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## **The Critical Importance of Forest Carbon Sink in the Green Economy of the Hindu Kush-Himalayan Mountain Systems<sup>1</sup>**

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### **Abstract**

*The forests of Hindu Kush Himalayan region present an opportunity for both enhancement of carbon and extraction of timber and energy biomass by managing its internal dynamics adopting the most suited silvicultural practices to keep these forests young and vigorous. Community institutions are an asset in the region which enhances the value of total forest capital stock considerably. At the conceptual level Sustainable Forest Management means that total forest capital stock, which is the sum total of natural capital stock, man made capital stock and the forest related institutional capital, must not corrode over succeeding generations subject to the further condition that Natural Capital should also not dip below the critical Natural Capital threshold. This implies that if natural forest capital can be kept above the critical threshold at all times it is possible to enhance human welfare through man made forest capital also. There is high potential for creating employment but there are many challenges in the shape of balancing carbon values with competing ecosystems services, ensuring benefits reach the primary stakeholders, avoiding conflicts among neighbouring communities over claims on forests, poor governance and difficulties in the implementation of Free and Prior Informed Consent.*

Key words: Hindu Kush Himalayan region, forest carbon, sustainable forest management, critical natural capital threshold

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<sup>1</sup> Paper presented at the International Conference on Green Economy and Sustainable Mountain Development: Opportunities and Challenges in View of Rio+20, Kathmandu, 5-7 September, 2011

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The central objective of Green Economy is to continually enhance human welfare at low risks to the global environment using the best available technological and scientific knowledge generated by the highest possible levels of human and financial investments in research and development. Green economy is thus a modern construct and is not a return to the early stages of evolution of human society. The optimal paths to such an economic state would differ from country to country depending on the current status of its natural resources and development, the extent of poverty and inequity, the vulnerability of its ecosystems, effectiveness of its institutions and its human and technological capacities.

Forest ecological services, including their potential for mitigating climate change, are one of the most important pillars of Green Economy. In the mountainous regions where people depend on the fragile ecosystems in their surrounds which not only must meet their demands but also of a much larger population living in the plains downstream, the green economy carries the special responsibility of maintaining ecosystem services for regions geographically far removed from them. The geographical, climatic and demographic features of a mountainous region contribute to their abilities to fulfil this special responsibility. Typically, a mountainous region is characterised by limited agriculture, lower population density and fewer bovine assets but more sheep, and greater number of rivers, streams and brooks but deeper water table than the plains. Transport systems in hills are fewer and costlier to maintain; this affects economy and it is a rare hill region which can be described as rich.

The composite effect of all these features described above is reflected in the higher forest cover in regions of high rainfall and pastures over lands of scanty rainfall on the hills as in the table below:

Table 1: Land use pattern in Hindu Kush- Himalayan region

Country	Geographical area in 1000 ha	% of geographical area			
		Agri land	forests	pasture	Protected areas
Afghanistan	39047	10.0	2.0	46.0	0.2
Pakistan	44438	7.8	6.9	10.1	5.3
India	52819	8.3	41.0	34.1	4.3
Nepal	14718	18.0	36.9	11.9	0.9
Bhutan	4700	7.6	58.8	1.6	18.5
Bangladesh	1318	7.8	65.7	2.2	0.8
Myanmar	28086	7.7	50.9	0.3	1.3
China	168907	1.2	21.5	53.4	0.9
HKH total	354033	5.4	24.1	37.5	2.5

(Source: Upadhyaya et al 2005)

The extent of forest cover rises with altitude before it declines again as the higher colder regions touch the snow line. In India the forest cover is highest in the altitude range of 1000 to 2000 meters as shown in the Table below for India

Table 2: Forest cover at different altitudinal regions in India

Altitude Zones (m)	Area (million ha)				% of total geographical area in different zones
	Very Dense Forests	Moderately Dense Forests	Open Forests	Total	
0-500	2.96	15.67	17.21	35.84	15.62
500-1000	2.15	9.71	7.81	19.67	33.58
1000-2000	1.45	3.71	2.46	7.62	72.19
2000-3000	1.42	1.93	0.70	4.05	66.04
Above 3000	0.37	0.88	0.66	1.91	7.98
Total	8.35	31.90	28.84	69.09	21.02

(Source: FSI,2009)

