STUDY ON DEVELOPMENTAL DISABILITY INDEX FOR HILL STATES IN INDIA

Rita Pandey **Purnamita Dasgupta**

(With Assistance from Sargam Gupta)

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Preface

The main objective of this report is to develop a methodology for constructing a "developmental disability" index with focus on hill states in India, and illustrate the methodology by constructing indices for hill states.

The main argument is: the need to protect and conserve forests, wildlife and other bio diversity, besides restricting the land use choices and thus causing developmental disadvantages, adversely affects the unit cost of providing public services.

In the literature these are referred to as "cost disabilities" which arise due to factors exogenous to state control such as difficult terrain, extreme and variable climatic conditions, large areas under forest, cost escalation in terms of time and institutional costs due to legal requirements and federal restrictions, cost mark-ups due to technological and material requirements for meeting specific rules and regulations.

It is argued that states need to be compensated through additional allocation by incorporating these in inter-governmental grants. This has been done in a number of countries.

The report notes that if a complete valuation of ecosystem services is possible, then that would constitute the most comprehensive valuation replacing the NPV and the above mentioned cost disabilities. In the interim, a developmental disability index is constructed, thereby generating a principle and basis for compensating hill states for a part of the values that their ecosystems provide based on the rationale of opportunity cost in economics.

At the NIPFP, the study was designed and led by Rita Pandey. The Governing Body of the institute does not bear any responsibility for the views expressed in the report. This responsibility lies mainly with the authors of the report.

(Rathin Roy)

May 2013

Acknowledgements

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Draft report of this study was carried out under the overall guidance of Dr. M Govinda Rao, who was Director, NIPFP at that time. We are grateful to him for all the help and support for this work. We would like to thank S P Singh, Centre for Ecology Development and Research, Uttarakhand, and Lekha Chakraborty, NIPFP, for useful discussions.

Purnamita Dagupta, Professor, Institute of Economic Growth, Delhi was associated with this study till the preparation of the draft report. Wasim Ahmad provided secretarial assistance.

(RITA PANDEY)

Table of Contents

Executive Summary

1. Objective and Rationale of the Study

Hill states in India are uniquely situated in terms of the large amount of land area designated as forest land in these states. Although these states derive substantial local benefits from the forest ecosystem services[1] they also tend to face certain developmental disadvantages. In economic terms, these can be conceptualized as opportunity costs - for not being able to use the land in alternative use that would yield the highest marginal economic value for the land.

The economic rationale for this lies in the fact that forest ecosystems provide a range of services, many of which are either "intangibles" or "non-marketed" and thereby do not lend themselves to easy quantification using available valuation techniques and tools. Also, the forest ecosystem services accrue at different scales – international, national and local implying substantial uncompensated positive externalities. The net economic value of maintaining forested land in its present state of use is therefore likely to be much less than in alternative use.

The need to protect and conserve forests, wildlife and other biodiversity, besides restricting the land use choices and thus causing developmental disadvantages, adversely affects the unit cost of providing public services. The cost of providing public services also varies across states/regions due to a large number of factors such as geographic location, population density, extreme and variable climatic conditions, and terrain. In the literature these are referred to as 'cost disabilities'. When 'cost disabilities' arise from factors that are considered exogenous to a state's control, it is argued that states need to be compensated through an additional allocation due to these disabilities, by incorporating these in the formulae for intergovernmental grants. In a number of developed countries cost disabilities have been in-built in the design of intergovernmental grants. Estimation of cost disabilities would require data on unit cost of providing various services along with a measure of gap/deficit in the level of services/level of services. This data is not directly available and thus there is a need to find alternative ways to estimate cost disabilities.

Factors contributing to 'cost disability' in forested areas of hill states vis-à-vis non-hill states and/or non-forested areas in hill states can be identified as: Cost escalation[2] in terms of time and institutional costs due to legal requirements and federal restrictions (e.g. Supreme Court rulings on diversion of forestland for non-forest purposes and associated ranges for NPV charges; requirement for central clearances for non-forest activities).

[1] The services can be classified in various ways – provisioning, regulating, supporting and cultural services.
[2] Any developmental project which falls within the forest area gets delayed by 2-3 years because of obtaining clearances for the forested area, which increases the total project cost by 20-25% (unplanned expenditure) which has its direct repercussions on the state's financial position (Source: a communication from Chief Minister of Uttarakhand to the Deputy Chairman of the Planning Commission, November 2011).

The other factors adversely affecting the unit cost of providing public services in hill states vis-à-vis non-hill states and or flat areas in hill states would be traced into unique characteristics of hill sates e.g. difficult terrain, extreme climatic conditions, fragile ecosystems, creating strategic infrastructure in border areas on strategic considerations. Specific factors contributing to increase in unit price can be identified as: higher technological and material requirements for meeting specific rules and regulations, and coping with variable climatic conditions; need to minimize damage to forest ecosystems and environment (e.g. variant technology for developing infrastructure such as roads, bridges, need to maintain wildlife corridors); higher costs of transporting materials and supplies through difficult terrain[3].

Opportunity costs when expressed in terms of forgone developmental alternatives, restrictions on livelihood options, and mark ups on costs of developmental projects are likely to be higher for forested areas of hill states than their corresponding costs in non-forested areas of hill states and non-forested states. The operationalization of such concepts can be achieved through developing a cost disability index that forms a basis for compensation.

As the nature and contribution of inputs that are required to produce a particular service vary across sectors, the factors affecting 'cost disability' are specific to each sector. The focus in this report in constructing a cost disability index is provision of developmental infrastructure e.g. roads, railway, bridges, air connectivity, power, telecommunication etc. It is important to note that contribution of various factors affecting cost disability of a service/sector may also vary and would need identification and assigning of appropriate weights in constructing a cost disability index.

2. Components of the Index

In constructing an index that captures the developmental or opportunity cost of maintaining forestlands for hill states in India as well as increase in unit costs of providing public services in hill sates several aspects need to be recognized.

- Accounting for the flows of Ecosystem Services from these forests at various levels:
    - *global level*: e.g. Carbon sequestration, biodiversity[4]
    - *national, regional and local level:* e.g. watershed services, timber, tourism
    - *local level:* e.g. fuel wood, fodder, NTFPs, micro climatic stabilization, cultural

[3] Shri Prem Kumar Dhumal, Chief Minister of Himachal Pradesh at 56th Meeting of National Development Council, October 2011, New Delhi, pitched for changing the wage cost to material cost ratio from 60:40 (present scheme of MNREGA) to 40:60 due to high cost of material and transportation in hill areas.

[4] Note that definitionally and depending on the specific empirical context, these classifications of services may change or overlap. The important point to note here is that these exist and need to be accounted for.

- Provision for Cost escalation factor on developmental projects in forested areas due to:
    - *unique geo-physical conditions*
    - *higher transaction costs*
- Criteria for Inclusive development and equity for states *linked to* forested land in hilly terrain states

While there has been some progress on incorporating the first factor in the existing devolution mechanisms, the last two are yet to receive full attention in the existing institutional mechanisms partly perhaps due to the fact that these pose problems both conceptually and empirically. The formula for distribution of a fund of Rs. 5000 crores as recommended by the XIII Finance Commission, and the NPV for use or diversion of forestland for non-forestry purposes currently being charged by state forest departments, both seek to address the requirements for the first criteria listed above.

While in theory one can argue against the parallel incorporation of all three criteria, the fact is that current knowledge on both ecosystem services and valuation methodologies does not permit complete valuation and accounting for ecosystem services, which could have by itself been an adequate basis (at least theoretically) for distributing resources among states.

3. Formula

Component 1: Endowment effect (geographical factor): Geographical Area of the state under forest

Component 1 = {FCAi/GAi}/ {FCA/GA}

- FCA=Forest Cover Area(km^2)
- GA=Geographical Area(km^2)

Component 2: Transaction costs (topographical factors and federal regulations):

Component 2= [HTi]*[IDPRi]

- HTi=Proportion of land under hilly terrain
- IDPRi= Infrastructure Deficit (Power Index + Road Index+ Tele density Index)

The forest disability index is thus calculated as a summary measure of the above two dimensions.

The results indicate that across the alternative rankings, states of Manipur, Arunachal, Meghalaya, Nagaland, and Mizoram dominate in terms of disability index as these are also states which have more than 60 per cent of the geographical area under forests, alongside substantial hilly terrain. These are also the less industrialized states. However, Jammu and Kashmir ranks high due to its substantial disadvantage in terms of the infrastructure deficit, alongside the higher transaction costs due to hilly terrain, although it has much lower percentage area under forest cover.

Among the states which have 30-60 per cent forest cover, and can be differentiated in terms of hilly and non-hilly terrain, Sikkim and Uttarakhand are also at relatively a greater disadvantage in terms of the infrastructure deficit component. Assam, in spite of having more than 30 per cent of its geographical area under forest cover ranks lower due a pattern of distribution of hill areas across districts. In Assam some districts have very large hill areas whereas some have large plain areas[5]. However, some hill states have hill areas distributed in such a way that most of their districts are classified as hill districts; this has improved proportion of hilly terrain data for these states. Although Himachal has relatively less forest cover than some other states such as Kerala, Chattisgarh or Jharkhand, its overall rank in terms of disability is higher due to disadvantage in terms of the infrastructure deficit when interacted with the proportion of hilly terrain.

4. Summary and Recommendations

All states in India have state-specific requirements to meet their developmental aspirations and targets of which poverty alleviation and the creation of infrastructure command high priority. Chronic poverty is often associated with being located in remote rural areas, such as hills and forested areas, which may not even be adequately reflected in state averages as in the case of Chamba in H.P. or the hilly regions in Assam. There are in place mechanisms to address these specific needs such as through the tax devolution formulae used by the Finance Commissions, grants made by the Planning Commission and so on. Specific requirements for incentivizing forest conservation and to compensate states for economic disadvantages arising from the maintenance of forest cover have also been addressed by the Thirteenth

[5] A hill district is a district with more than 50% of its geographical area under 'hill talukas' based on criteria adopted by the planning Commission for hill area and Western Ghats development programs.

Finance Commission. The present study seeks to address another dimension – that of specific disadvantages arising from increased costs arising from a combination of bio-physical features such as terrain and increased transaction costs due to legal and public good aspects of maintaining forest ecosystems. This differs from the earlier forest disability index of the Planning Commission (2004) which computed the replacement value of forests in terms of (agricultural) farming. It may be noted that if a complete valuation of ecosystem services applying state-of-the art techniques to sufficiently disaggregated and reliable data is possible, then that would constitute the most comprehensive valuation replacing all these sub components of values. In the interim, a forest disability index is constructed. Note that this is a partial value, which captures only certain aspects, and is not the full opportunity cost.

- The forest disability index developed here demonstrates that there is a case for devolving funds to states based on the higher transaction costs that they face due to bio-geographical reasons such as forested land in hilly terrain.
- Since the notion of disability stems from the motivation of inclusiveness and sustainable development, it may be also proposed that such devolution should be closely monitored and linked to outputs / outcomes that address the disability and help in overcoming these.
- A contentious issue in this context is the choice of policy option for compensation. Various considerations including low technical and governance capacities of the state and local governments have led to reservations about general grants or even project based grants in India. There seems some merit in this argument until governance deficiencies at the state and local government level are addressed. However, it would be unfair to use this argument to undermine the need for compensation to hill states. The Committee may consider creating an "*infrastructure and technology fund*" for hill states which can be used for creating and upgrading strategic developmental infrastructure and for development/sourcing of hill sensitive technology (especially for development of market for niche mountain products, and diversification and value addition in agriculture) which are the two most critical factors in improving the productivity of resources and boosting the environmental and developmental performance of the hill states. This Fund may also take steps to address the data gaps in estimating cost disabilities as outlined above. However, it is to be emphasized that the need for such a fund should reduce overtime, so that eventually the compensation

for provision of environmental services could be linked entirely to a comprehensive index of environmental externalities/performance.

- Finally, to streamline and speed up the process of forest land clearance and environmental approvals specific suggestions may be considered (Section 3 of report). This is expected to impart efficiency and transparency to the system.

Developmental Disability Index for Hill States in India

1. Introduction: Framing and Conceptualization

1.1 Sustainable development and the role of natural capital

Sustainable development is an interdisciplinary notion, a fact that is highlighted through the working definition promoted in the World Commission's report: "...development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (*World Commission on Environment and Development 1987, Our Common Future).* It is thus an amalgamation of various social, economic and environmental goals.

The operationalization of the notion of sustainability has posed unique problems in economics. At a minimum, sustainability requires that there should be signals which effectively reflect increasing scarcities in the resource base in order to enable economic growth to continue, within an ecological-life support system. (Arrow et. al. 1995). However, it is equally important to bear in mind that carrying capacities are themselves contingent on technology and preferences of society. Thus, from the macro economy point of view, one needs to look at indicators that are rooted in a welfare economy approach. From this perspective, a key requirement of sustainable development is that the economy's wealth must not decline (Dasgupta 2001, Bhattacharya and Dasgupta 2004). Wealth in turn is defined in terms of the economy's capital assets, both natural and man-made. Natural and human capital are important components in an inclusive definition of capital and have to be accounted for in computing the wealth of a nation. It is this stock of capital that becomes relevant for understanding sustainable development (Hamilton and Clemens 1999, Dasgupta and Maler 2000, Dasgupta 2001).

Early attempts at measuring sustainability include studies for Indonesia and Costa Rica (Repetto et al 1989, Solorzano et al 1991). Pearce and Atkinson (1993) provided the first set of sustainability indicators for 18 countries. The World Bank has published series of investment estimates – termed as genuine savings – which attempt to incorporate investments in human and natural capital.

Assuming the possibility of substitution between natural and manmade capital, an economy was sustainable if it saves more than the combined depreciation on two forms of capital i.e. natural and manmade capital. This weak sustainability indicator, allowed for unconstrained

elasticity of substitution between natural and man-made capital. In contrast, a strong sustainability indicator would require that there should be no depreciation of the natural capital stock.

The sustainable development approach provides the basis for developing methodologies that can be applied *empirically* for estimation of the value of ecosystem services. To quote Heal (2004) "ecosystem services are the return on natural capital, and natural capital essentially consist of ecosystems. The economic value of natural capital is obviously the present value of the ecosystem services it provides."

1.2 The Ecosystems approach

Ecosystems and the services that they provide are essential for human well-being. Ecosystem services are extensive and diverse and range from dispersal of seeds, drought and flood mitigation, cycling of nutrients to provision of food, fuel, timber and other products. Ecosystem services have been severely threatened due to growth in the scale of human enterprise and neglect of long term social welfare, which has characterized the process of economic growth through the history of economic development (ESA, 2000).Human well-being depends on material welfare, health, good social relations, security and freedom all of which are affected by changes in ecosystem services (Millennium Ecosystems Assessment (MEA) 2003). While many of the services such as food production and fisheries are obvious in terms of their employment and livelihood implications, the others such as the regulating ones have historically not been a focus of valuation studies although these are life supporting services (Dasgupta 2009). The adoption of an ecosystems approach facilitates an understanding of the relationship between ecosystems and human well-being.

