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What sustains and what threatens ecological sustainability? Review of Nepalese context.

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Abstract:

Ecological sustainability, in the Nepalese context, can be defined as efforts to “maintain”, “support”, or “endure” both human and wildlife in its natural equilibrium. There are various versions of ecological sustainability. The one used by the Brundtland Commission of the United Nations is now quoted widely and is “Sustainable development which meets the needs of the present without compromising the ability of future generations to meet their own needs”. This is universal principle which is also appropriate for Nepal.

Every ecosystem provides vital goods and services to humans beings and other organisms, both macro and micro, according to the nature of ecosystem, other things remaining constant. However, the need of human beings, appears far greater than what nature can offer at a given space and time. Hence, imbalances are being observed in sustaining the ecological systems in Nepal. Government of Nepal has adopted two major ways of reducing negative human impact and enhancing ecosystem services by carrying out various activities of environmental management based on the information gained from earth science, environmental science and conservation biology. In order to sustain the country’s ecology, the Government of Nepal has promulgated various laws and by-laws; set aside more than twenty three per cent (23%) of the total land area of the country into protected area system and has categorized its forest into different management regimes. International Conventions and Treaties are being honoured and various activities are being implemented accordingly.

Despite these efforts however, the forests are getting devoid of trees, forest areas are being converted into other land use practices, trafficking of rare and endangered wildlife continues, rural people are not satisfied with the Government’s programme of extending protected area systems as they are deprived of using forest products within the protected area systems. Rural people who are used to collecting medicinal and other herbal plants for their own consumption are not getting these resources as it used be in earlier days. Hence, there are local resentments and political pressures as well on the ecosystems services to be more flexible with its conservation models. This has resulted in concepts of “peoples and parks” and “buffer zones” such that both humans and wildlife can derive benefits from protect areas.

What sustains the long term ecological sustainability is an unanswered question in Nepalese context. It is to some extent dependant on the basic livelihood demands of the population and the resultant pressure on the available natural resources. This is followed by weak governance and poor service delivery system especially in the natural resources management sector. There are three broad criteria for ecological sustainability and these are:

- (a) renewable resources should provide a sustainable yield, i.e. the rate of harvest should not exceed the rate of regeneration,
- (b) for non-renewable resources there should be equivalent development of renewable substitutes; and
- (c) waste generation should not exceed the assimilative capacity of the environment.

Unfortunately, these criteria are not fully adhered to in Nepal while managing natural resources of the country.

This paper examines the elements of ecological sustainability, analyzes the potential constraints and threats and proposes major indicators of sustainability. In the end it outlines an approach to implement sustainable practices in the context of Nepal and Nepalese society.

The country in figures

Nepal is a relatively small country covering an area of 147,181 km². It is situated between China and India. The country is divided into five physiographic zones with an east west extension. The zones are from south to north: Terai (14% of the country), Siwalik (13%), Middle Mountain (30%), High Mountain (20%) and High Himal (23%). In altitude, it ranges from 70 m above mean sea level in the south eastern Terai, to 8,848 m at the summit of Mount Everest, the highest point on Earth. With its varied topography and elevation, the country experiences a wide variety of climates, ranging from sub-tropical in the lowlands to alpine in the high mountains. The average annual rainfall ranges from 250 to 4,500 mm. The total population is 27.3 million with 2.24% annual growth rate. About 86 percent of the total population lives in the rural areas.

Use of forest Resources

Forests are an integral part of the farming system in Nepal and form a vital resource for livelihood especially in rural areas. These forests and ecosystems are supporting human beings and wildlife biodiversity of the country in different forms and were in equilibrium. Forest resources are mainly used for domestic purposes although trading of Non-Timber Forest Products is practiced in the country. Unfortunately, these resources are depleting as forest cover is shrinking due to various reasons. High population growth, unmanaged settlement, unemployment, encroachment, grazing and forest fire are some of the underlying causes for the depletion. And because of over exploitation, illegal use and land use change, forest ecosystem equilibrium is now at the verge of being ruptured. Sustainable development as has been defined by the United Nation's (Brundtland Commission) as meeting the needs of the present without compromising the ability of future generations. This is true for Nepal as well and we must ensure this balance between environment, population and development equation. It is being followed up partially because the rural people are heavily dependant on forest to fulfill their basic needs and this unfortunately compromises the ability of future generations.

