil, decreasing water resources, rise in temperatures, and increased incidence of extreme events such as flash floods, massive flooding, and landslides.

Climate change is a major concern globally because climate change is impacting the occurrence of disasters but it also results in the financial crisis, the energy and water crises, migration, impact on health and so on. The threat to water flows from faster glacier meltdown in the mountains will have serious short- and long-term consequences downstream. So the conservation and planning in this region is of global importance. This is a serious challenge to the concept of green economy and sustainable development. The impacts of unsustainable development in the mountains have been more rapid, have taken a heavier toll, and have been more difficult to correct than in other ecosystems (MA 2005).

7.6 Lack of Data

The lack of data for studying the change, impacts and for proposing future strategy is also major issue in Uttarakhand. Reference to previous data helps in sound management and planning for sustainable development. Lack and

unavailability of ecological, climate, economic and social data hinders the planning process.

8. ACTIONABLE POINTS FOR GREEN ECONOMY IN UTTARAKHAND

In spite of the challenges that the state is facing today there are opportunities in the context of a green economy. The previous development strategies need to be re-looked and re-worked. The economic and ecological model of green economy offers opportunity to rectify earlier development models which have in a way ignored the concerns and interests of mountain regions. This provides a more inclusive approach and a framework for valuing and compensating ecosystem services with sustainable agriculture in focus as it takes care of livelihood, food and nutrition and the ecology of the area. The more people stay in the state for this, more managed the ecosystem would be.

8.1 Interdependence of ecological and socio-economic activities focusing on agriculture

The problems in the Himalaya are complex, having intricate linkages between social, economic and ecological concerns. The solutions, therefore, cannot be addressed in isolation (Singh, 2004). A holistic approach with ecological and social principles will be sustainable. A macro and micro level planning is required by hills and the adjoining areas. Mapping and categorisation of resources and ecosystem is required and managed accordingly. Ecological system provides raw materials to the economic system and absorbs the waste generated by the economic system. Therefore, the system will be constrained by the productive and waste-absorption capacities of the ecological system.

8.2 Realising the Value of Mountain Ecosystem Services

Depletion and degradation of natural capital and the value of ecosystem services was not recognised earlier and the services were “free” and common property. The concept of green economy recognises the value of the ecosystems in the production of goods and services for downstream economies and for securing overall human wellbeing at local, national, regional, and global scales. The valuation will also assure that local community receive the full benefits from their mountain resources so that they are encouraged to conserve resources for global benefit. The economic benefits will reduce poverty and decrease the rate of migration in the hills.

8.3 Developing market for Niche Products

The climatic advantage of the hills makes it an economically strong player in the market for products such as medicinal and aromatic plants and other non-timber forest products, mountain crafts, off season vegetables, horticulture and so on. Some policy and support at regional and local level is required for marketing mountain products for better benefits.

8.4 Livelihood Security and poverty alleviation

The ecology and economy is so closely linked that linking ecology and environment based livelihood would maintain

the ecosystem services as well as improve the economic condition of hill community thereby reducing poverty and enhancing environmental sustainability.

8.5 Diversification, post harvest techniques and value addition in agriculture

In Uttarakhand there is subsistence farming and the productivity is low and so are the returns. Geographic inaccessibility, environmental diversity, and ecological fragility have contributed to this historic agro ecological production system, mainly sustained with inputs from the forest. The impact of climate variability is a major issue in the region. In this the diversification of crops provides a mitigation plan in this changing climate scenario. Post harvest techniques and value addition is also going to help the people to increase the income source and reduce the food losses.

9. CONCLUSION

The action points discussed above will definitely help in improving the economy of Uttarakhand and maintaining the ecology of the region. The similar action points are applicable in other mountain regions. There is a requirement to go for green economic growth to maintain the ecosystem functioning because conservation of mountain ecosystem is of global importance. The foregoing analysis shows how the nearly one-fifth of the world's people living in the mountains depend on mountain ecosystem resources for their sustenance and wellbeing, while billions more living downstream benefit from these resources indirectly. Directly and indirectly the economy is dependent on the services provided by mountains. Food security is an important aspect and through agriculture diversification it can be ensured. Mountain ecosystems are therefore global natural capital and have a special role in the green economy and in the sustainable development of the world (ICIMOD, 2011).

Dedicated comprehensive policies and institutional frameworks are needed to build mountain concerns and specificities into actionable plan of work. Some intervention points could be:

- Recognition and promotion of agriculture and allied services for sustainability of mountain ecology and economy through local people.
- Ensuring economic growth and equity in mountains.
- Improved governance mechanisms in the form of appropriate environment and development policy for agriculture.
- Institutional strengthening and capacity building

There is thus a need to adopt region specific strategies in development plans for conservation and poverty alleviation. It would be decisive if mountain ecosystem conservation is made central to economic decision making. Strengthening value chains to benefit mountain communities by providing markets of the local produce and a good branding of mountain goods and services would make it efforts of community sustainable. It is also important to strengthen knowledge base of communities on sustainable mountain development. Awareness, strong economy, long-range database and an inclusive and holistic approach would realise green economy and sustainable development. This will ensure

improved quality of life, better economic status, and better preparedness against the impacts of changing climate & disasters and a healthy life-support environment for the region as well as the world.

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