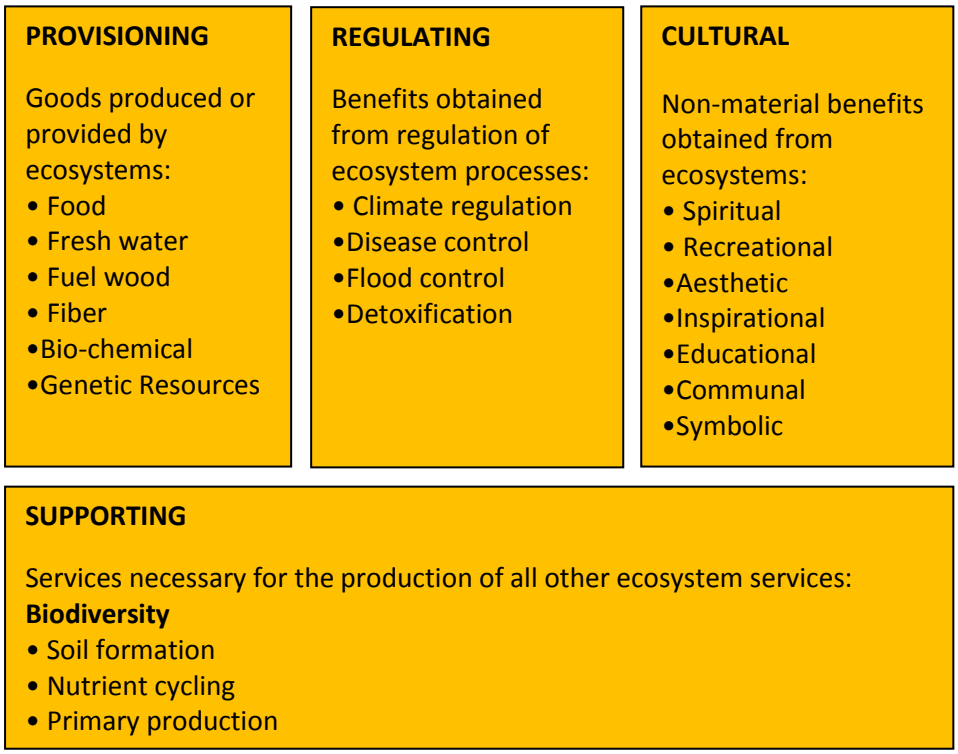
1.3 Forest ecosystems and their services

Forest ecosystems have been defined in different ways by various agencies including the Food and Agriculture Organization (FAO), MEA, etc. Alternative criteria are available for defining what constitutes forested land (such as crown cover greater than 10%, as used by the FAO). As such there exists no universally accepted technical definition of forests. The way forward in this matter is an evolving one and is accommodative of new knowledge and practical considerations.

While alternative classifications relevant to specific ecosystems may be developed, the MEA provides a comprehensive one which is summarized below. The MEA (2005) classifies

ecosystem services into four categories, namely supporting, provisioning, regulating and cultural services. Forests in particular provide both tangible and intangible services that not only promote economic activity, but are fundamental to life on earth, with basic life supporting services such as biodiversity preservation, hydrological services and climate stabilization. Briefly, the services included within each category are listed in Figure 1.

Figure 1: Forest Ecosystem Services



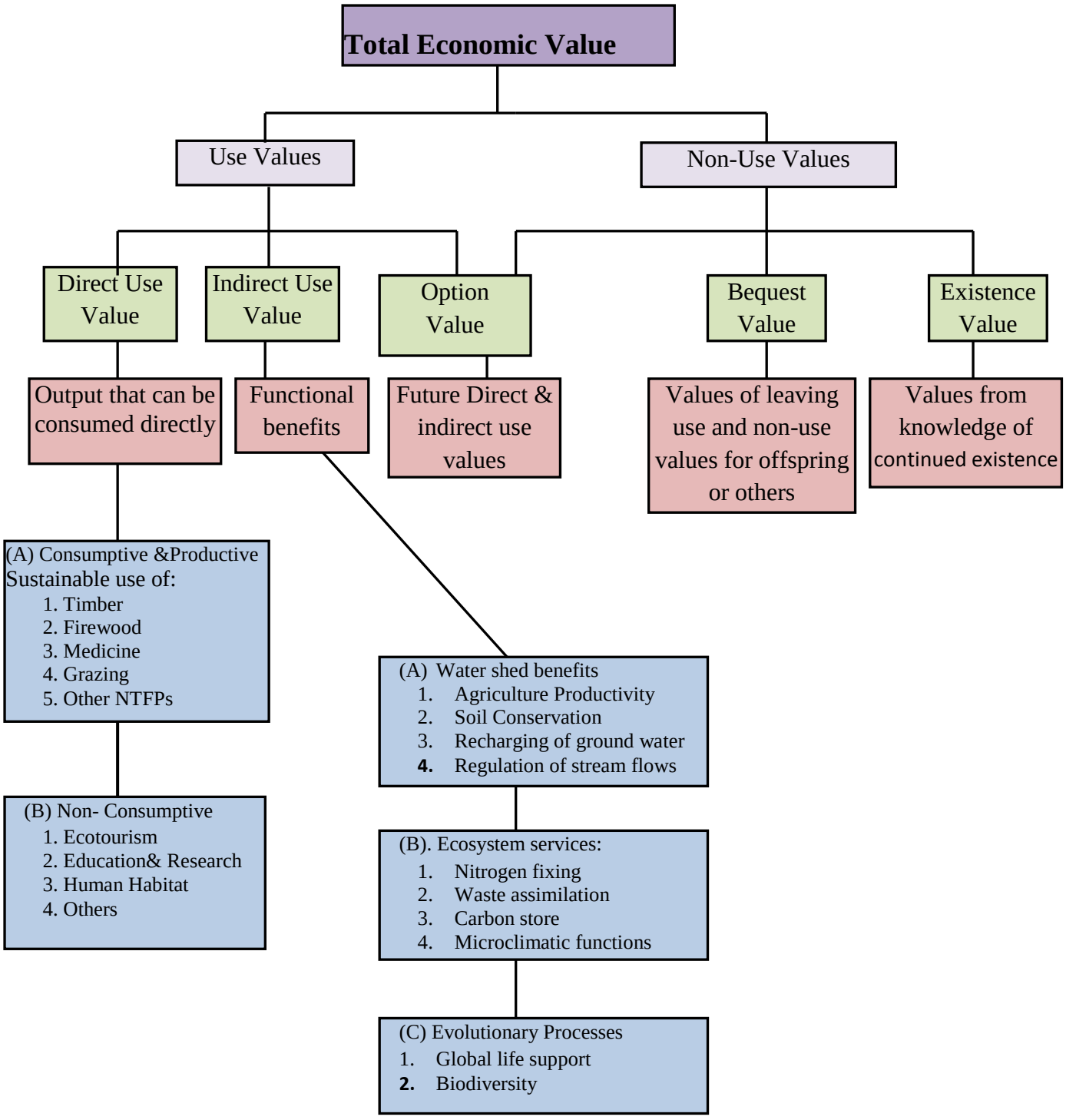
Source: MEA, 2005

Pearce *et al.* (1989) introduced a typology for classifying services from forests in terms of their *direct use* value, *indirect use* value and *non-use* value. These comprise of the following respectively:

1. The benefit of using forest resources as input to production or as a consumption good;
2. The indirect support and protection provided to economic activity and property by natural forest functions, or forest "environmental" services and,
3. All other benefits which cannot be characterized in terms of a current or future physical interaction between the forest and consumers (Bishop 1999).

The classification is also sometimes divided into use and non-use values comprising two parts of total values. Figure 2 below provides a listing of the economic values typically associated with forest ecosystems, corresponding to the notion of "Total Economic Value."

Figure 2: Total Economic Value of Forests



Source: Barbier et al, 1991

Methodologies for economic valuation take note of economic characteristics such as presence of externalities, public good characteristics (non-excludability, non-depletability) of forest ecosystem services. The presence of these implies that the market cannot reveal prices that reflect the true social value of these services. The techniques of valuation that have been developed for measuring non marketed values are based on neoclassical economics concepts of value. The underlying economic principle is that of the familiar framework of the consumer's marginal willingness-to-pay (WTP) for the benefit in question[6]. The valuation methods have been classified in different ways – as physical linkages methods and behavioural linkage methods; revealed preference (e.g. travel cost, hedonic, averting cost techniques) and stated preference techniques (e.g. contingent valuation, conjoint analysis techniques).

2. Economic valuation of forest ecosystem services: Theory and Empirics of Relevance to India

2.1 A brief review

The economic valuation of forests has provoked much discussion in both forestry and non-forestry circles. This is inevitable given the intricate linkages that forest ecosystems have with human well-being. It is important to have a consistent conceptual framework relating forests with economic activity, one that will adequately capture the synergies and the stresses that exist between the two. Economic valuation has sought to provide a monetary measure for characterizing this relationship, and contributing thereby to decision-making with regard to the use of forests and forest lands.

India has experienced rapid economic growth at the aggregative level over the last couple of decades, and particularly so since 2001. The imperatives for conservation of forests on one hand and diversion of forest lands for alternative use on the other hand have posed conceptual and methodological challenges for economic valuation in the forestry sector. There is a synergistic, but not necessarily complementary relationship between the economic value of forests and economic development in non-forestry sectors in the country.

The current approach to forest valuation promotes a holistic understanding of the true value of forests as forest ecosystems, which provide both tangible and intangible services that not

[6] WTP and WTA adopt different reference points for levels of well-being. Each of these differs in terms of the underlying distribution of property rights (Krutilla 1967). The choice on the appropriateness of the measure of welfare depends on the context; the equity aspects and practicalities of the specific situation.

only promote economic activity, but are fundamental to life on earth, with basic life supporting services such as biodiversity preservation, hydrological services and climate stabilization. However, translating this approach into a comprehensive empirical economic valuation of forests poses challenges at both the macro and the micro level.

At the macro level, economic value of forests has been modeled in terms of their contribution to the Gross Domestic Product (GDP), as a sector in the National Income Accounts. Valuing forests as an essential component of natural capital, whose stock has to be maintained for ensuring the flow of services from the forests is an alternative macro level approach. At the micro level, there has been a proliferation of studies on the valuation of goods and services from forest ecosystems, these values being attributable to specific contexts of valuation.

Economic valuation of ecosystem services seeks to fulfill several purposes. *Firstly*, to provide inputs for informed decision making by policy makers, particularly, for decisions that involve trade-offs regarding alternative resource use. *Secondly*, it provides a convenient indicator for the state of the environment in a particular context, such as the provision of estimates of changes in natural capital, and, inputs for green accounting. It helps in measuring whether there has been depletion or regeneration in an ecosystem or whether ecosystem functions have improved or not in terms of a common numeraire, especially in situations where one needs to compare a diverse set of services. *Thirdly*, resource allocation decisions can be informed through such valuation decisions, particularly in developing countries which face resource scarcities while making investment decisions, whether it is for environmental preservation or development. For example, appropriate valuation reflecting the true worth of environmental services can create forceful arguments for investing in resource efficient technology (e.g. energy sector), restoration of ecosystems, and for investing in capacity enhancement and better institutions for natural resource management on one hand, and for compensations to communities and governments that preserve ecosystems on the other hand.

When policymakers are faced with trade-offs between different ecosystem services (e.g. habitat preservation versus agriculture – increased use of water and fertilizers or expansion of cultivated land reducing availability of water for other uses, degrading water quality, reducing biodiversity and decreasing forest cover) or if they need to measure the costs and benefits from changes that may occur in ecosystem services; economic valuation serves a purpose in quantifying the values of the concerned services.

The economic approach to valuation is based on the premise that all values are anthropocentric (Markandya 1998). Thus it precludes all values that are non-anthropocentric or in related terminology non-instrumental except for that which is instrumental to humans[7]. This is distinct from the emphasis placed on intrinsic values or energy-based values by ecological economists (Venkatachalam 2007). The MEA (2005) recognizes the existence of non-anthropocentric sources of value and the fact that both anthropocentric and non-anthropocentric sources of value are taken into account in informing policy decisions regarding the preservation of ecosystems.

Economic valuation of environmental resources covers a wide range of values, including both marketed and non-marketed values. This is of particular importance for ecosystem services since the majority of these are non-marketed. Further, economic valuation can be conducted for both use and non-use values, as elaborated in the by now familiar total economic value framework (Barbier et.al 1991). An adverse consequence of changes in ecosystem services may occur if decision-making is unable to take into account the non-marketed benefits adequately.

Economic valuation techniques can help in measuring direct and indirect use values of an ecosystem. However, it is neither feasible nor desirable to evaluate all the benefits and costs through such techniques, rather one concentrates on those which are significant in a given context and where the existing state of knowledge is appropriate for such economic valuation.

The aggregation of individual values leads economists to societal values. Individual values are based on economic principles of individual preferences (marginal willingness to pay or accept compensation). Values are specific to the time frame, context, and assumptions made for a valuation exercise. The framing of the valuation question is often influenced by the context in which valuation is conducted. Values are entirely dependent on the context and may change as the elements of that context change (Bockstael, Freeman, et.al. 2000). The scope of the analysis in terms of the spatial spread of cause and effect, the distribution of changes in services and the time scale are all important considerations in the design of an economic valuation exercise. Again, willingness to pay and willingness to accept compensation are two approaches that can yield different results as they are based on differences in the distribution of property rights. Discounting is an important aspect of any

[7] There is an extensive literature on philosophy and ethics of the environment which is beyond the scope of the present study (Callicot, 2004; Turner, 1999).

cost-benefit exercise and requires assumptions on time frames and discount rates that can influence the outcome of economic valuation.

Stakeholder participation contributes to the decision making process alongside economic valuation. Economic and financial interventions have to be used to regulate ecosystem goods and services. Where markets fail to function properly, economic valuation helps in the designing of appropriate economic instruments that can be used to achieve efficient allocation of resources since they reflect non marketed values.

What also needs to be reiterated is that in a large economy such as India, policies on land use that are designed at the national / central level, are bound to have very different local implications, given the diversity of local bio-geo-chemical conditions. Ecological inputs, availability of reliable data and choice of methodology become all important for an exercise on economic valuation. Finally, it is also important to keep in mind that it may not be either feasible or desirable to impute monetary values to all services. This may hold true even in situations where unique stakeholders can be identified to whom specific services accrue, since the social or ecological context may make such valuation misleading due to methodological constraints.

2.2 India context: Issues and concerns

As noted earlier, the imperatives for conservation of forests on one hand and use of forest lands for non-forestry purposes on the other has been a major focus for planning and management of forests. In this context, it is argued that economic valuation of forests can provide important input into decision-making.

The understanding of the economic value of forest ecosystem goods and services in India is majorly impacted by three major considerations. *Firstly*, there is substantial mineral wealth below the ground in many forested regions of the country, for instance in states such as Orissa, Madhya Pradesh, Chhattisgarh, Jharkhand, etc. *Secondly*, the forests themselves are of high and substantial ecological value, including biodiversity and habitat, and the sustenance of flows in rivers which originate here and therefore support water related economic activities such as agriculture, downstream pastures, and inland navigation. *Thirdly*, large numbers of forest dwellers and forest adjacent populations inhabit forests, and are critically dependent on these in various ways not just for economic reasons, but also for their socio-cultural security. The contribution to livelihoods by forests needs to be appropriately valued in economic terms for addressing poverty alleviation. There have been several case

studies in India based on both quantitative and qualitative research methodologies that have sought to evaluate the linkages between ecosystem services and poverty in this context.

2.3 Valuation of forest ecosystem services: Methodology

The conventional approach to measurement of changes in the economic value of service flows from natural resources is that of Cost-Benefit Analysis (CBA). CBA typically compares all the costs of a (proposed) project with all its benefits. In the present context, a benefit is a service flow from the ecosystem that increases human well-being while a cost is a flow that reduces human well-being. Once the stream of benefits and costs has been determined these are discounted to account for the fact that costs and benefits would accrue over a period of time. In operationalizing the CBA rule, various decision criteria have been developed in order to judge between alternative options. These include the Net Present Value (NPV), internal rate of return and the benefit-cost ratio. For instance, maximizing the NPV is a criterion that indicates that in choosing among alternative interventions, the project with the highest NPV should be selected.