Forest resources at present

There are 35 major forest types and 118 ecosystems found in Nepal. According to the recent data, forest and shrub cover only 29 per cent and 10.6 percent respectively of the total land area of the country. The Far Western Development Region of the country has the highest percentage of forest land area followed by the Central development Region (Table 1).

Table 1: Forest and Shrub Area by Development Region (ha.)

Region	Total land area	Forest Area,	Forest (%) of total land area	Shrub Area,	Shrub (%) of total land area	Forest and shrub total, (%)
FWDR	1,953,900	687,400	35.2	263,900	13.5	48.7
MWDR	4,237,800	1,192,400	28.2	442,000	10.4	38.6
WDR	2,939,800	734,300	25.0	256,900	8.7	33.7
CDR	2,741,000	918,600	33.5	233,800	8.5	42.0
EDR	2,845,600	736,100	25.9	362,600	12.7	38.6
Total	14,718,100	4,268,800	29.0	1,559,200	10.6	39.6

What threatens ecosystem sustainability?

Every ecosystem provides vital goods and services to human beings and other organisms, both macro and micro, according to the nature of ecosystem, other things remaining constant. However, the need of human beings, appear are far greater than what nature can offer at a given space and time. Hence, imbalances are being observed in sustaining the ecological systems in Nepal. Some of the major factors that are threatening ecosystem sustainability in Nepal could be spelled as follows:

Deforestation and forest degradation

It is a serious concern in Nepal. The forest cover decreased from around 60 per cent in the 1960s to 29 per cent in the 1990s. As a result, the per capita forest area in the country has also declined to just 0.27 ha. Nepal lost 570,000 hectares of natural forests in 27 years between 1964 and 1991 out of which 380,000 hectares have been converted into agricultural land (Adhikari, 2002). The forest area decreased at an annual rate of 1.7%. The increase in shrub land since 1978 to 1994 shows that forest areas are degrading and being converted into other land use types (Table 3). The recent studies in 20 Terai districts of the country revealed that forest cover has decreased at an annual rate of 0.06 percent from the period of 1990/91 to 2000/2001.

Table 2: Change of forest coverage from 1978 to 1994

Year	Forest Area (' 000 ha)	Percentage	Shrub area ('000 ha)	Percentage
1978*	5616.8	38.0	689.0	4.7
1986*	5504.0	37.4	706.0	4.8
1994**	4268.0	29.0	1560.0	10.6

Source: * HMG/ADB/ FINNIDA, 1988; ** DFRS, 1999.

Population pressure

Of the various critical causes, one is population growth. Population pressure and the so-called developmental activities are causing a rapid depletion of forests in every part of the country. As a result, countless plant species are facing considerable danger of extinction. A significant lowering of the upper timber line has resulted from human activities which include conversion of forest to arable land, commercial timber cutting, excessive gathering of timber for domestic use, construction of roads, dams, canals, high-tension electricity lines etc. The trend of forest cover loss is inversely related with the increase in the nation's population (Table 3).

Table 3: Total forest cover and population of the country

Year	Forest cover (ha)	Total Population
1952	63,43,500	82,56,625
1978-79	63,06,700	1,60,50,631
1994	58,28,000	20,067,307
2010	58,28,000	26,494,504

Illegal forest harvesting

There is significant illegal forest harvesting in Nepal and the volume varies with the number of incidence. However, it is very difficult to estimate the exact volume of illegal timber as there is no official data or record for illegal harvesting and smuggling. Most of the timber is consumed in local market and some goes to neighboring countries. There are several cases in the past when illegal harvesting has been exposed. Unfortunately the local forest department officials themselves have been involved in these illegal activities together with politicians and at times community forest user group (CFUG) leaders.

Box Error! No text of specified style in document.: Glimpse of involvement of forestry personnel in illegal forest harvesting

In order to examine the cases of illegal harvesting and involvement of forestry personnel, government formed a special judiciary court of enquiry on 13th August 2010. The judicial court found a number of officials guilty and convicted 28 forest officers. Among the convicted was the then DG of the DoF who was charged for involvement in illegal logging and other illegal forest activities (www.mfcs.gov.np). Recently, the national daily newspaper *Gorakhapatra* (17 September, 2012) reported that the Commission for the Investigation of Abuse of Authority (CIAA) moved the special court for punishment of a total of 195 personnel including the Regional Director of the FWDR: a Joint Secretary level officer of the Government, for being allegedly involved in the embezzlement of USD 4.85 million by selling round timber (21,390 m³) from 108 CF in one of the hill districts of the country (Dadeldhura). Almost every day there are some news in daily newspapers regarding illegal forest harvesting and involvement of forestry officials. Such acts result in loss for the entire country as active forest management takes back seat as government and watch dog bodies react by issuing blanket order to ban cutting of all timber in Nepal.