### Forest growing stock in the Mountains

Not only the forest cover is higher in the mountains the forest growing stock is often higher too. In India, the combined growing stock in the forests of Himalayan mountainous region over the physiographic zones of Western Himalayas, Eastern Himalayas and the North East at 1836.28 million cubic meter is 40.82% of the total growing stock in the Indian Forests even though the combined recorded forests area in these zones is only 28.39% of the total in the country<sup>1</sup>. Also of the ten species with highest growing stock in Indian forests six species, namely, *Pinus roxburghii*, *Abies pindrow*, *Quercus semecarpifolia*, *Cedrus deodara*, *Pinus excels* and *Abies smithiana* are only found in these mountains<sup>1</sup>. It can be safely assumed that the broad picture is similar in the high rainfall zones elsewhere in the region. In low rainfall zones grasslands predominate.

The importance of the forests to the local people over a long time past is reflected in relatively stronger role of local institutions in the management of common resources of forests and pastures in the HKH region. Perceived violations of local governance over forests by the British colonial regime led to strong protests and enactment of special law of Van Panchayat for the

hills of Uttar Pradesh in the early years of 20<sup>th</sup> century. And it is this tradition which is undoubtedly behind the greater acceptance of the role of community forestry organizations in Nepal and Bhutan and of the Joint Forest Management Committees in India.

### **Mountain Forests and Green Economy**

But even though forest cover has improved in many parts of the region contributing to ecological enrichment, particularly in unstable and ecologically vulnerable areas, people in the mountains may not always benefit from the natural assets in their midst. More often than not forests are seen to be hindering not only economic progress of the region but also access to basic amenities like roads, water and energy.

It is not as if this issue has been ignored by policy makers. In fact, this is one area which has actually been one of the core concerns of central planning in India which was expressed in special central grants to the hill states. Carving out of small hill states was meant to provide the political space needed to enable the hill people to organize themselves to not only contribute to strengthening their economic and ecological systems but also seek commensurate returns for their efforts. As a result of sustained political and economic support today the hill states in India have an average per capita income that is significantly higher than the average national income.

Improved lot of mountain people, however, is entirely unconnected with the forests which is rarely seen as an economic asset by the people. For the past many decades some countries of the region, certainly India, seem to be practising a kind of forestry in which little activity is permitted as the central task is considered to preserve what we have and forest management is confined to filing court cases of illegal felling and encroachments. In the name of harvesting only the dead and dying trees are removed. Even in the areas earmarked for joint management with communities, the Joint forest Management Committees (JFMCs) are often only expected to watch over the forests against encroachment and illegal felling. Ecotourism, which has been promoted as an important non-consumptive asset of mountain forests, plays a role only for a small part of the region which has other non-forest tourism attractions in the neighbourhood. As a result it is a rare JFMC that earns a significant income from forests. Under such conditions the interest of communities in the management of forests can not be sustained.

### **Greater potential lies in Intensive Forest Management**

The forests of region actually present a very good opportunity for both enhancement of carbon and extraction of timber and energy biomass, and of non-timber forest produce by managing its internal dynamics adopting the most suited silvicultural practices to keep these forests young and vigorous except in the protected areas and selected biodiversity rich forests where nature

must be allowed to take its own course. One special strength of the region is the tradition of community organizations that either have the capacity of managing forests or can be imparted the requisite skills fairly easily.

At the conceptual level Sustainable Forest Management (SFM) is keeping the forest capital stock and forest productivity intact over succeeding generations while meeting the needs of the forest dependent communities in addition to other harvesting that may be permitted. And forest capital stock (TFC) is defined as the sum total of natural capital stock (NC), man made capital stock (MC) and the forest related institutional capital (IC). It may be noted that bequeathing adequate manmade capital for succeeding generations is often as important as leaving rich natural stock since man made capital has high potential for increasing human welfare. Thus sustainable forest management means that  $TFC (= NC + MC + IC)$  must not be corroded over succeeding generations subject to the further condition that Natural Capital (NC) should also not dip below the critical Natural Capital ( $NC_{cr}$ ) which is that Natural Capital which, if destroyed, has profound damaging effect. This implies that if natural forest capital can be kept above the critical threshold at all times it is possible to enhance human welfare through man made forest capital also.

Taking the example of India in this context it may be mentioned that over the past three decades harvesting has gradually been discouraged in the mountain forests all over India but under an intensive management sustainable harvesting and planting will have to be included as an integral part of management of the forest resources in the country. Below we use the estimated numbers of stems and volume by species and diameter classes in Indian temperate forests in the Himalayan region to make an estimate of the economic possibilities that can be generated which can then be used to estimate the potential elsewhere in the HKH region.