However, several important methodological issues arise in applying CBA to ecosystem services. Choosing the appropriate rate of discount and the choice of planning horizon often require value judgments. Issue of risk and uncertainty, distributional concerns, and the sustainability of resource in question are important considerations to which there are no easy answers (Chopra and Dasgupta, 2008).

2.3.1 Non-Market Valuation of Ecosystem Services

Economic characteristics such as presence of externalities, public good characteristics (non-excludability, non-depletability) of these services imply that the market cannot reveal prices that reflect the true social value of these services. Techniques of valuation that are consistent with the theory of economic welfare measurement have been developed for measuring specific non-market values. Neoclassical economics has provided the basic concepts of economic value.

Sseveral scholars have contributed to the literature on techniques for valuing non-market benefits (Freeman 1993a, Bishop 1999). The underlying economic principle is that of the familiar framework of the consumer's marginal willingness-to-pay (WTP) for the benefit in question. Alternatively, the marginal willingness-to-accept (WTA) monetary compensation for losing the benefit is estimated. Each of these differs in terms of the underlying distribution

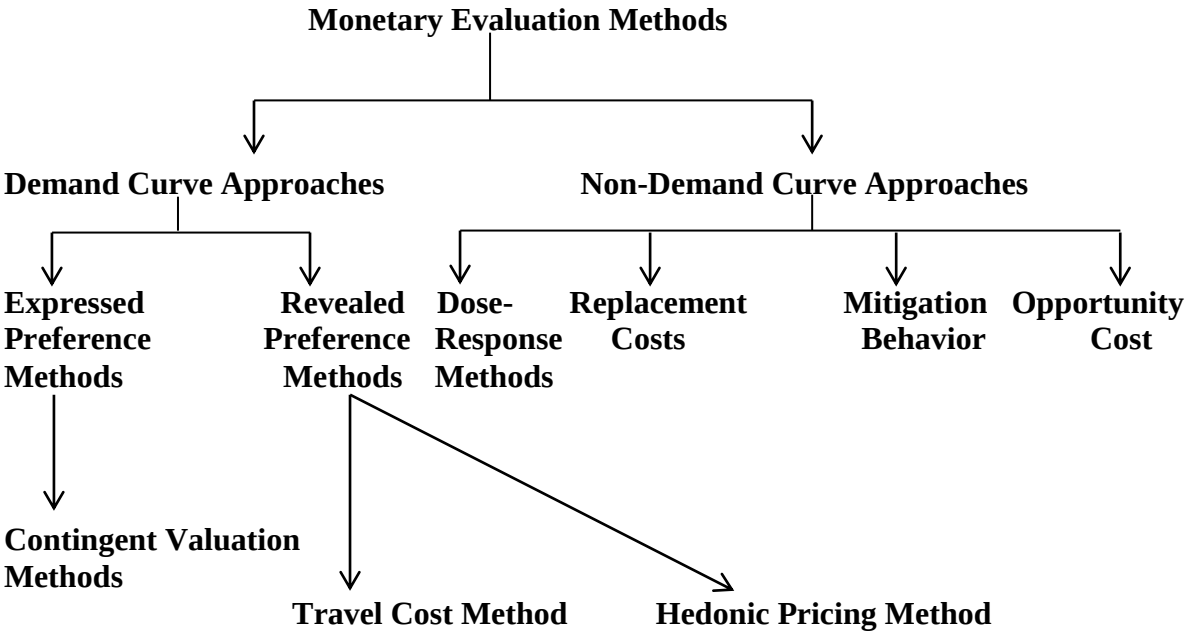
of property rights (Krutilla 1967). The choice on the appropriateness of the measure of welfare depends on the context; the equity aspects; and practicalities of the specific situation.

Valuation methods for specific resource flows have been classified in various ways. Some of the earlier literature started by distinguishing between physical linkages methods and behavioural linkage methods. Freeman (1993b) proposed a classification based on whether resource values were directly elicited or not, and whether they were hypothetical or observed values. In general, two well-accepted broad categories into which valuation techniques have been divided are revealed preference (e.g. travel cost, hedonic, averting cost techniques) and stated preference techniques (e.g. contingent valuation, conjoint analysis techniques). Figure 3 provides a classification.

Among approaches available to economists for the valuation of changes in ecosystem services, methods such as cost benefit analysis, risk assessment, multi criteria analysis, cost-effectiveness analysis, precautionary principle and vulnerability analysis have been used to various extents. The use of values allows for the incorporation of the damages or benefits from maintaining forests ecosystem services to the stakeholders concerned.

An option under situations of uncertainty is to apply the precautionary principle, particularly in cases involving ecosystem changes that could majorly impact current ecosystem services, such as those related to biodiversity. Under these circumstances, the call for compensation to states that undertake to apply the precautionary principle in not converting to alternative land use, deserve greater compensation, in line with the uncertainty and the length of the time frame under consideration.

Figure 3: Methods for the monetary evaluation of the environment



Source: Turner *et al, 1994*

2.3.2 Valuation Contributes to Designing Economic Instruments

Appropriate valuation can point towards correcting market failure and the mis-alignment of economic incentives (MEA, 2007) in the economy. It can aid in eliciting appropriate response through various mechanisms. These include the greater use of economic instruments and market based approaches in the management of ecosystem services. These could range from the imposition of taxes or user fees on activities that cause negative externalities (e.g. consumption of polluting substances, discharge of effluents) to elimination of harmful subsidies (e.g. energy, fertilizer, electricity). Payments for ecosystem services (PES) are another economic mechanism for encouraging conservation of natural resources. The PES mechanism in fact can provide an anchor for the rationale to provide compensation to states that conserve and preserve their forests as an opportunity cost of developmental opportunities. Inputs from valuation studies can form the basis for designing to markets for carbon trading.

2.4 Valuation of forest ecosystems: some empirical aspects for India

Pressures on forests emanate primarily from competing economic values of hydropower, real estate development, transport and large infrastructure, and industrialization. Typically, the computed net economic benefits from these tend to be larger, since the services provided

from these are tangible with well-developed methodology for monetary evaluation, mostly driven by market prices. The secondary impacts on economic growth or cumulative causation leading to more employment and commerce are also seen as deliverables which have greater certainty of being realized with higher market based pay-offs. As against these, forest ecosystem services are perceived as being uncertain (watershed services for example), many are partially or completely intangible (socio-cultural, aesthetic, option values for future use) and apart from a select few, forest ecosystem services are substantially not marketed. The links with economic wellbeing are therefore not always well perceived, nor is scientific methodology for economic evaluation well-developed for many ecosystem services. Economic loss associated with such ecosystem services tends to be perceived when specific awareness campaigns have been launched, or where large groups of people are directly impacted by the loss of these services.

The point can be illustrated using the case of NPV for forest diversion in India. Typically, payments made for diversion of forest use to non-forestry purposes are compensations for the loss of forest and the loss of the flow of goods and services accruing from it to diverse stakeholders. Economic valuation exercises aim to provide a measure of the compensation that is due. In India, cost benefit analysis has been the methodology used to compute this value for official purposes, using the NPV criterion for decision making. A robust methodology for estimating the economic value of forests can form one of the components for determining what these payments should be. Several recommendations and guidelines have been developed for computing NPV for forest lands by various agencies and scholars (Kanchan Chopra Committee 2006, GIST, CEC 2007), in view of developments in the theoretical literature on economic valuation and currently available scientific data.

It is well recognized that currently the forest sector's contribution to GDP is grossly underestimated, especially in terms of the contribution for self-consumption, ecotourism and fuel wood trade. The Central Statistical Organization (CSO) had commissioned studies to evaluate the contribution of forest resources in specific locations of the country. It is hoped that methodologies would ultimately be made uniform across studies in order to enable systematic inclusion of these economic values in the construction of Green Accounts as well.

There are a range of studies in India which have looked at the values of ecosystem services. Most of these have valued individual ecosystem services while few have modeled the value of *changes* in the ecosystem service in question, for India. Integrated economic and

ecological modeling attempts are fewer in number, but are gaining popularity, such as system dynamics models.

Several studies have attempted to quantify the value of household collections, from common property resources, of which the major proportion comes from forests. In landmark study by Jodha (1986) common pool resources were adding 15% to 23% to the poor's income. Several other researchers (Pasha 1992, Beck and Ghosh 2000) have also gathered empirical evidence from micro level studies that show household income of the rural poor was augmented by 12 to 15% from collections. A more recent study (Dasgupta 2006) finds that such collections continue to make significant contributions to the livelihoods of the poorest households, in rare cases upto 40% of their annual incomes. The use of alternative participatory models, and qualitative approaches and interdisciplinary methods can contribute to improving the estimates from quantitative approaches.

Biodiversity has been valued in different ways by scholars in India. While some advocate the use of the precautionary principle (IIED 2000, Chopra and Dasgupta 2007), others consider application of economic tools for valuation (Ninan 2007). In the case of valuation of forest ecosystems in India, Chopra and Dasgupta (2007) make use of the precautionary principle for biodiversity hotspots, arguing that these sorts of protected areas require safe guarding through non-economic instruments such as legal instruments. Ninan (2007) assesses use and non-use values that people derive from tropical forests and the scope for economic valuation for halting the loss of biodiversity in forest hotspots. Again, in the case of wastelands, the investments being made in India are based on subjective assessment of the importance of restoring these, although quantitative valuation maybe a challenge.

There have been several attempts to value ecosystem services from *watersheds* in India. The techniques used have been contingent valuation method, changes in productivity approach or the replacement cost approach. Chopra and Kadekodi (1997) derived values for the Yamuna river basin. Ecological functions were found to be worth Rs. 624 per hectare in the forest ecosystem. Kumar (2004) valued soil conservation services. Several other scholars have also discussed socio-economic impacts of benefits from watersheds (Chaturvedi 1992, Lele and Venkatachalam 2003, Lele et al 2007).

Several research studies were sponsored under the World Bank Capacity Building Programme on Environmental Economics in India (Parikh and Raghuram, 2003). Of these, four projects were to study the services of *urban wetlands* while four more were to examine

the interface between protected areas and economics. Of these, a study of the wetland ecosystem in Kolkata yielded WTP ranging from Rs. 60 to Rs. 1200 per person per year as existence value for the Wetland. Another study valued the damage costs for the agricultural sector, fisheries and drinking water due to industrial water pollution in Tiruppur.

There appears to be a clear *trade-off* between anthropogenic activities and the loss of ecosystem services such as biodiversity. Ninan (2003) finds that villagers are willing to spend Rs. 6003 per household per year at one site for elephant conservation activities in terms of the opportunity cost of income forgone. At another study site, villagers were willing to participate in such activities amounting to Rs. 585 per household per year in terms of opportunity cost of time of forgone labour benefits.

An exercise on economic valuation is complicated by the fact that cause and effect of ecosystem changes can be *spatially differentiated*. For instance, consider the case of upstream and downstream users of river Yamuna, with regard to the city of Delhi. Water supply to residents in Delhi is disrupted when excessive discharge of industrial pollutants takes place upstream in Haryana. *Paripasu* untreated waste (human and industrial) discharged into the river within Delhi adds to the pollution load and poses health risks for communities located further downstream (Dasgupta 2005). This underscores the need for choosing appropriate time scales and geographical scales relevant to the ecosystem service being valued. Similarly Murty et. al. (1999) found that WTP for water quality improvements, for user and non-user values, can both differ substantially between urban and rural households.

At the practical level, *lack of data and information gaps* often constrain economic valuation studies. It is therefore not uncommon to find different methodologies yielding non-identical values for the same ecosystem service, although the individual methodologies are internally consistent. The maintenance of ecosystems, and their resilience, is becoming an imperative for most countries, and India is no exception. In most instances, micro level and disaggregated information is an essential input for ensuring ecosystem service flows.

2.5 Payments for Ecosystem Services

Some of the more recent initiatives in context specific, market based approaches to valuation, includes Payments for ecosystem services (Pagiola et al 2002). Such a mechanism seeks to establish relationships between buyers and sellers (those who would preserve/ maintain) of specific ecosystem services. Payments for ecosystem services are an obverse to the polluter

pays principle, when positive ecosystem services are being generated. Beneficiaries of a forest ecosystem would thus be acknowledging the existence of these benefits, internalizing the public good aspect of the ecosystem through payment transfers. The recipients have an incentive thereby to preserve forest cover and not divert the land to alternative use which has higher economic rents. A range of terms, associated with each other but definitionally distinct have emerged in the literature in this context, under the broad category of markets for ecosystem services (Wunder 2005, Rosa et al 2003). Each of these terms has varied implications in terms of payment vehicles, transaction costs and the economic agents involved. Thus compensation (such as in NPV payments for diversion to non-forest use in India) is distinct from rewards (as in the RUPES program in Indonesia, Nepal and Philippines) (Noorwijk, et al 2004). To have an effective PES mechanism in place, two important components are as follows. The first is to have an appropriate valuation of the ecosystem service in question and the second is to ensure equitable distribution of the benefits for both providers and suppliers of the service, to ensure sufficient buy-in from all concerned stakeholders. While, there are many design issues which can pose a challenge for having in place an effective PES mechanism, but as international experience has shown, this is an evolving field in which there is potential for making progress.

International experience with PES has varied in both developed and developing countries Pagiola et al 2002). In France, USA and Australia the experimentation with PES has mostly been linked to the water sector and has been used for improving water quality (e.g. New York City's water supply, reduction of salinity in New South Wales). In many of these instances, the ecosystem service has been provided by upstream land owners or farmers and/or forests (owned either privately or by the state). The payment vehicle and design has also differed across countries. In Colombia, an eco-tax for watershed management was levied on industrial water users and payment was to be made by municipalities to private land owners. Examples of payments from water utilities to locals for ensuring water flows for hydro power generation are also found in Asia (for instance as part of the RUPES programme) and Costs Rica. An example of voluntary emission trading scheme that transfers carbon credits from local forest community and small farmers (providers) respectively to beneficiaries (World Bank, others) is found in India (Adilabad, Andhra Pradesh) and Mexico.

Some scoping studies have been carried out at some sites in India on the possibility of promoting *PES mechanisms* that reflect the value of watershed services such as water purification and regulation of stream flows that are maintained by upstream residents for the

benefit of downstream users in Sikkim, landscape and recreation services for Gangtok and Munnar. However, these are at a very preliminary stage and markets that adequately reflect the true economic values are yet to be developed (IDRC 2006, WWF 2007). It can also be argued that PES mechanisms, broadly defined include cess, tax, cap and trade and eco-labeling measures Among other initiatives in India, benefit sharing arrangements such as payments for sharing indigenous knowledge related to biodiversity in the case of the Kanitribals of Kerala and payments for biodiversity conservation to the Mawphlang community in Meghalaya can also be classified as attempts to incorporate PES mechanisms.

The hill states in India offer a good possibility of experimenting with a workable model of this approach to placing economic value on forest ecosystem services. Payments for such services can be across communities (such as downstream and upstream settlements or users in a watershed), or across states (between states which preserve forests and those which benefit from these).

3. Forest Policy and Governance in Indian Context: Implications for development of infrastructure

3.1 India's forest typology and distribution

Forests in India can be considered in different ways. The forests can be seen in terms of density class, species composition and growing stock. The density class and the bio-geographic zones, reflect the species mix and its availability.