Forest encroachment

Twenty-nine out of 75 districts in Nepal have severe forest encroachment problems. These include the Terai districts. People tend to encroach on forest land near their homestead no matter whether it is in hills or in Terai. Additionally, the practice of shifting cultivation is very severe in middle hill physiographic zone of the country. It has been reported that around 91,100 ha. of forest land have been encroached since the establishment of the Forest Department in 1942 (Forest Secretary's presentation 16 September, 2012). One main reason of this increase in encroachment is the policy of the government to settle down so called landless people inside the forest area coupled with the weak physical infrastructure and lack of resources. In addition, the ease of transport, population pressure and lack of good governance and accountability have also had an effect. Although the concerned forest officials try to move out encroachers from the forest land repeatedly, it has become an increasingly difficult task due to political interferences.

Forest fires

The incidence of forest fire is increasingly becoming a serious problem in Nepal. Recent forest fire (in the year 2008) have killed 43 people. A notorious forest fire was in the Ramechhap district also killed 33 firefighters.

Shifting cultivation

The shifting cultivation, often known as 'khorea phandne', is another form of habitat destruction. In this process a patch of the climax forest is cleared, burnt and used for farming for some years. It is then abandoned for some years as the farmers shift to another forest area, clearing another patch of the climax vegetation. This practice results in the destruction of a large number of biological species and the abandoned land is mostly succeeded by a fewer number of sporadic species that are quite different from the original forest cover.

Overgrazing

Livestock graze inside forest throughout the year in Nepal. This is mainly because of shortage of fodder and other feeding materials. Overgrazing has resulted in poor regeneration of forests and change in forest composition. Fodder for the estimated 15 million cattle in the country, which includes important non-timber forest products used by the villagers, is estimated at 5.6 million tons of fodder per year (Upreti, 1985). About three-quarters of the fodder come from the forest and grassland, thus posing pressing threat to the country's biodiversity (Sigdya, 1984).

Overexploitation

Besides, medicinal and aromatic plants and other forest products are extracted in the wild using traditional system. Home-made tools and techniques do prevail in collecting them without taking into account the sustainability or its regenerating ability. Tropical and sub-tropical medicinal herbs have already reached near extinction levels in most areas of the country causing irreversible damage to ecosystem.

Effect of rise in temperature

Temperature observations in Nepal show a general warming trend. The temperature differences are most explicitly seen during the dry winter season. The change in temperature is increasingly becoming important in the Nepalese context and is being viewed as one of the challenges in ecosystem sustainability. The Table 4 below compares the maximum temperature of Nepal in degrees centigrade over the period of five years (2004 and 2009).

Table 4: Trend of temperature rise in Nepal (2004-2009)

Place	January 2004	January 2009	Change in temperature (Degree Centigrade)
Kathmandu	18.0	24.0	6.0
Nepalganj	17.0	24.0	7.0
Silgadhi	15.9	24.0	8.1
Simara	12.0	22.7	10.7
Bhairahawa	17.9	21.7	3.8

Source: Department of Hydrology, Quoted in *Kantipur Daily*, 22 January, 2009.

Other factors

Over the last few years, there have been frequent and intense floods, droughts and extremes in local temperature in the country. The major consequence can be seen in the Himalayan regions. Invasive species such as *Lantana camera*, *Eupatorium* spp., *Mikania micrantha*, are increasing. Food for birds is diminishing. Reportedly, as many as six Red Pandas have been killed in the periphery of Makalu-Barun National Park. In the past Pangolins have been caught at Makwanpur district and ultimately killed. The possible purpose for the animal coming out into human habitat in Makwanpur district could be due to their search for food thus endangering their existence. Furthermore, the vulnerability of animals has also been observed in high altitude regions. Experts' claim that Pika (*Ochotona* spp.) species which has been residing mostly in 2,800 meters above sea level, is now found to have shifted its habitat up to 3,200 meter high. Similarly, the common leopard is now observed at a much higher altitude.