**Table 3: Estimated number of stems and volume by species and diameter class in temperate forests of India**

Species	Diameter Class					
	10 -- 30 cm		30 -- 50 cm		50+ cm	
	No. of stems (in '000)	Volume (in million m <sup>3</sup> )	No. of stems (in '000)	Volume (in million m <sup>3</sup> )	No. of stems (in '000)	Volume (in million m <sup>3</sup> )
<b>Temperate</b>						
Abies densa	9390.494	2.167	7150.337	6.687	4665.208	21.057
Abies pindrow	21634.056	6.07	15024.922	18.57	15526.653	86.421
Abies smithiana	9368.569	2.037	4774.946	6.558	9444.46	80.632
Alnus nepalensis	20524.174	6.199	5939.116	8.544	352.762	1.433
Castanopsis species	100820.244	16.445	29205.009	27.068	9393.47	29.885
Cedrus deodara	32285.979	8.317	25274.273	30.781	12958.105	53.269
Picea smithiana	7264.752	1.545	3682.435	4.291	4356.779	25.551
Pinus excelsa	59926.819	11.183	24470.404	26.491	14865.91	53.821
Pinus roxburghii	166669.848	22.169	66962.38	60.075	21680.974	57.408
Quercus dilatata floribunda	22232.102	3.792	5732.368	5.133	3457.839	14.121
Quercus incana	139029.447	16.329	27063.915	19.067	8932.672	27.227
Quercus semecarpifolia	73650.734	11.381	26725.301	24.873	14482.241	60.594
Quercus species	48849.208	8.641	26244.762	20.412	11470.112	27.065

Rhododendron arboretum	119998.77	10.269	15650.869	6.708	2966.016	4.086
<b>Total</b>	<b>831645.196</b>	<b>126.544</b>	<b>283901</b>	<b>265.258</b>	<b>134553.2</b>	<b>542.57</b>

Source: Adapted from FSI (2009)

From the Table 3 one can see that the lowest diameter class, which should normally be the younger trees in the forest, has 832 million stems measuring 127 million cubic meter. In the next higher diameter class the number of stems is 284 million measuring 265 million cubic meters while in the highest diameter class the number of stems are 135 million with 543 million cubic metre volume. Assuming that the temperate forest trees would take an average of 30 years to grow from the lowest diameter class to the middle diameter class and the same period between the middle and highest diameter class and that during the same period the lowest diameter class will also get populated by fresh regeneration of 832 million stems measuring 127 million cubic metre through both natural and assisted regeneration. This would mean the possibilities of an increase of 543 million cubic metre in 30 years of time in the temperate forests or 18.76 or 19 million cubic metre annually that allows harvesting at sustainable levels under a management system aimed at keeping the forests in the vigorous phase of growth (except in the protected areas and specific areas of high biodiversity values). Assuming that 50% of the mountain forests have to be kept inviolate on account of high biodiversity value, steep slopes or otherwise ecologically sensitive nature, this would mean about 9.5 million cubic meters of both annual removal, and annual accrual, of timber. This is almost twice the amount of timber imported by India in 2008 at an average price of US\$ 274 per cubic meter or a value of US\$ 2.6 billion, a substantial part of which could reach the communities through share in stump value as part owners of forests and as payments for harvesting and related activities carried out. The annual accrual of 9.5 million cubic meter of timber (or 9.975 Mt of biomass or 4.987 Mt of Carbon or 18.3 Mt of CO<sub>2</sub>) would be a measure of carbon sequestered over one year.

This would also generate 40% non-timber biomass about half of which, 3.8 million cubic meter, could be used as firewood or for producing biomass based electricity where such facilities are made available. This would count for a renewable source of energy and thus prove to be an important climate mitigation tool.

### **REDD Plus provides another opportunity**

While many countries have tended to recognize the contributions of ecological services from their hill regions to the domestic economy, the introduction of REDD Plus as one of the most important climate change mitigation tool now offers an entirely new opportunity when the global community would be able to recognize the continued contribution of the mountain people to the health of the globe. REDD Plus is thus a very useful opportunity for communities living in and nearby forested areas in developing countries to benefit from the contribution that forests make towards climate change mitigation. This could come from these communities taking active part in slowing deforestation and forest degradation, conserving the existing forest carbon stocks, enhancing carbon stock and managing the forests sustainably. The detailed procedures are being worked out and it would still be some time before the REDD Plus can be operationalized. But from the overall approach to REDD it would be useful to discuss a few issues that may turn out to be of high importance during the actual implementation of the program.