Forest cover of India is shown in three density classes viz., very dense forest (VDF) with more than 70% canopy density, moderately dense forest (MDF) with canopy density between 40% and 70% and open forest (OF) with canopy density between 10% and 40%. Scrub and water bodies are also delineated. The non-forest cover includes scrub. The area under VDF, MDF and OF also includes mangrove cover of the corresponding density class.

There are 10 major bio-geographic zones of India ranging from Trans-Himalayan to Desert further to Western Ghats Mountains and the islands. These major zones indicate a distinctive set of physical and historical conditions and include the following: Trans-Himalaya, The Himalaya, The Indian Desert, and the Semi-arid zone, The Western Ghats, The Deccan Peninsula, The Gangetic Plain, The Northeast, The Islands and The Coast (Rodgers and Panwa 1988).

However, in terms of volume per hectare (density of growing stock) the hill states are in a good position with leading states like Himachal Pradesh, Jammu & Kashmir, Uttarakhand, Arunachal and Assam (Table 1).

India has a diverse range of forests: from the rainforest of Kerala in the south to the alpine pastures of Ladakh in the north, the deserts of Rajasthan in the west to the evergreen forests in the north-east. Climate, soil type, topography, and elevation are the main factors that determine the type of forest. Forests are classified according to their nature and composition, the type of climate in which they thrive, and its relationship with the surrounding environment.

The forests can be divided into six broad types, each with a number of sub types. Many important types are found in the hill states. Moist tropical forests are found along the Western Ghats and the Nicobar and Andaman Islands and all along the north-eastern region. In Montane temperate forests *Wet type are* found in the region to the east of Nepal into Arunachal Pradesh. Sub-alpine forests extend from Kashmir to Arunachal Pradesh while among the Alpine forests, moist ones are found all along the Himalayas.

3.2 Status of forests in hill states

The total forest cover of the country as per 2009 assessment is 692027.25 sq. km and this constitutes approximately 21 percent of the geographic area of the country (Table 1). Of this, 83427.76 sq. km. is very dense forest; 320238.27 sq. km. is moderately dense forest.

In India, forest ownership is mainly with the government. Private companies, corporations, individuals, clans and communities own significant areas of unclassified forest. The seven northeastern states of Meghalaya, Mizoram, Nagaland, Tripura, Arunachal Pradesh, Manipur and Assam have the largest areas of unclassified forest in India, and these are controlled by local communities with very little State control[8].

Hill States in India with only 18 percent of geographical area of the country account for 34 percent of the total forest cover (Table 2). The total forest cover in the region is 234,933 km^2 which is 39.58 percent of the geographical area as against the national average of 21.05percent.The hill districts (124 districts in 2009) constitute 21.53 percent geographical

[8]Unclassified forests provide the backbone for livelihood generation, as these are the areas where most shifting cultivation takes place. Village, community and private forests are used mainly for meeting the subsistence needs of communities in terms of fodder and fuel wood, and other non-timber products.

area in the country, with 40.65 percent of the total forest cover in the country. Over 80 per cent of these are in hill states (Table 3).

India has lost 367 square km of forest cover between 2007 and 2009[9]. The total forest cover in the country is now at 6,92,027 sq. km. This accounts for 21.05 per cent of the total geographical area of India. Northeastern states saw a decrease of 549 sq. km of forests during this period. The other states that lost forest cover are Kerala (24 sq. km), Chhattisgarh (4 sq. km), Maharashtra (4 sq. km), Uttar Pradesh (3 sq. km), Gujarat (1 sq. km) and Chandigarh (0.22 sq. km). The states that registered forest growth include Haryana, Himachal Pradesh, Karnataka, Goa, Jammu & Kashmir, Uttarakhand and West Bengal (Table 2). A total of 548 sq. km forest cover has decreased in the 124 hill districts of the country (Table 3). Loss in forest cover was highest in Manipur and Nagaland among the hill states.

Table 4 presents a summary of forest cover in tribal districts of the country. The tribal districts (188 districts in 2009) constitute only 33.64 percent geographical area of the country, though the forest cover in these districts is 59.52 percent of the total forest cover in the country. It is significant to note that the forest cover in the tribal districts shows a net loss of 679 km^2 as compared to net loss of 367 $km^2$for the country as a whole during the period 2007-2009as opposed to a net gain of 690 km^2 of the total gain of 728 km^2 for the country as a whole during 2005-2007.

Despite the pressures of development, and growing population, India has been able to maintain its forest cover and address the issues of deforestation. However, unsustainable exploitation of forest resources has resulted in the degradation of the forests which has been estimated at 40 per cent[10]for the past two decades.

[9]The study conducted by the Indian Institute of Science (IISc), Bangalore for “Current Science" journal says that massive deforestation has been masked by Forest Survey of India's afforestation data. The IISc study contradicts FSI's forest-cover figures and highlights a loss of 998.5 sq. km of forests between 2007 and 2009 (ToI, 2012).
[10]This estimate is based on the crown cover change, which does not take into account the degradation of ground vegetation and change in soil characteristics

India has registered an average economic growth of 7% over last one decade. While large infrastructure projects like dams, roads, special economic zones have been implemented, the benefits of this development have not trickled down to large part of rural India. Further, this has affected forests and other natural resources in two ways. One, large areas of forest have been diverted for the above mentioned projects. Second, lots of people have been displaced from their village commons without much compensation (MoEF 2006). The loss of their earlier livelihood opportunities, in turn, has put pressure on forests, resulting in its degradation.

It is important to ensure that the benefits of infrastructure development especially when diversion of forest land is involved, reach the rural areas and to the community which suffers the highest local externality ─ due to displacement or degradation due to project activity. For instance, in many cases it will take a few years before the benefits of a highway can be realized by the local community if linking roads are not provided. Similarly, power project will not benefit them directly if their villages are not supplied power. Besides, affected/displaced community will need to be helped with alternative livelihood opportunities.

The net change in any class of forest cover may be the result of improvement somewhere and degradation elsewhere. There could be several reasons for this change. FSI in consultation with the state Forest departments has ascertained important reasons of changes in forest cover in some states (Table 5). Among the hill states, decrease in forest cover is mainly due to shortening of shifting cultivation cycle and biotic pressure, departmental felling, and encroachment.

3.3 Estimates of Wasteland in India and Hill State

There are several estimates of the extent of degraded lands reported by various agencies in the country. These estimates vary largely due to variation in approaches and methodologies of estimation. According to an atlas (Wasteland Atlas of India, 2010) developed by the National Remote Sensing Agency (NRSA) of the Department of Space on the wastelands of the country, there are 13 categories of wastelands covering 19.4% of the country's geographical area; while in the IHR, wastelands cover significantly higher (about one third) proportion of the total area of the region (Table 6 and Table 7). More than one fifth (22.4%) land in the IHR is either under snow or barren and does not support any biological growth. However, for most of the states in the north-eastern Himalaya, reliable revenue records are yet to be prepared or updated. Land ownership and obtaining right-of-way are major issues for executing developmental projects in areas where government owns no or small area of land (e.g., Nagaland and Meghalaya). This has implications on the time taken for project execution and cost of the project. Further, the wasteland atlas has categorized area under *Jhum* as wasteland, although it is a prominent traditional agricultural land use associated with the social framework of a large number of tribal communities of the north-eastern states. Local terrain in the region coupled with dynamic practices (both in time and space) of shifting cultivation, and lack of cadastral maps make it difficult to provide accurate estimates of areas under such usage. This can, however, be measured using space borne technology, albeit at higher resolution; and will require frequent updating (GoI, 2010).

The land resources of the Himalayan region are steadily degrading due to a number of natural and man-made factors. The continuing uplift of the Himalaya has also contributed to a modification in the land forms, leading to slope instability especially during heavy rains. The soil erosion rate in northwest Kashmir is of the order of 2 to 12 mm/year, and in Kumaun region of Uttarakhand it is 1.73 mm per year. The IHR rivers transfer the eroded material to the plains and as stated earlier, the sediment load in the Himalayan rivers is amongst the highest in the world. River Brahmaputra carries more that 650 million tons of sediment per year; the Ganga more than 417 million tons per year. Soil erosion and landslides that occur in the IHR on account of very swift surface run-off from degraded forests, low vegetal cover areas, construction activities (buildings and roads), improper cultivation practices (faulty terraces and shortened *Jhum* cycles) are of major concern The only way of tackling this is through a strictly observed, mountain specific land use policy and watershed based land use planning. There is need for uniformity in protocols for land use classification in the entire region. Interventions are also required to manage, improve and supplement *Jhum* (GoI, 2010).

3.4 Forest Management Policies and Laws

There are a number of laws and policies which impact forestry sector and forest management in India. The different laws related to the forests and biodiversity include Indian Forest Act (IFA), 1927; Forest (Conservation) Act (FCA), 1980; Wildlife (Protection) Act, 1972; and Biological Diversity Act, 2002. However, the key policies and laws which have brought paradigm shift in forest management include National Forest Policy (NFP), 1988; Joint Forest Management Resolution (JFMR), 1990; National Environment Policy (NEP), 2006; Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 along with the recently adopted National Action Plan on Climate Change (NAPCC). A brief analysis of these is given below.

The present legislative framework for environmental protection is broadly contained in the umbrella NEP 2006, Environment Protection Act 1986, the Water (Prevention and Control of Pollution) Act, 1974, the Water Cess Act 1977 and the Air (Prevention and Control of Pollution) Act, 1981.The environmental clearance process is required for 39 types of projects and covers aspects like screening, scoping and evaluation of the upcoming project. The main purpose is to assess impact of the planned project on the environment and people and to try to abate/minimize the same.

The IFA, 1927, was the first comprehensive Act governing the forest sector. It allowed the state control of all forests and prioritized commercial objectives. The basic tenets of the Act were based on commercial exploitation and state custodianship and management. The Act does not address contemporary issues such as people's participation in forestry management. This resulted in forest degradation and the alienation of forest-dependent communities.

The FCA 1980, was enacted to control the diversion of forest land for non- forestry purpose and to slow down deforestation. Under this legislation, the approval of the central government is required for diversion of forest land above 1 ha. for non-forestry purposes. The user agency has to pay for compensatory afforestation as well as an amount equal to the Net Present Value of the forests diverted. While this Act has helped in keeping a check on diversion of forests for non-forestry purposes, it has also posed serious challenges for setting up developmental infrastructure in states, especially the hill states which have limited non-forest land resources.

The NFP, 1988, marked a paradigm shift in forest management from regulatory to participatory. It laid the foundation of involvement of local communities in management of forests as well as implied a shift from the earlier revenue-oriented forest management to the current conservation-oriented management. It puts emphasis on meeting peoples' needs and involving them in management of forests. Meeting the subsistence needs of the local communities, maintenance of environmental stability and restoration of ecological balance have been identified as the major objectives of forest management under the NFP.

JFM, 1990 facilitated involvement of local communities in the management of forests. Jimi's globally the most well-known system of forest management based on sharing of responsibilities and benefits between the state and local communities. The Forest Policy (1998) clearly supports participation in forestry by calling for the creation of a massive people's movement to achieve its objectives. JFM differs in form from state to state and while it has created opportunities for communities to participate in and benefit from the formal system of forest management, it is troubled by a number of shortcomings. Although JFM is reported to have had positive impacts in terms of improvement in vegetation cover and income of communities in many areas across the country, several issues such as distribution of powers of Forest Protection Committees (FPCs) vis-à-vis those of the forest department, gender equity, security of tenure, financial sustainability remain.

The NEP, 2006 recognized that forest laws and formal institutions have undermined traditional community rights and disempowered communities, and such disempowerment has led to the forests becoming open access in nature, leading to their gradual degradation. The Policy advocates recognition of traditional rights of communities.

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (FRA) recognizes the rights of forest dwelling STs and other forest dwellers (in occupation for at least 3 generations or 75 years). The rights include habitation, self-cultivation for livelihood, ownership, access to minor forest produce, other community and customary rights. The Act commands upon them the responsibility of protection of forests. The procedure for determining the rights of dwellers is initiated at the level of *Gram Sabha*.

The Green India Mission under the NAPCC, 2008, advocates bringing one-third of the geographic area of the country under forest cover, through afforestation of wastelands and degraded forest areas. A key program to facilitate this is the Greening India Program, under which 6 Mha of degraded forest area would be afforested with the participation of FPCs. The mission also recognizes the need for effective conservation of biodiversity both within and outside Protected Areas (PAs). While this is an important policy statement, the guidelines for its implementation are being formulated. As of now, the money collected under NPV and compensatory afforestation has been reallocated for the afforestation activities under the NAPCC.

The national forest policy (1998) advocates that two-thirds of the area in hills should be maintained under forest cover. Following the Planning Commission's practice, a hill taluka can be defined as one where the altitude is above 500m form sea level, based on which 124 districts (SFR 2011) in the country can be classified as hill districts in India.

In addition, Wild Life (Protection) Act,1972 (amended in 2001 and 2002) and Biological Diversity Act, 2002 provides for protection of wild animals, birds, plants and their habitats, and setting up of protected areas.

3.5 Forest Management in Special Areas

This can operate at two levels— tenure rights and right to decision making. The decentralized governance framework is not uniform and varies in states, scheduled areas and special category regions. While most states are governed by the provisions of *nagarpalikas* in urban areas and *panchayats* in rural areas, certain areas have a different version of it or are exempt from these institutional arrangements. Further, Schedule VI areas bar application of Acts of central and state governments in the subject matter where Autonomous Council is authorized to make laws. This would imply that the IFA, 1927; and the FCA, 1980 would be applicable only to the reserve forests in Schedule VI areas whereas these Acts would apply in non-Schedule VI areas. Certain national laws, the IFA, 1927 and the F C A, 1980 are not applicable to Jammu and Kashmir, but the state has its own Forest Act and Forest Conservation Act, both of which must be complied with when undertaking works that encroach on forest areas. However, since the Forest Act and the Forest Conservation Act of the Government of India are not applicable to the state of Jammu and Kashmir, any project activity that encroaches on forest areas needs to obtain clearance from the State Forest Department, as per the Jammu and Kashmir Forest (Conservation) Act, 1997.

3.6 Cross-Sectoral Linkages

In the absence of an integrated land-use policy and development planning in the country/states, the policies and programs of various governments, ministries have inadvertent impacts (both positive and negative) on the forestry sector. The linkages between forest management and some of the policies and programs of various ministries and departments are well known. Some of the important programs are: watershed development, National Rural Employment Guarantee Scheme, and agriculture and energy programs which have both positive and negative impacts on the forestry sector. A synergy in these programs and the forestry sector programs can be used gainfully in addressing conflicts in forest conservation and infrastructure development; strengthening of institutions; and improving the forest resources.

Afforestation activities have been part of watershed development in the country since the beginning of the program. Its implementation should be improved by strengthening the coordination between the watershed development agencies and the state forest department.

Permissible works under the NREGS include land development, afforestation and horticulture activities. At present 8% of total NREGS funds are being utilized for drought proofing, which include the plantation activities.

Under central agriculture program, some of the national level activities like National Horticulture Mission and National Bamboo Mission are being undertaken to improve the livelihoods of the farmers and simultaneously increase the vegetative cover of the country.

The energy program has direct impact on the forest management in the country. It is estimated that 65% of rural and 22% of urban population, constituting 40% of total population of the country depends upon fuel wood for cooking purposes (NSSO, 2001). It puts an immense pressure on forests and is one of the reasons for degradation of forests. The Ministry of New and Renewable Energy (MNRE), Government of India, has been promoting improved cook stoves (IC) which could significantly save fuel wood and thus could reduce pressure on the forests. There is a huge potential of 85 million ICs in the country which could save 17 MT of fuel wood every year.