Surface water sources are decreasing in and around high altitude forests because of erratic rainfall. This has had negative impact on all biodiversity composition including trees, shrubs, herbs, water plants in ponds and lakes, plus fishes. All of these are important components of food and habitat for the local and migratory birds.

Unforeseen flooding is an example of general threat to ecosystem sustainability. According to the Ministry of Home Affairs, in the year 2010, 226 persons were killed from flood and landslides. Recently in April 2012, an unexpected

flooding of the Seti River (Central Development Region of Nepal) has taken the lives of more than 50 people and washed away thousands of hectares of fertile land.

Nepal has made considerable progress in sustaining its environment over the past 40 years, but its political instability and economic and demographic context shows that there are on-going threats to forests and biodiversity. These threats can be categorized into three headings:

- Loss and conversion of natural habitat into other land use (agriculture, encroachment, grazing, road construction, and extraction of sand and gravel).
- Illegal and overexploitation of biological resources, including extraction of timber and Non-Timber Forest Products and poaching of wildlife.
- Modifications of natural systems in the form of dams and fire, invasive species, and climate change.

Lenzen et al., (2012) have pointed out that local threats to species are driven by economic activity and consumer demand across the world. Consequently, policy aimed at reducing local threats to species should be designed from a global perspective, taking into account not just the local producers who directly degrade and destroy habitat but also the consumers who benefit from the degradation and destruction.

The Master plan for the Forestry Sector (1989) was a strategic framework for forestry sector planning and policy development. To meet the stipulated objectives, six primary and six supportive programs were developed. Master Plan for the Forestry was prepared for 21 years (1989-2010) to guide the forestry sector of Nepal. The key objectives of the plan were:

- to meet the people's basic needs of forest products and contribute to food production through an effective interaction between forestry and farming practices,
- to protect land against degradation and ecological imbalance,
- to conserve ecosystems and genetic resources, and
- to contribute to the growth of local and national economies by developing forest management and forest-based industries and creating employment opportunities from the forestry sector.

What sustains ecosystem sustainability?

Natural resources are a gift of nature we have inherited these resources from our forefathers. It is our responsibility to handover it to our children and future generations if not in the same order then at least by not degrading and losing them. The best way to sustain ecological balance would be to:

- The positive role of indigenous people
- Promulgation of policies, and legislations
- Issue of good governance
- Provide the sense of ownership.

The positive role of indigenous people

Indigenous people, to some extent, with their socio-cultural relationships with natural resources have largely been contributing to sustainable conservation of biodiversity, especially in *in-situ* conservation. Indigenous people have long been using herbs medicinal plants for treating and curing diseases at household level (Shrestha et al, 2008).

Policies and legislations are in place

Government does have several policies related to the conservation and wise use of natural resources. The Interim Constitution of Nepal, 2007; has also stipulated various directive principles and policies in mobilizing the nation's natural resources and heritage in a useful and profitable manner for national welfare. The Forest Act (1993) and Regulations (1995) are the legal instruments to translate the policy vision into practice. National Park and Wildlife Conservation (NPWC) Act 1973, Buffer Zone (BZ) regulations and guidelines are the legal tools for the Protected Areas (PAs) declaration and management. Additionally, Environment Protection Act (1995) and Regulation (1996) are the legal basis for striking a balance between development and environment protection. Similarly, Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD) is the key policy instrument in mitigating climate change. Additionally, some of the policy measures are:

- Leasehold Forestry Policy, 2002
- Nepal Biodiversity Strategy, 2002
- National Wetland Policy, 2003
- Herbs and NTFP Development Policy, 2004

- Terai Arc Landscape Strategy 2004-2014
- Sacred Himalayan Landscape Strategy 2006-2016
- Gender and Social Inclusion Strategy in the Forestry Sector 2004- 2019

Despite all these plans, policies, Act and regulations being in place, the basic needs of the people have not been fulfilled satisfactorily. This results in forest degradation and ecological imbalances in the form of erosion, landslides, fire and loss in biological diversity.

It shows that Nepal has a number of good existing policies and many newly drafted policies that have the potential to be very effective but it needs to be strictly translated into positive action in the field. This will require good governance at all levels of government, which is lacking at present. In some cases, there is lack capacity of implementing them. Hence, capacity of institutions needs to build stronger and robust in order to ensure enforcement and compliance.