### **REDD can create employment at a significantly large scale**

In the recovery<sup>4</sup> from the Great Depression of 1930s in the USA, and from the destructions of the Second World War in Japan, the forestry sectors in these countries played a key role in creating productive employment by undertaking reforestation of timberlands, fighting forest fires, building forest roads and creating and maintaining forest parks and the building of these assets during that time not only provided employment so critical during those days but, even more importantly, created resources for future generations to reap benefits from.

In the forestry sector an annual expenditure of \$ 1 million creates between 500 to 1000 full time jobs in the developing countries and between 20 to 100 jobs in the developed countries<sup>3</sup>. At annual investments of \$ 20 billion in REDD activities should be able to create between 10 to 20 million full time forestry jobs in developing economies. The REDD related activities which can be undertaken in this manner may include identification and survey of forest boundaries, maintenance of related land records, inventorying timber and non-timber forest produce, preparation of management plans, carrying out sustainable harvesting, first level value addition to the harvested product, setting up and managing decentralized biomass energy units sustainably for meeting local energy needs, replanting cleared lands, protection against fires and pests and promotion of ecotourism through laying trails and managing them, and capacity building of suitable members of the local communities for all the related activities. All these activities will improve forest management at the base level and also contribute to good forest governance. This would be able to absorb a good number of primary stakeholders in forestry and related jobs. This is perhaps one of the strongest point about REDD.

### **REDD for women in distress in times of civil war<sup>5</sup>**

An unending civil war has resulted in severe damage to the economy and environment of Afghanistan. Firewood is often the only source of household energy but poor management and the collapse of traditional and formal regulatory mechanism for extracting firewood from trees has led to severe depletion of its forest and tree resources which now cover only about 1.5% of land down from 5% in the 1950s. There is a good scope for enhancement of carbon stock in forests by replanting the former degraded forest areas and wastelands with the primary motives of meeting the energy needs of Afghan households and this job is best done by Afghan women since there is no cultural inhibition in permitting women to take part in tree husbandry and none of the warring factions in the civil war are known to have any objection to women's participations as tree planting is considered a highly desirable activity in Islam and women's role in meeting household energy needs is accepted traditionally.

#### **Many challenges ahead:**

Ecosystem services generated by the mountains contribute enormously to human welfare and economy. Producing these public goods and services has high costs that are borne by the mountain societies. Now the price on carbon sequestered and stored does offer an opportunity to these societies to monetize their carbon assets. But realizing them would not be an easy task for a number of reasons described briefly below

#### **Balancing Carbon, biodiversity and other ecosystem services is a difficult task**

Often carbon can prove to be a rival to other products of mountain like timber and non-timber forest produce, and of biodiversity as maximizing carbon values can reduce returns from these other products. The need is, therefore, of balancing these services which can be done relatively easily for timber and non-timber forest product as they are already a part of market but can prove to be an impossible task in the case of biodiversity. In the recent years valuation methodologies for placing values on biodiversity have evolved that may make it possible for a more objective balancing of these rival products.

#### **Channelizing Carbon benefits to primary stakeholders is not easy**

Much has been written about REDD being a low cost climate mitigation option. But the aggregated opportunity cost of people whose livelihood causes emissions from forests could actually prove to be very high. For the sustained success of REDD over a long period of time it is very important that the carbon payments must reflect the realities of opportunity costs to different stakeholders and reach them without vanishing in corrupt practices. Otherwise, any gains of reducing emissions from deforestation and degradation would only be temporary as the disappointed stakeholders would not take long to revert to previous practices that caused

damage to forests. The usual option suggested is to hand over the entire moneys to the communities on the ground that only they can ensure that money reaches the people who make sacrifices for retaining forests. But, sometimes, the community leadership can be as wanting in ethical behaviour as those in the higher rungs of provincial and national leadership.

### **Poor governance makes REDD difficult of implementation**

Many REDD candidate countries face the problem of poor governance, some at its worst. These countries lack institutions needed for effective implementation and even the ones that are available have low capabilities and the poorer people, the primary stakeholders of REDD, usually have lower levels of faith in the fairness of these institutions. Channelizing funds to lower formations in such countries poses an enormous challenge.