3.7 Reducing Emissions from Deforestation and Forest degradation (REDD)

Forest management and governance issues have gained greater importance as new mechanisms for REDD are being negotiated in international climate change talks. For, tenure over land and trees – the systems of rights, rules, institutions and processes regulating their access and use – will affect the extents to which REDD and related strategies will benefit or marginalize forest communities; which is crucial in determining the success/failure of approaches like REDD.

Previous global approaches to curb deforestation have been unsuccessful. REDD provides a new framework to break this trend. The basic idea is that the developing countries willing and able to reduce their deforestation rate keyed to a reference time period will receive financial compensation. Transfers will be based either on foregone opportunity costs or on the value of carbon market prices. The objective primarily is emissions reductions, but it has the potential to deliver a range of co-benefits e.g. poverty alleviation in forest areas, biodiversity conservation. REDD+ concept came into prominence since Bonn2009.Plus activities are not directly linked to emissions reductions. Rather, enhancing existing forests/increasing forest cover, creating new forests which store carbon, increase sequestration, create rain, moderate weather conditions and protect biodiversity.

India advocates a mechanism to raise resources with a national level accounting for REDD+. Indian approach on financing REDD+ activities is a mix of market and fund based approaches; a central funding would compensate for maintenance of forest carbon stocks whereas money for compensating change in carbon stocks (due to decrease in deforestation and degradation or increase in forest cover) could be generated by selling carbon credits in the international markets (MoEF 2009).

3.8 Compensatory Afforestation Fund Management and Planning Authority (CAMPA)

The Supreme Court in a recent order has said that Rs 11,000 crores, collected for diversion of forestland for non-forest uses, be released to state governments. States in India have long fought the Centre to recover the money they gave to the compensatory afforestation fund. Collected over seven years, the money has been lying idle because the states and the Centre disagreed over controlling the money.

3.9 The FCA, 1980

3.9.1 Basic Features

The FCA, 1980 provides for prior approval from the Central Government for de-reservation of reserved forests; use of forest land for non-forest purpose; assigning of forest land to any private person or any authority/ corporation/ agency not owned, managed or controlled by government; and clearing of naturally grown trees for the purpose of reforestation.

3.9.2 Organizational set up for implementation of FCA

- Forest Conservation Division – MoEF
- Regional Office (Headquarters) - MoEF
- Six Regional Offices located at - Bangalore, Bhopal, Bhubaneswar, Chandigarh, Lucknow, and Shillong

3.9.3 Functions of regional offices

- Processing proposals under FCA seeking diversion of forest land up to 40 ha. in each case,
- Follow up action on the implementation of conditions and safeguards laid down by the Ministry while granting clearance to development projects under FCA, 1980 and EPA, 1986.

- Monitor and evaluate on-going forestry projects and schemes with specific emphasis on conservation of forest.

3.9.4 Procedure for grant of approval under FCA, 1980

1. Every user agency, who want to use forest land for non-forest purpose, after examining all feasible alternatives, prepares the proposal in the format prescribed in the Forest (Conservation) Rules, 2003 and submits to the concerned nodal officer authorized in this behalf by the State Government, along with requisite information and documents complete in all respect well in advance of taking any non-forest activity on the forest land (see flow chart 1).

2. The proposals received from the user agencies are examined by the State Government at minimum four levels, covering all levels of hierarchy from Divisional Forest Officer to the State Government.

3. The guidelines issued under the FCA, 1980 provide that the proposal submitted to the Central Government for diversion of forest land should be accompanied with the opinion of the local people in the form of a resolution of the 'AamSabha' of Gram Panchayat/Local Body of the area endorsing the proposal that the project is in the interest of people living in and around the proposed forest land except in case wherever consent of local people in one form or another has been obtained by the State or the project proponents, and the same is clearly indicated in the proposal. The projects necessitating linear diversion of forest land in several villages, diversion of private forest land, and the proposals involving small public utility projects like drinking water, schools, hospitals do not require consent of the 'AamSabha' of Gram Panchayat/Local Body.

4. The State Government, after being satisfied that the proposal requires prior approval under the Forest (Conservation) Act, 1980, sends the proposals along with its specific comments and justification for diversion of forest land, to the MoEF. The proposal involving clearing of naturally grown trees in forest land or portion thereof for the purpose of using it for reforestation are sent in the form of Working Plan or Management Plan.

5. The proposals involving forest land up to forty hectares in each case and those involving clearing of naturally grown trees in forest land or portion thereof are sent to the concerned Regional Office of the MoEF. The proposals involving forest land of more than forty hectares are sent by the State Government to the Secretary, MoEF, with a copy of the proposal (with complete enclosures) to the concerned Regional Office of the MoEF.

6. In respect of the proposals involving diversion of forest land up to 40 hectares received by the Regional Office, the Chief Conservator of Forests of the concerned Regional Office is competent to finally dispose off all proposals involving forest land up to 5 hectares, except in respect of the proposals for regularization of encroachments and mining (including renewal of mining leases). Similarly, proposals involving clearing of naturally grown trees in forest area or portion thereof for reforestation are also finally disposed of by the Chief Conservator of Forests of the concerned regional office. The Chief Conservator of Forests, Regional Office seeks prior approval of the MoEF, whenever the proposal involves clear-felling of forest area having density above 0.4, irrespective of the size of area involve; and proposals involving clear-felling in more than 20 ha. in plains and 10 ha. in the hilly region, irrespective of the density.

7. In respect of the proposals involving diversion of forest area above 5 hectares and up to 40 hectares and all proposals for regularization of encroachments and mining up to 40 ha., the same are examined by the Regional Chief Conservator of Forests in consultation with an Advisory Group consisting of the representatives of the State Government from Revenue Department, Forest Department, Planning and/or Finance Department and the concerned Department whose proposal is being examined. The views of the Advisory Group are recorded by the Regional Chief Conservator of Forests and along with the same; the proposal is sent to the MoEF for consideration and final decision.

8. The concerned Regional Office of the MoEF inspects the forest land, proposed for diversion, in all cases which involve forestland of more than 100 ha.

9. Every proposal involving more than 40 ha. forest land, along with site inspection report, wherever required, are referred by the MoEF to the Forest Advisory Committee composed of following members:-

(i) The Director General of Forests, MoEF – Chairperson

(ii) Additional Director General of Forests, MoEF- Member.

(iii) Additional Commissioner (Soil Conservation), Ministry of Agriculture –Member

(iv) Three eminent experts in forestry and allied disciplines (non-officials)– Members

(v) Inspector General of Forests (Forest Conservation), MoEF – Member Secretary

10. The Forest Advisory Committee having due regard to all or any of the following matters tenders its advice on the proposals referred to it:

(a) Whether the forest land proposed to be used for non-forest purpose forms part of a nature reserve, national park, wildlife sanctuary, biosphere reserve or forms part of the habitat of any endangered or threatened species of flora and fauna or of an area lying in severely eroded catchment;

(b) Whether the use of any forest land is for agriculture purpose or for the rehabilitation of persons displaced from their residence by reason of any river valley or hydro-electric project;

(c) Whether the State Government or the other authority has certified that it has considered all other alternatives and that no other alternatives in the circumstances are feasible and that the required area is the minimum needed for the purpose; and

(d) Whether the State Government or the other authority undertakes to provide at its cost for the acquisition of land of an equivalent area and afforestation thereof.

11. While tendering advice, the Forest Advisory Committee may also suggest any condition or restrictions on the use of any forest land for any non-forest purpose, which in its opinion, would minimize adverse environmental impact.

12. The MoEF, after considering the advice of the Forest Advisory Committee and after such further enquiry as it may consider necessary, grant approval to the proposal with appropriate mitigation measures or reject the same.

13. In case a proposal involves diversion of forest land located within a protected area notified in accordance with the provisions of the Wildlife (Protection) Act, 1972, approval of the Standing Committee of the National Board for Wildlife (NBWL) and Hon'ble Supreme Court is required to be obtained by the concerned user agency before grant of approval under the Forest (Conservation) Act, 1980. Similarly, in case the forest land proposed for diversion is located within the duly notified eco-sensitive zone around boundary of a protected area, EIA of the project needs to be placed before the Standing Committee of NBWL. In case Eco-sensitive zone has not been notified, 10 km distance from the boundary of such protected area shall be treated as eco-sensitive zone.

14. To boost the development in rural and tribal areas, general approval has been granted under FCA, 1980 for diversion of forest land for public utility development projects, to be executed by Government Departments, of area involving less than one ha. in each case, namely; schools, dispensary/hospital, electric and telecommunication lines, drinking water, water/rainwater harvesting structures, minor irrigation canal, non-conventional sources of energy, skill up-gradation/vocational training centre, power sub-stations, communication posts and police establishments like police stations/outposts/border outposts/watch towers, in sensitive areas.

15. General approval has also been granted under FCA, 1980 for underground lying of optical fiber cables, underground laying of telephone lines and underground laying of drinking water supply pipelines.

16. As a special measures to boost development of basic infrastructure in Left Wing Extremism (LWE) affected districts in nine States of the country, the general approval for diversion of the forest land for execution of 13 categories of public utility projects by Government Departments has been relaxed for diversion of forest and up to 2 hectares in each case, for a period of five years i.e. till 31.12.2015. For 60 LWE affected districts identified for implementation of Integrated Action Plan (IAP) the said general approval has been further relaxed for diversion of forest land up to 5.00 ha. in each case.

17. The mandatory mitigative measures required for approval under the FCA, 1980 include creation and maintenance of compensatory afforestation, realization of Net Present Value of the diverted forest land, preparation and implementation of wildlife conservation plan etc.

3.9.5 Earlier Recommendations/Observations/Proposals to speed up the approvals in this context

1.The Govindarajan Committee Report (GoI, 2002), set up to reform investment approvals and implementation procedures, made wide-ranging recommendations for re-engineering the project cycle for public investment for physical and social sector development. The first part of the report covered the stage of project conceptualization to investment approval. The second part focused on downstream issues from investment approval to implementation of project and its operation.

The committee identified delays in environment and forest clearances as the largest source of delays in development projects and observed that empowering of the single window system at the state level along with re-engineering of regulatory processes would have maximum impact on reducing delays in getting approvals and implementing projects. It has suggested that states can consider various alternatives such as enacting legislation or amending the rules of business to empower specially constituted bodies to operationalize and empower the single window system. It has also detailed a process for re-engineering all relevant regulatory systems at the central, state and local government levels to ensure transparency, unambiguous decision rules, minimizing documentation and ensuring accountability. The process would require that the best global practices are taken on board and the revised processes are embodied in e-governance systems.

In the case of environmental clearances, which cause maximum delays to projects, the report suggests that the empowered committees with representation of all concerned including states should be set up for expediting decisions. Expert agencies should be authorized for initial scrutiny of applications. Diversion of forestland for pre-construction activities should be permitted after the non-forest land identified for compensatory afforestation has been transferred to the forest department.

The committee stressed the need for re-engineering of regulatory procedures prescribed under various legislation and regulations to simplify procedures for grant of approvals and reduce delays as well as simplify regulation of projects during their operational phase. It has suggested that re-engineering groups be set up in the Ministries for detailed examination of each approval requirement under various Acts, rules and regulations and re-engineering of the regulatory process. As many approvals as possible should be placed on self-regulation, that is, under automatic approval upon filing of necessary documents.

The report identified the ministries of labour, environment and forests, power, agriculture, petroleum, and industrial policy and promotion as the ones in which re-engineering groups need to be set up.

2. Stating the urgent need to streamline land acquisition and environment clearance for infrastructure projects, the Economic Survey for 2010-11 has recommended setting up a National Forest Land Bank to expedite clearances. "A National Forest Land Bank, with clear paperwork and titles, could significantly reduce the approval time for forest clearances," the Survey said.

3. The draft NEP 2004, under its approach to process related reforms, noted that the recommendations of the Govindarajan Committee will be followed for reviewing the existing procedures for granting clearances and other approvals under various statutes and rules. These include the Environment Protection Act, Forest Conservation Act, the Water (Prevention and Control of Pollution) Act, the Air (Prevention and Control of Pollution) Act and Wildlife (Protection) Act, and Genetic Engineering Approval Committee (GEAC) Rules under the Environment Protection Act. The objective is to reduce the delays and the levels of decision-making, realize decentralization of environmental functions, and ensure greater transparency and accountability. The draft NEP, 2004 also noted the need for substantive reforms in environment and forest clearances. In order to make the clearance processes more effective, the following actions were proposed:

a) Encourage regulatory authorities, Central and State, to institutionalize regional and cumulative environmental impact assessments (R/CEIAs) to ensure that environmental concerns are identified and addressed at the planning stage itself.

b) Give due consideration, to the quality and productivity of lands which are proposed to be converted for development activities, as part of the clearance process. Projects involving large-scale diversion of prime agricultural land would require environmental clearance whether or not the proposed activity otherwise requires environmental clearance.

c) Encourage clustering of industries and other development activities to facilitate setting up of environmental management infrastructure, as well as monitoring and enforcing environmental compliance. Emphasize post project monitoring and implementation of environmental management plans through participatory processes, involving the government, industry, and the potentially impacted community.

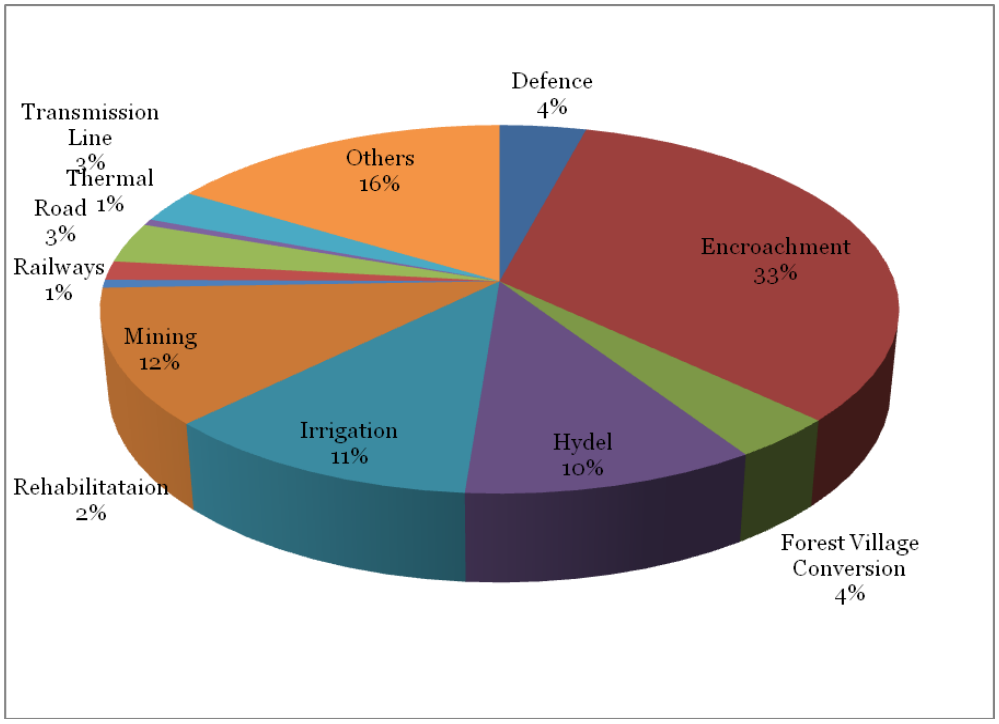
d) Prohibit the diversion of dense natural forests to non-forest use, except in site-specific cases of vital national interest. No further regularization of encroachment on forests should be permitted.