Issue of good governance

Good governance in forestry sector is expected to have transparent, service oriented, result oriented, accountable, inclusive, and gender equity based positive actions. So far the service delivery is far from satisfactory. The important service delivery performance measures could be:

- Effectiveness coordination,
- inclusiveness resulting in representation, participation, devolution and local decision making,
- Legitimacy of procedures and the rule of law,
- Accountability of authorities, and
- Fair and equitable allocation of benefits.
- Enactment of good policies, rules and regulations backed by strict enforcement and compliance regime.
- Monitoring and Evaluation resulting in strengthened Research and Development.

Provide the sense of ownership

Community-based natural resource governance structures have continued to function during the period of political instability in Nepal. It is one of the successful forest management models in Nepal. Nearly one third area of the forest (1,664,918 ha) are being managed by communities in Nepal (Nepal Biodiversity and Tropical Forestry Analysis. USAID/Nepal, 2012). This could be because of the sense of belonging and ownership. Existing models of community conservation, such as community forest and buffer zone management should be continued in the hills and appropriate model developed in the Terai belts (leasehold). Whatever be the management system, it should balance between protection of biodiversity and ecosystem services and the consumption needs of people, both for subsistence and for the market (commercial purposes).

It would be very difficult to see the ecological sustainability or restore ecological equilibrium unless the rural people are provided adequate food and shelter. Nepal should focus its programme to combat climate related risks, including flooding and siltation, as threats to ecosystem conservation. Nepal's National Assessment Report for the World Summit on Sustainable Development (2002) has already recognized the links between climatic circumstances and land degradation, erosion and landslides: *'too much water' and 'too little water' is responsible for land degradation in different land uses in Nepal.*

Continual support from development partners

There are multilateral and bilateral donor agencies that are supporting government's initiatives on biodiversity conservation, livelihood improvement and sustainable utilization of natural resources. Nepal received significant support for Community Forestry from the 1970 into the 1990s. The World Bank has financed three forestry projects in Nepal since 1980: Community Forestry Development and Training Program; Second Forestry Project and Hill Community Forestry Project. The three projects all sought to assist the development of Community Forestry, and tried to blend investment in plantation establishment and other services with support for tenure reforms. Donors support in Nepal appears now to increase again with the onset of international interest in the issue of Climate Change, mitigation and adaptation through the forest sector. For example, DFID, in collaboration with the SDC, and GoF recently announced their intention to support a major new national forestry program over the next 10 years.

Similarly, the World Bank's Forest Carbon Partnership Facility (FCPF) is now supporting the development of REDD+ Strategy and Program under the leadership of the MoFSC. The REDD+ program at present is carrying out studies and supporting consulting activities for the possible marketing of forest carbon emissions reductions, designing relevant monitoring systems and review of related policy developments. GoN has also expressed interest in participation in the Bank' Forest Investment Program (a component of the Climate Investment Fund family).

Recently, DFID has announced grant assistance to Nepal for tackling climate change. The Forest Resource Assessment Project (FRA) (2010-2014) is working to provide hard data on the current state of Nepal's forests, including trends in their area of coverage and composition. The results of the FRA could be a strong evidence base for policy, legislation and regulation at the national level. A multi-stakeholder mechanism to support the forestry sector in Nepal is underway. Nepal would need continual support from its international partners and friends at both national and international level including bilateral, multilateral and INGOs; in order to keep its present stage of ecological stability and enhance them.

Other issues

There is dearth of reliable data which would support the current understanding of many of the ecosystem issues. The concerned authorities should be able to take appropriate decision based on informed choices.

The ways and means of lifting morale of civil service should be adopted. Currently, the morale of the civil servants is very low which reflects in poor governance and weak monitoring of assigned tasks. Nepal must build the capacity of the government to implement the policies with a focus on decentralization and technical knowledge.

The Fourth National Report to the Convention on Biological Diversity implementation demonstrated that Nepal has improved conservation and sustainable use of biodiversity in various ways. Furthermore, it has suggested that the way forward is for Community-Based Conservation is one of the essential ingredients for the conservation and sustainable use of biodiversity. The sustainability model in Nepal should take the advantages of global and regional initiatives such as climate change mitigation measures in sustaining its ecosystem.

Finally, Nepal must

- Minimize the use of its natural resources,
- Raise awareness, and
- Adopt alternative source of energy.

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