### **Too high a level of expectations from carbon can disappoint primary stakeholders**

Over the past few years there has been considerable exaggerations about the flow of funds under REDD raising expectations among the forest dwelling communities to an uncomfortably high levels. There is a tendency towards expecting financial rewards for the entire stocks of carbon in the neighbourhood and very little understanding of the concept of additionality and leakages. This can discourage their participation in REDD when they find that the gains may be far more modest than those imagined now.

### **REDD can exacerbate Inter-community conflicts<sup>7</sup>**

In the enthusiasm for REDD it is often not realized that a poorly implemented REDD program has the potential for igniting violence among neighboring tribes that have territorial disputes over control over forests that have remained largely un-demarcated as tribal lands have only rarely undergone the process of settlement. With forests attracting REDD investments the disputes may suddenly acquire a seriousness which was absent in the past. Such situations require deft government interventions to ensure that peaceful compromises are quickly arrived at before the disputes become violent.

### **Non-settlement of forest lands is an issue**

Such violence is more likely among tribes than among non-tribal communities who usually have well defined land boundaries which, by itself, limit disputes. Also, unlike the tribal societies used to their own mechanisms for dispute settlement, the non-tribal communities place faith in the national judicial systems, and are often patient in the face of long delays inherent in civil dispute settlement processes. Delineation of boundaries between the neighboring tribes through land survey would, therefore, appear to be the answer as many authors have suggested but it is not only time consuming it can also ignite the very conflict that is sought to

be avoided because claims and counterclaims can vitiate the delicate balance. Land settlement should begin only after a prolonged consultation with the neighboring communities and this would require skilled interventions by local government officials who must be seen as fair and just to both sides.

### **Free and Prior Informed Consent has the potential of being misused by unscrupulous industry<sup>6</sup>**

The Article 26 (1) of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) recognizes the right of the indigenous peoples “to the lands, territories and resources which they have traditionally owned, occupied or otherwise used or acquired” and the Article 26 (2) further recognizes the right “to use, develop and control what they possess”. Article 26 (3) of UNDRIP seeks legal recognition and protection to the lands and resources of the indigenous peoples in keeping with their customs and land tenure systems. Free Prior Informed Consent (FPIC) requires approval by the indigenous people before implementing policies and measures likely to affect them and flows from the founding principles of human rights.

The FPIC is crucial but its application must not be blind to the realities of the world because vested commercial interests involved in illegal and excessive harvesting or in other economic activities that lead to deforestation can, using unscrupulous means, tempt or mislead traditional institutions of the indigenous communities not to agree for REDD. Also it has to be borne in mind that the traditional institutions of the indigenous peoples may sometimes deny fair treatment to minority groups sharing their physical and economic space and also may not always permit representation to women.

It should be the endeavour of government agencies to apply FPIC vigorously where dislocation of habitation or core economic activities of the indigenous peoples are proposed. But there would be occasions when indigenous traditional institutions are not representative and practice discrimination based on gender, parentage or ethnicity. In such cases the consent should be taken from another higher level of democratic institution, like Panchayat or a Joint Forest Management Committee in India, that has been rightfully set up. And whenever there is even a slight departure from FPIC the international body governing REDD must be consulted by the Country Government<sup>6</sup>.

### **Conclusions:**

If millions of hectare of forest lands are kept completely unworked allowing trees to die of old age and insect attacks, creating no employment and little incomes to any but the forest department staff, one can hardly expect to gain people's support for keeping a large part of the country's most precious resource, the land, under forest and tree cover. A forester's job has to be defined in a much more comprehensive manner. He must use the land at his command

appropriately. And the appropriateness has to be measured not merely ecologically but also economically. Enhancing productivity of the forests for economic gains, and even more importantly for direct and indirect employment generation, is as important as the ecologically sound management. A balance has to be found which may not always be achievable in every bit of forests but can perhaps be achieved over larger landscapes. It might be possible to bring the focus back to comprehensive forestry in which economic productivity is not an abusive word. The increasing demand for mitigation of climate change through carbon sequestration might perhaps cause the changes needed in our forestry practices.

Acknowledgement: The author acknowledges the contribution of Ms Swati Chaliha, Research Associate, Institute of Green Economy in the writing of this paper.

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