3.9.6 Approvals under FCA, 1980: Assessing the Performance

Since the FCA, 1980 came into being; a total forest area of 11.33 lakh ha. has been diverted for various activities. A sectoral break-down of this is presented in Graph 1. Graph 2 provides the status of approvals given during the said period. The following observations can be made on the basis of the information in these graphs:

- Since these projects were approved under FCA, 1980 appropriate mitigation measures were taken which was not the case prior to implementation of FCA, 1980.
- One third of the total forest land diverted is gone to encroachments whereas only 2 per cent is taken up by rehabilitation. Further, forest land diverted to encroachments is equal to the forest land diverted for mining, irrigation and hydel power projects put together. This implies that contrary to the perception that there is a conflict between forest conservation and infrastructure development; the real problem lies in either poor design and/or enforcement of policies.

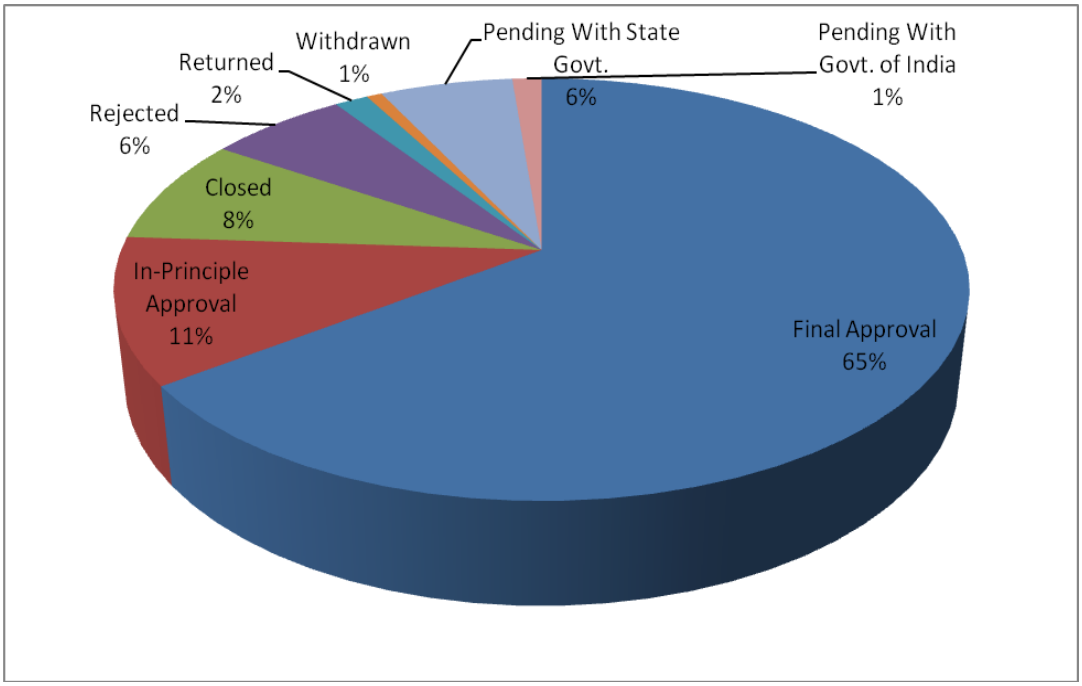
Graph 1: Approvals accorded for forest land diversion during 1980- 31 January 2012 (All India)



Source: MoEF, 2012

- Of the 29,534 proposals received for approval during the said period, in 65 per cent of the cases final approval has been granted and another 11 per cent have been given in-principle approval, implying an approval rate of 75 per cent (Graph 2).
- In the absence of any benchmark it is difficult to judge the success or otherwise of the approval rate. However, the number of cases rejected and closed constitutes 14 per cent of the total cases which seems reasonable given the national forest cover targets, and the complexity of the issues involved.

Graph 2: Status of forest clearance proposals during 1980- 31 January 2012 (All India)



Source: MoEF, 2012

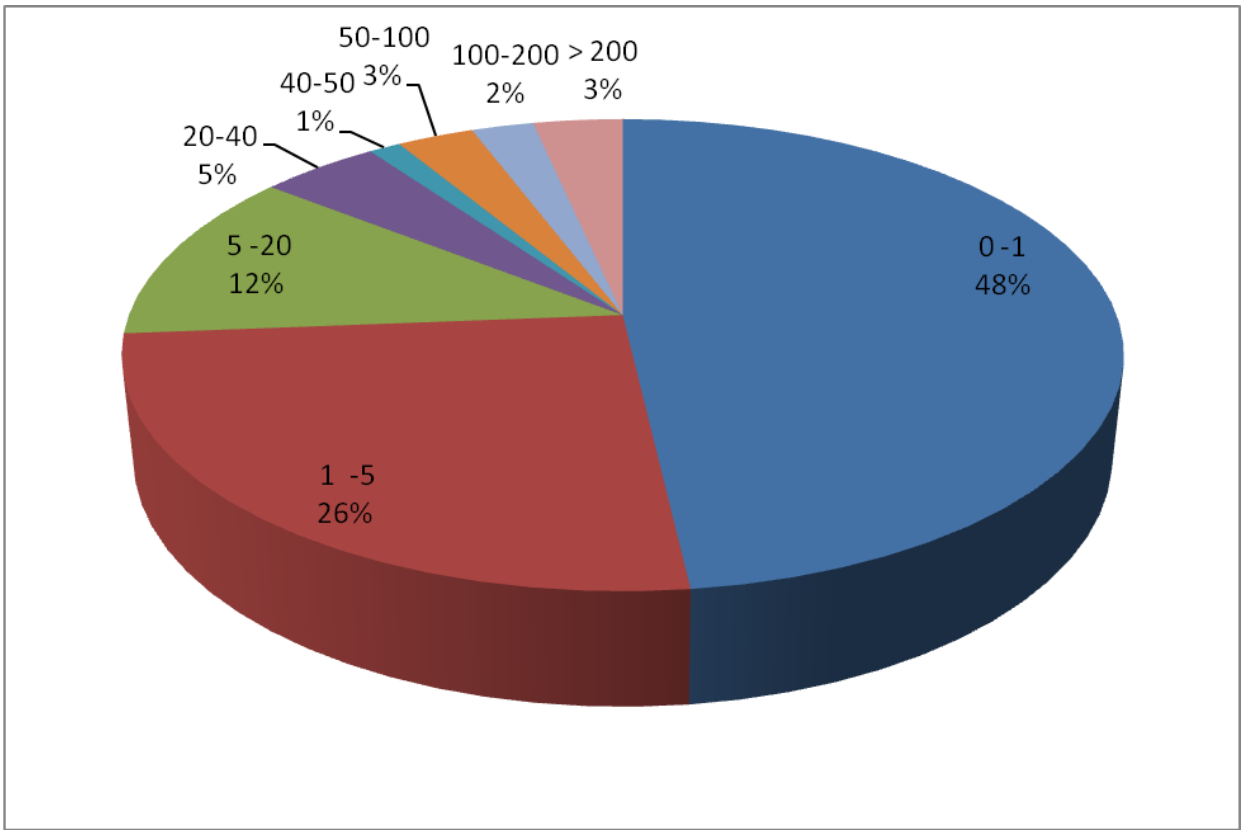
It may be seen in Graph 3 that 48 per cent of the total cases for approval of forest land were in upto 1 ha.category and over a quarter of cases were in 1-5 ha. category. Only in 5 per cent of the total cases were in over 100 ha. category. As mentioned earlier, to facilitate the implementation of certain categories developmental projects undertaken by government agencies in identified areas/categories the following general approvals have been granted by the MoEF in 0-1 ha and 1-5 ha classes:

- Public utility projects of 11 identified categories implemented by the government department – throughout country – 1 ha. in each case up to 31.1.2013

- Public utility projects of 13 identified categories implemented by the government departments in 60 districts in left wing extremism (LWE) affected districts selected for iap: 5.00 ha. in each case till 13.05.2016

- Public utility projects of 13 identified categories implemented by the government departments in remaining 23 LWE districts: 2.00 ha. in each case till31.12.2015.

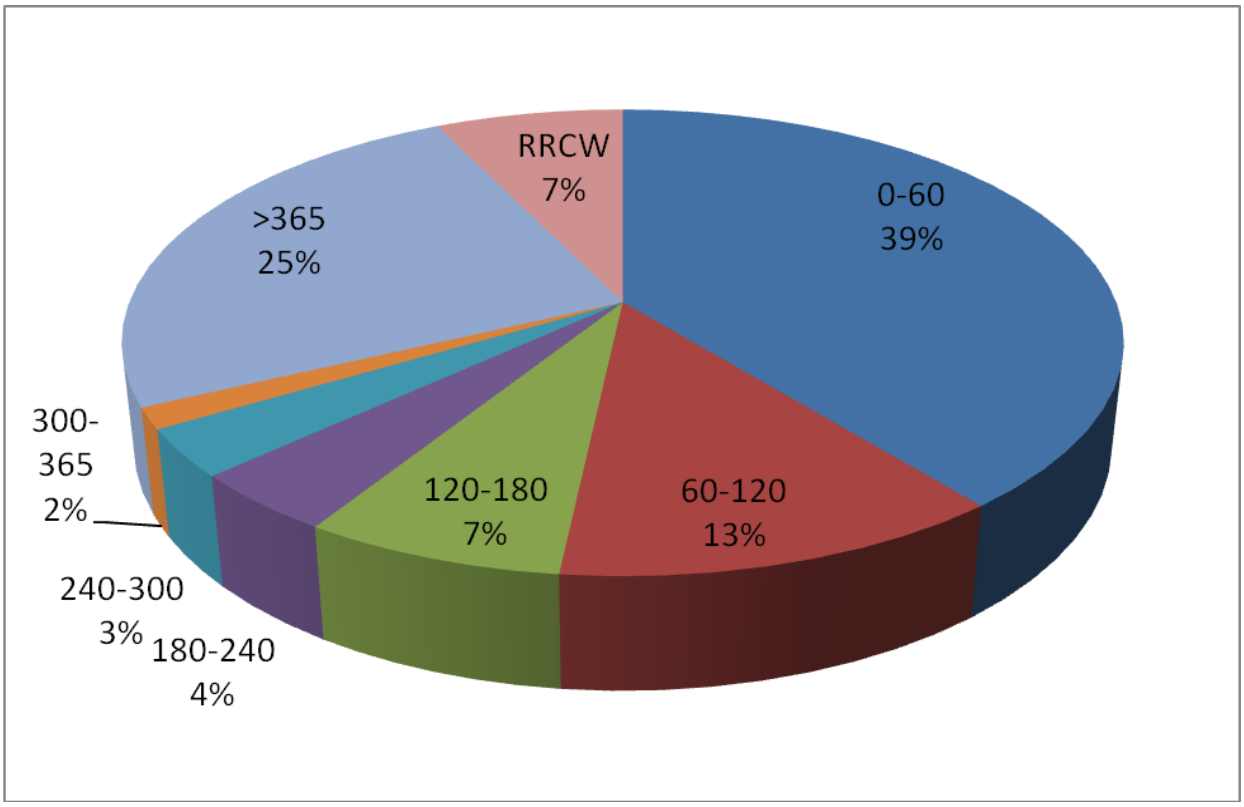
Graph 3: Forest diversion proposals in different area classes (All India)



Source: MoEF, 2012

The Graph 4 shows the number of days taken in granting stage-I approvalunder the FCA, 1980 by the MoEFduring the period under reference. It may be seen that one fourth of the total cases took more than one year for stage-I approval, 7 per cent cases were dropped (retuned, rejected, closed, withdrawn) at this stage, while 68 per cent cases were given stage-I approval in under one year. Of the latter, 39 per cent cases received stage-I approval within two months, stipulated time being 90 days except in case of lease renewal where it is 60 days.

Graph 4: Time taken (in days) by the MoEF to accord stage-I approval under FCA, 1980



RRCW- Returned, Rejected, Closed, Withdrawn); Source: MoEF, 2012

While the discussion so far in this sub-section provides an overview of the status of approvals under FCA, 1980; the data does not help understand the following:

- Which projects (type, size (in terms of forest area involved), location, type of institution responsible for execution of the project) took longer than the stipulated time. Is there a pattern? And
- What are the reasons for delay?

At the state government level:

Do reasons for delay constitute: poor /incomplete proposal; sloppy follow up; lack of trained personnel; lack of reliable data/information to support the case; absence of dedicated group of people for the purpose?

Previous record of poor compliance with the mitigative provisions of the FCA, 1980 could also be a factor leading to additional safeguards by the approving authority and thus more time. An overview of the compliance (by the state governments) in the cases cleared under FCA, 1980 shows that during the reference period, of the total 15,361 cases monitored, 42 per cent of the cases were found non-compliant. A state wise analyses shows that among the hill states the major defaulters are Arunachal Pradesh, Meghalaya, Manipur and Uttaranchal with non-compliance rate of 100%, 42%, 40%, and 34% respectively. However, in Arunachal Pradesh only one case was monitored and was found non-compliant. The extent of non-compliance and non-compliance in respect of which provisions is however not available except in the case of compensatory aforestation requirement.

All the hill states have defaulted on meeting the requirement of compensatory aforestation. Among the hill states, Tripura tops the compliance list with almost 43% compliance in compensatory aforestation followed by Meghalaya (27.12%), J&K (25.6%), and Arunachal Pradesh (23.15%). Manipur is the biggest defaulter followed by Uttaranchal and Assam.

At the MoEF level:

Do reasons for delay constitute: lack of trained personnel; lack of reliable data/information needed in decision making; absence of dedicated group of people for the pupose; lack of transparency?

Issues arising from the difference of opinion, between centre and states, on the desirability and design of the project due to lack of vision, faulty planning, obsolete technology, multiplicity of schemes, overlapping jurisdictions could be a source of delay in decisions. For instance, one of the most common areas of contention (which came up in my discussions with the officials at the MoEF)is the desirability of better traffic management vis-a-vis broadening of some of the roads in mountains. Similarly, instead of a comprehensive plan for the development of an area where space utilisation can be optimised and projects can be executed in a time bound manner with minimum environmental damage[11], projects are undertaken by various departments resulting in duplications, less than optimal use of scarce space,

[11]The Prime Minister at Nainital declared that the Centre will set up "Himalayan Development Authority" for overall development of the Himalayan region including all the states of North East.

environmental pollution and leakages. Therefore, for himalayan region better planning and convergence of schemes is very crucial.

To speed up the process of forest land and environmental approvals a recent study (Pandey, 2012) made the following suggestions:

a. Comprehensive planning for overall development of an area/city/state (medium to long-term perspective) encompassing infrastructure development schemes across different sectors to optimize space utilization.
b. Training for all relevant government departments/corporations/user agencies and forest officials for preparation of FCA, 1980 cases.
c. Dedicated specialized groups/missions at the state level and in MoEF for preparation and scrutiny of cases. Initial preparation and scrutiny may also be outsourced to experts/expert agencies.
d. Posting of forest officers and subject experts in relevant government departments/corporations/user agencies.
e. Adoption of best global practices and e-governance systems.
f. Continuous updating of crucial data and information for decision making.
g. Introducing incentives for ensuring accountability.
h. Posting a compliance officer at state level and at the MoEF who will periodically prepare a compliance report which can be analyzed to identify the action points and recommend appropriate processes, checks and balances, technical and compliance training and e-governance needs to plug systemic and other flaws.

The above study also suggested a strategy for infrastructure development in hill states. This included, among others, (i) Setting up of an 'infrastructure planning mission' for formulating a long term plan for development of infrastructure in Hill State;(ii) Enhancement of norms for technology, quality, and cost of infrastructure development needs special consideration. Setting up of '*a technology mission'* for the development of infrastructure in hill states should be a priority; and (iii) Creating an '*infrastructure and technology fund'* for hill states which can be used for creating and upgrading strategic developmental infrastructure and for development/sourcing of hill sensitive technology (especially for development of market for niche mountain products, and diversification and value addition in agriculture) which are the two most critical factors in improving the productivity of resources and boosting the

environmental and developmental performance of the hill states. The need for such fund should reduce overtime, so that eventually the compensation for provision of environmental services could be linked entirely to a comprehensive index of environmental externalities/performance.

4. Methodology: Constructing a Developmental Disability Index

4.1 Conceptual frame

The starting premise of the study is that states which have large areas designated as forestland tend to face certain developmental disadvantages. In economic terms, these can be conceptualized as opportunity costs - for not being able to use the land in alternative use that would yield the highest marginal economic value for the land. As discussed earlier, the economic rationale for this lies in the fact that forest ecosystems provide a range of services, many of which are either "intangibles" or "non-marketed" and thereby the values of these are not captured through normal market processes. Thus, they remained under-valued with complete total economic value (TEV) not being estimated in practice due to methodology and data limitations, and NPV being an inadequate reflection of the true opportunity cost. Thus, states in India which have large tracts of land under forests provide services which are un-priced or underpriced, leading to a notion of "disadvantage" in economic or financial terms. This disadvantage can be characterized in alternative ways. On one hand this notion is formalized in terms of opportunity costs of (forgone) alternative paths of primary, secondary or tertiary sector development (e.g. more extensive agriculture, development of special economic zones, industrial development) which yields benefits in the form of greater income generation and employment creation. On the other hand, the lack of these economic benefits as well as the under-pricing of ecosystem services from forests leads to a reduction in the taxable base and revenue raising capacity or a "revenue loss" for the states concerned in financial terms.

At the same time, it is equally important to recognize that the immensely valuable forest ecosystem services that are found here have to be preserved. These services accrue at different scales – international, national, regional, and local. For instance, carbon storage value is a global value and typically from an efficiency argument this value will tend to dominate other values such as livelihood values, leading to trade-offs in decision-making regarding devolution of funds. For instance, the XIII Finance Commission formula has in-built in it greater weightage to global values than livelihood values, which by itself is

justified in terms of a TEV approach, but does not do much in terms of incorporating distributional considerations. As well recognized in economics, distributional considerations require add-ons since market principles cannot take care of these adequately.

The hill states in India are uniquely situated in terms of the large amount of land area designated as forest land in these states. Given that a full accounting of the value of the services provided by forest ecosystems in national GDP or SDP is not achievable within a foreseeable time frame, it becomes important to evolve mechanisms that can achieve twin objectives of incentivizing conservation alongside meeting developmental objectives of the hill states.

A case for compensation is thus built on economic principles, for those hill states that have substantial areas under forested lands. Opportunity costs when expressed in terms of forgone developmental alternatives, restrictions on livelihood options, and mark ups on costs of developmental projects (both due to unique local geo-physical conditions, technology and material requirements, and federal and other regulatory requirements/restrictions) are likely to be higher for forested areas of hill states than their corresponding costs in non-forested areas of hill states and non-forested states. The operationalization of such concepts can be achieved through developing a cost disability index that forms a basis for compensation.

4.2 Components of the Index

In constructing an index that captures the developmental or opportunity cost of maintaining forestlands for hill states in India several aspects need to be recognized.

- Accounting for the flows of Ecosystem Services from these forests at various levels:
    - *global level*: e.g. Carbon sequestration, biodiversity[12].
    - *national, regional and local level:* e.g. watershed services, timber, tourism.
    - *local level:* e.g. fuel wood, fodder, NTFPs, micro climatic stabilization, cultural.
- Provision for Cost escalation factor on developmental projects in forested areas due to:
    - *unique geo-physical conditions*
    - *higher transaction costs*

[12] Note that definitionally and depending on the specific empirical context, these classifications of services may change or overlap. The important point to note here is that these exist and need to be accounted for.

- Criteria for Inclusive development and equity for states *linked to* forested land in hilly terrain states

While there has been some progress on incorporating the first factor in the existing devolution mechanisms, the last two are yet to receive full attention in the existing institutional mechanisms partly perhaps due to the fact that these pose problems both conceptually and empirically. The formula for distribution of a fund of Rs. 5000 crores as recommended by the XIII Finance Commission, and the NPV for use or diversion of forestland for non-forestry purposes currently being charged by state forest departments, both seek to address the requirements for the first criteria listed above. The primary purpose behind the formulae is to incentivize conservation while recognizing the economic loss that this may involve.

However, existing mechanisms for compensating states fall short of expectations with regard to criteria two and three. While in theory one can argue against the parallel incorporation of all three criteria, the fact is that current knowledge on both ecosystem services and valuation methodologies does not permit complete valuation and accounting for ecosystem services, which could have by itself been an adequate basis (at least theoretically) for distributing resources among states. When devising formula for distribution and compensation among states, one has to also keep in mind the severe limitations posed by data availability and its accuracy.

Considering costs, the compensation can potentially incorporate distinct cost aspects. These can alternatively be considered as transaction costs which manifest themselves in various ways. They include a range of factors that lead to cost escalations such as increased time and institutional costs due to legal requirements and federal restrictions. These include the laws and rules that govern the states, such as clearances from MoEF for non-forest activities and Supreme Court rulings on diversion of forestland for non-forest purposes that impose specific ranges for charging NPV. Cost mark-ups due to technological and material requirements for meeting specific rules and regulations also occur due to the terrain in forested areas of hill states (e.g. variant technology for developing infrastructure such as roads, maintaining wildlife corridors, minimizing damage to forest ecosystems and environment)

Mostly, the formula proposed and used for devolution of funds among states has used the percentage share of forested lands in a specific state to address distributional considerations. However, the emphasis has been on using this as a proxy for approximating the extent of

forest ecosystem service benefits, rather than to push the notion of achieving equity in developmental status of populations residing in forested areas with those in non- forested areas. The former approximates more to an efficiency criterion while the latter calls for a focus on equity based criterion in defining human welfare. This gains importance in view of the Eleventh and Twelfth Plan's focus on inclusive development. The Planning Commission (2003) had proposed a forest disability index which sought to incorporate disadvantage faced by hill states in terms of agricultural productivity. Thus, the value for forest land was evaluated in terms of farming as a primary alternative activity and the potential loss in revenue projected accordingly. Alternative criteria which helps incorporate disparities such as those in per capita state GDP may however be considered as more appropriate since in most hill regions, farming may not be the most economically viable alternative at par with plains for instance. This is especially true of those areas (in terms of both feasibility and incentive effects unless one is assuming availability of latest technology, various other material inputs and human skills) which suffer from poor connectivity. As a general point low connectivity is an important issue for hill areas and impedes development of economic activity in most sectors. Although farming has traditionally been practiced in most areas, meeting some self-consumption needs of the poor, it is an inadequate vehicle for poverty alleviation as data on poverty among Scheduled Tribes and other forest dwelling communities has shown. This would lead to a more comprehensive measure for judging the economic losses involved and the disparity that requires to be addressed through a distributional formula which can be used to devolve funds across states with this specific objective of achieving development with equity in mind.

4.3 Formula

Component 1: Endowment effect (geographical factor): Geographical Area of the state under forest

Component 1 = {FCAi/GAi}/ {FCA/GA}

- FCA=Forest Cover Area(km^2)
- GA=Geographical Area(km^2)

Component 2: Transaction costs (topographical factors and federal regulations):

Component 2= [HTi]*[IDPRi]

- HTi=Proportion of land under hilly terrain
- IDPRi= Infrastructure Deficit (Power Index + Road Index+ Tele density Index)
- The first two components of the infrastructure deficit have been calculated on the basis of the state-wise infrastructure index estimated by the IDFC (2010). The deviation of each state from the maximum value of the index attained at present was taken as the measure of the deficit. The combined index in IDFC (2010) which considers infrastructure in three sectors, power, road and telecom, could not be used since the telecom index does not provide state-wise details for the north-eastern states. Instead, we opt to use index of the infrastructure deficit in the power and road sectors since state-wise data is available for these two indicators. For the telecom, we have used data on tele-density which is obtained from Annual Report 2010-11 of the Department of Telecommunication, Government of India. A combined index of the infrastructure deficit in the power, road and telecommunication has been derived using equal weights.

The forest disability index is thus calculated as a summary measure of two dimensions:

(i)Endowment (Component 1)

(ii) Transaction cost (Component 2)

Base Case Formula: Forest Disability Index (Fd_i) with equal weightage across components

Fdi_1 = (0.5) Component 1 + (0.5) Component 2

[The index for each state can be subsequently used for ranking states (after normalization)].

Alternative Formula 2: Forest Disability Index (Fd_i) with higher weightage to forest cover area as indicator of federal obligations.

Fdi_2 = (0.6) Component 1 + (0.4) Component 2

This formulation captures the fact that in forested regions, there are federal obligations and legal or executive orders that need to be complied with. For instance, the NFP's policy that 66% of the area should be under forest cover in hill states. Developmental projects in forested areas require clearances which lead to delays and consequent cost escalations. 20-25% increase in project costs (unplanned expenditure) due to an average delay of 2-3 years

as compared to project sin non-forested areas has been accounted for in this formulation. Subsequently a higher weightage is accorded to the first component in the formula.

Alternative Formula 3: Forest Disability Index (Fd_i) with higher weightage to transaction costs in forested areas in hilly terrain

Fdi_3 = (0.40) Component 1 + (0.60) Component 2

In addition to cost escalations from meeting federal requirements, higher material costs and higher transportation costs have been claimed for hill areas in particular. In order to incorporate this aspect, a third formulation was also done giving relatively higher weightage to the first and third components. Assam and Jammu and Kashmir for instance see some improvement in building their case for compensation based on such an index. Yet another formulation is used where component is given weight 0.30 and component 2 has higher weight 0.70.

5. Results and Analysis

Table 8 presents the index values and rankings state-wise for the two constituent components of the forest disability index. There are variations in the rankings of states across components; this indicates the importance of having a combined index that provides for the differences among states in terms of the range of parameters considered relevant for the study. Forest cover data is available on a regular basis from the MoEF and has been used in informed discussions and derivation of policy mechanisms for various forest ecosystem related quantitative and qualitative measures such as NPV, compensation for states in the finance commission's devolution, policy for wildlife and habitat protection, etc. However, it must be noted also that the area under forest cover is also an indicator of important ecosystem services many of which remain intangible, or cannot be evaluated to the full extent, such as biodiversity.

TABLE 8: Ranking according to individual components

RANK	Component_1		Component_2	
1	4.34	Mizoram	50.09	Arunachal Pradesh
2	3.85	Arunachal Pradesh	47.09	Mizoram
3	3.84	Nagaland	46.09	Jammu & Kashmir
4	3.69	Meghalaya	43.09	Sikkim
5	3.66	Manipur	42.61	Uttarakhand
6	3.64	Tripura	42.09	Manipur
7	2.27	Sikkim	41.43	Meghalaya
8	2.19	Uttarakhand	40.76	Nagaland
9	2.13	Kerala	38.76	Tripura
10	1.97	Chhattisgarh	12.54	Assam
11	1.69	Assam	10.81	Himachal Pradesh
12	1.50	Odisha	7.92	Maharashtra
13	1.38	Jharkhand	6.22	Kerala
14	1.26	Himachal Pradesh	4.54	Karnataka
15	1.21	Madhya Pradesh	1.58	West Bengal
16	0.90	Karnataka	0.00	Chhattisgarh
17	0.87	Tamil Nadu	0.00	Odisha
18	0.81	Andhra Pradesh	0.00	Jharkhand
19	0.79	Maharashtra	0.00	Madhya Pradesh
20	0.70	West Bengal	0.00	Tamil Nadu
21	0.49	Jammu & Kashmir	0.00	Andhra Pradesh

22	0.36	Gujarat	0.00	Gujarat
23	0.35	Bihar	0.00	Bihar
24	0.28	Uttar Pradesh	0.00	Uttar Pradesh
25	0.22	Rajasthan	0.00	Rajasthan
26	0.17	Haryana	0.00	Haryana
27	0.17	Punjab	0.00	Punjab

Component 2 provides insights on the infrastructure deficit when interacted with the proportion of hilly terrain. This component thereby directly relates to an important aspect of developmental disability as focused upon in the study. A close association is observed between the hill states and the infrastructure deficit. This gets heightened with the interaction of the two sub-components as the rankings across states reveals.

Table 9 provides the rankings of the states by the forest disability index, using the four alternative weighting options for the formula. While there are minor variations across scores for alternative formula, the relative rankings remain consistent across states, with a couple of

TABLE 9: Ranking of States according to Developmental Disability Index value

Rank	Fdi_1	State	Fdi_2	State	Fdi_3	State	Fdi_4	State
1	26.97	Arunachal Pradesh	22.35	Arunachal Pradesh	31.60	Arunachal Pradesh	36.22	Arunachal Pradesh
2	25.72	Mizoram	21.44	Mizoram	29.99	Mizoram	34.27	Mizoram
3	23.29	Jammu & Kashmir	19.04	Manipur	27.85	Jammu & Kashmir	32.41	Jammu & Kashmir
4	22.88	Manipur	18.78	Meghalaya	26.76	Sikkim	30.85	Sikkim
5	22.68	Sikkim	18.73	Jammu & Kashmir	26.72	Manipur	30.56	Manipur
6	22.56	Meghalaya	18.61	Nagaland	26.44	Uttarakhand	30.48	Uttarakhand
7	22.40	Uttarakhand	18.60	Sikkim	26.33	Meghalaya	30.10	Meghalaya
8	22.30	Nagaland	18.36	Uttarakhand	25.99	Nagaland	29.69	Nagaland
9	21.20	Tripura	17.69	Tripura	24.71	Tripura	28.22	Tripura
10	7.11	Assam	6.03	Assam	8.20	Assam	9.28	Assam
11	6.04	Himachal Pradesh	5.08	Himachal Pradesh	6.99	Himachal Pradesh	7.95	Himachal Pradesh
12	4.35	Maharashtra	3.77	Kerala	5.06	Maharashtra	5.78	Maharashtra
13	4.18	Kerala	3.64	Maharashtra	4.58	Kerala	4.99	Kerala
14	2.72	Karnataka	2.36	Karnataka	3.08	Karnataka	3.45	Karnataka
15	1.14	West Bengal	1.18	Chhattisgarh	1.23	West Bengal	1.32	West Bengal
16	0.99	Chhattisgarh	1.05	West Bengal	0.79	Chhattisgarh	0.59	Chhattisgarh
17	0.75	Odisha	0.90	Odisha	0.60	Odisha	0.45	Odisha
18	0.69	Jharkhand	0.83	Jharkhand	0.55	Jharkhand	0.41	Jharkhand
19	0.60	Madhya Pradesh	0.72	Madhya Pradesh	0.48	Madhya Pradesh	0.36	Madhya Pradesh

20	0.43	Tamil Nadu	0.52	Tamil Nadu	0.35	Tamil Nadu	0.26	Tamil Nadu
21	0.40	Andhra Pradesh	0.48	Andhra Pradesh	0.32	Andhra Pradesh	0.24	Andhra Pradesh
22	0.18	Gujarat	0.21	Gujarat	0.14	Gujarat	0.11	Gujarat
23	0.17	Bihar	0.21	Bihar	0.14	Bihar	0.10	Bihar
24	0.14	Uttar Pradesh	0.17	Uttar Pradesh	0.11	Uttar Pradesh	0.09	Uttar Pradesh
25	0.11	Rajasthan	0.13	Rajasthan	0.09	Rajasthan	0.07	Rajasthan
26	0.09	Haryana	0.10	Haryana	0.07	Haryana	0.05	Haryana
27	0.08	Punjab	0.10	Punjab	0.07	Punjab	0.05	Punjab

exceptions within the top 8 states in terms of the developmental disability index. This demonstrates its robustness across the weighting categories.

The results indicate that across the alternative rankings, states of Manipur, Arunachal, Meghalaya, Nagaland, and Mizoram dominate in terms of disability index as these are also states which have more than 60 per cent of the geographical area under forests, alongside substantial hilly terrain. These are also the less industrialized states. However, Jammu and Kashmir ranks high due to its substantial disadvantage in terms of the infrastructure deficit, alongside the higher transaction costs due to hilly terrain, although it has much lower percentage area under forest cover.

Among the states which have 30-60 per cent forest cover, and can be differentiated in terms of hilly and non-hilly terrain, Sikkim and Uttarakhand are also at relatively a greater disadvantage in terms of the infrastructure deficit component. Assam, in spite of having more than 30 per cent of its geographical area under forest cover ranks lower due a pattern of distribution of hill areas across districts. In Assam some districts have very large hill areas whereas some have large plain areas[13]. Some hill states have hill areas distributed in such a way that most of their districts are classified as hill districts; this has improved proportion of hilly terrain data for these states. Although Himachal has relatively less forest cover than some other states such as Kerala, Chattisgarh or Jharkhand, its overall rank in terms of disability is higher due to disadvantage in terms of the infrastructure deficit when interacted with the proportion of hilly terrain.

[13] A hill district is a district with more than 50% of its geographical area under 'hill talukas' based on criteria adopted by the planning Commission for hill area and Western Ghats development programs.

6. Summary and Recommendations

All states in India have state-specific requirements to meet their developmental aspirations and targets of which poverty alleviation and the creation of infrastructure command high priority. Chronic poverty is often associated with being located in remote rural areas, such as hills and forested areas (Mehta and Shah 2002), which may not even be adequately reflected in state averages (Chaudhuri and Gupta 2009) as in the case of Chamba in H.P. or the hilly regions in Assam. There are in place mechanisms to address these specific needs such as through the tax devolution formulae used by the Finance Commissions, grants made by the Planning Commission and so on. Specific requirements for incentivizing forest conservation and to compensate states for economic disadvantages arising from the maintenance of forest cover have also been addressed by the Thirteenth Finance Commission. The present study seeks to address another dimension – that of specific disadvantages arising from increased costs arising from a combination of bio-physical features such as terrain and increased transaction costs due to legal and public good aspects of maintaining forest ecosystems. This differs from the earlier forest disability index of the Planning Commission (2004) which computed the replacement value of forests in terms of (agricultural) farming. It may be noted that if a complete valuation of ecosystem services applying state-of-the art techniques to sufficiently disaggregated and reliable data is possible, then that would constitute the most comprehensive valuation replacing all these sub components of values. In the interim, a forest disability index is constructed, thereby generating a principle and basis for compensating hill states for a part of the values that their ecosystems provide based on the rationale of opportunity cost in economics. Note that this is a partial value, which captures only certain aspects, and is not the full opportunity cost.

- The forest disability index developed here demonstrates that there is a case for devolving funds to states based on the higher transaction costs that they face due to bio-geographical reasons such as forested land in hilly terrain.
- Since the notion of disability stems from the motivation of inclusiveness and sustainable development, it maybe also proposed that such devolution should be closely monitored and linked to outputs / outcomes that address the disability and help in overcoming these.
- A contentious issue in this context is the choice of policy option for compensation. Various considerations including low technical and governance capacities of the state and local governments have led to reservations about general grants or even project

based grants in India. There seems some merit in this argument until governance deficiencies at the state and local government level are addressed. However, it would be unfair to use this argument to undermine the need for compensation to hill states. The Committee may consider creating an *"infrastructure and technology fund"* for hill states which can be used for creating and upgrading strategic developmental infrastructure and for development/sourcing of hill sensitive technology (especially for development of market for niche mountain products, and diversification and value addition in agriculture) which are the two most critical factors in improving the productivity of resources and boosting the environmental and developmental performance of the hill states. However, it is to be emphasized that the need for such a fund should reduce overtime, so that eventually the compensation for provision of environmental services could be linked entirely to a comprehensive index of environmental externalities/performance.

- Finally, to streamline and speed up the process of forest land clearance and environmental approvals specific suggestions may be considered (Pandey 2012, also in Section 3 of the report). This is expected to impart efficiency and transparency to the system.

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Appendix

Table1: Volume per hectare in Different States/UTs(2009)

State	Forest Cover Area (ha)(2009)(FCA)	Total Growing Stock(in million cum) (2009)	Volume/ha (in Cum)(2009)
Andhra Pradesh	4638900.00	370.77	79.93
Arunachal Pradesh	6741000.00	567.205	84.14
Assam	2767300.00	214.86	77.64
Bihar	684500.00	82.38	120.35
Chhattisgarh	5567400.00	404.45	72.65
Delhi	17620.00	2.75	155.79
Goa	221900.00	11.61	52.33
Gujarat	1461900.00	166.25	113.72
Haryana	160800.00	20.16	125.38
Himachal Pradesh	1467900.00	342.46	233.30
Jammu & Kashmir	2253900.00	375.133	166.44
Jharkhand	2297700.00	167.62	72.95
Karnataka	3619400.00	416.89	115.18
Kerala	1730000.00	191.64	110.78
Madhya Pradesh	7770000.00	334.77	43.08
Maharashtra	5064600.00	440.70	87.02
Manipur	1709000.00	81.569	47.73
Meghalaya	1727500.00	66.375	38.42
Mizoram	1911700.00	77.434	40.51
Nagaland	1331800.00	53.636	40.27
Orissa	4890300.00	358.82	73.37
Punjab	176400.00	35.02	198.50
Rajasthan	1608700.00	115.95	72.07
Sikkim	335900.00	20.849	62.07
Tamil Nadu	2362500.00	214.73	90.89
Tripura	797700.00	29.255	36.67
Uttar Pradesh	1433800.00	205.08	143.03
Uttarakhand	2449600.00	481.066	196.39
West Bengal	1299500.00	138.21	106.35
UNION TERRITORIES			
Andaman & Nicobar Islands	672400.00	53.85	80.09
Chandigarh	1678.00	0.37	221.69
Dadra & Nagar Haveli	21100.00	4.83	228.77
Daman & Diu	615.00	0.12	191.87
Lakshadweep	2706.00	0.05	18.11
Puducherry	5006.00	0.41	82.50
All States	**69202725.00**	**6047.25**	**87.38**

Source: SFR 2011

Table 2: Change in the Forest Cover Area of states in India (2007-2009)

State	Total Forest Cover Area(km^2)(2007)	Total Forest Cover Area(km^2)(2009)	Change(2009-2007)(km^2)
Andhra Pradesh	46,670.00	46,389.00	-281.00
Arunachal Pradesh	67,484.00	67,410.00	-74.00
Assam	27,692.00	27,673.00	-19.00
Bihar	6,804.00	6,845.00	41.00
Chhattisgarh	55,678.00	55,674.00	-4.00
Delhi	176.58	176.20	-0.38
Goa	2,212.00	2,219.00	7.00
Gujarat	14,620.00	14,619.00	-1.00
Haryana	1,594.00	1,608.00	14.00
Himachal Pradesh	14,668.00	14,679.00	11.00
Jammu & Kashmir	22,537.00	22,539.00	2.00
Jharkhand	22,894.00	22,977.00	83.00
Karnataka	36,190.00	36,194.00	4.00
Kerala	17,324.00	17,300.00	-24.00
Madhya Pradesh	77,700.00	77,700.00	0.00
Maharashtra	50,650.00	50,646.00	-4.00
Manipur	17,280.00	17,090.00	-190.00
Meghalaya	17,321.00	17,275.00	-46.00
Mizoram	19,183.00	19,117.00	-66.00
Nagaland	13,464.00	13,318.00	-146.00
Orissa	48,855.00	48,903.00	48.00
Punjab	1,664.00	1,764.00	100.00
Rajasthan	16,036.00	16,087.00	51.00
Sikkim	3,359.00	3,359.00	0.00
Tamil Nadu	23,551.00	23,625.00	74.00
Tripura	7,985.00	7,977.00	-8.00
Uttar Pradesh	14,341.00	14,338.00	-3.00
Uttarakhand	24,495.00	24,496.00	1.00
West Bengal	12,994.00	12,995.00	1.00
UNION TERRITORIES			
Andaman & Nicobar Islands	6,662.00	6,724.00	62.00
Chandigarh	17.00	16.78	-0.22
Dadra & Nagar Haveli	211.00	211.00	0.00
Daman & Diu	5.65	6.15	0.50
Lakshadweep	26.48	27.06	0.58
Puducherry	49.97	50.06	0.09
All States	**692,393.68**	**692,027.25**	**-366.43**

Source: SFR 2011

Table 3: Forest Cover Area in Hill Districts of India (2009)

State	No. Of Hill Districts(2009)	Geographical Area(km²) [GA](2009)under Hilly Terrain	Total Forest Cover Area(km²)(in Hill Districts)(2009)(TFCA)	(TFCA)% of [GA]	Change (2007-2009)
Arunachal Pradesh	13	83,743.00	67,410.00	80.50	-74
Assam	3	19,153.00	12,985.00	67.80	-18
Himachal Pradesh	12	55,673.00	14,679.00	26.37	11
Jammu & Kashmir	14	222,236.00	22,539.00	10.14	2
Karnataka	6	48,046.00	23,200.00	48.29	0
Kerala	10	29,572.00	13,687.00	46.28	-13
Maharashtra	7	69,905.00	15,502.00	22.18	-6
Manipur	9	22,327.00	17,090.00	76.54	-190
Meghalaya	7	22,429.00	17,275.00	77.02	-46
Mizoram	8	21,081.00	19,117.00	90.68	-66
Nagaland	8	16,579.00	13,318.00	80.33	-146
Sikkim	4	7,096.00	3,359.00	47.34	0
Tamil Nadu	5	22,789.00	6,372.00	27.96	5
Tripura	4	10,486.00	7,977.00	76.07	-8
Uttarakhand	13	53,483.00	24,496.00	45.80	1
West Bengal	1	3,149.00	2,289.00	72.69	0
All States	**124**	**707,747.00**	**281,295.00**	**39.75**	-548

Source: SFR 2011

Table 4: Forest Cover Area in Tribal Districts (2009)

State/UT	No. of Tribal Districts	Geographical Area(km²) [GA](2009)in Tribal Districts	Total Forest Cover Area(km²)	% of GA	Change (2007-2009)(km²)
Andhra Pradesh	8	87,090.00	25,301.00	29.05	-266
Arunachal Pradesh	13	83,743.00	67,410.00	80.50	-74
Assam	16	50,137.00	11,996.00	23.93	-12
Chhattisgarh	9	92,656.00	40,057.00	43.23	-3
Gujarat	8	48,409.00	6,766.00	13.98	-1
Himachal Pradesh	3	26,764.00	3,231.00	12.07	0
Jharkhand	8	44,413.00	13,962.00	31.44	73
Karnataka	5	26,597.00	13,139.00	49.40	0
Kerala	9	27,228.00	13,096.00	48.10	-13
Madhya Pradesh	18	139,448.00	42,301.00	30.33	-11
Maharashtra	11	138,272.00	29,512.00	21.34	3
Manipur	9	22,327.00	17,090.00	76.54	-190
Meghalaya	7	22,429.00	17,275.00	77.02	-46
Mizoram	8	21,081.00	19,117.00	90.68	-66
Nagaland	8	16,579.00	13,318.00	80.33	-146
Orissa	12	86,124.00	33,298.00	38.66	-1
Rajasthan	5	38,218.00	6,349.00	16.61	1
Sikkim	4	7,096.00	3,359.00	47.34	0
Tamil Nadu	6	30,720.00	6,742.00	21.95	18
Tripura	4	10,486.00	7,977.00	76.07	-8
Uttar Pradesh	1	7,680.00	1,319.00	17.17	-1
West Bengal	11	69,403.00	12,300.00	17.72	1
Andaman & Nicobar Islands	2	8,249.00	6,724.00	81.51	62
Chandigarh	1	491.00	211.00	42.97	0
Daman & Diu	1	72.00	4.00	5.56	0
Lakshadweep	1	32.00	27.00	84.38	1
All States	**188**	**1,105,744.00**	**411,881.00**	**37.25**	**-679**

Table 5: Reasons of change in Forest Cover Area (2007-2009)

State	Reason
Andhra Pradesh	Management intervention like harvesting of short rotation crops followed by new regeneration/plantations, forest clearances in some encroached areas.
Andaman & Nicobar Islands	Recovery of coastal vegetation in Tsunami affected areas, shelterbelt plantations and increase in mangrove cover.
Arunachal Pradesh	Change in forest cover in the state is because of shifting cultivation and biotic pressure.
Assam	Decrease in Forest Cover is mainly attributed to illicit felling, encroachments in insurgency affected areas and shifting cultivation practices.
Bihar	Enhanced Plantation activity outside forest areas in recent times contributed towards increase in forest cover.
Chhattisgarh	Submergence of forest areas in catchments of the dams.
Jharkhand	Increase in forest cover is mainly on account of effective protection by the Village Forest Protection Committees and plantation activities undertaken in the state.
Manipur	Decrease in Forest Cover in the state is due to shortening of shifting cultivation cycle and biotic pressure.
Meghalaya	Decrease in Forest Cover in the state is due to shortening of shifting cultivation cycle and biotic pressure.
Mizoram	Decrease in Forest Cover in the state is due to shortening of shifting cultivation cycle and biotic pressure.
Nagaland	Decrease in Forest Cover in the state is due to shortening of shifting cultivation cycle and biotic pressure.
Orissa	Main reason for the increase in forest cover is due to effective protection by the JFM committees and regeneration of shifting cultivation areas.
Punjab	Growth of young plantations carried out under extremely aided Project and Agro-forestry activities in TOF areas.
Rajasthan	Regeneration in the forest areas and extensive plantation activities.
Tamil Nadu	Regeneration in the forest areas and extensive plantation activities in and outside forests.

Source: SFR 2011

Table 6: Wastelands and Non-usable lands in the IHR (km2)

Region	Wastelands		Non-usable Area		
	Total Area	% to Total Area	Snow/Glacier	Barren/Rock	Steep Slopes
Indian Himalayan	180432.91	33.5	55788.49	38415.07	4198.37
India	638518.31	19	55788.49	64584.77	7656.29

Source: GoI, 2010

Table 7: State wise waste land availability

State	Total WL(area in sq. km)
Hill States	
Arunachal Pradesh	18176
Assam	14034
Himachal Pradesh	28337
Jammu and Kashmir	70202
Manipur	13175
Meghalaya	3411
Mizoram	4470
Nagaland	3709
Sikkim	3808
Tripura	1323
Uttarakhand	16097
Hill States Total	**176742**
Other States Total	**375953**
All India Total	**552695**

Source: Indrani Chandrashekharan (2010)