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Multi Stakeholder Forestry Programme
बहुसरोकारवाला वन कार्यक्रम

Sustainable Forest Management in Nepal

AN MSFP WORKING PAPER

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PREFACE

The Multi Stakeholder Forestry Programme ended on 15 July 2016 after four years.

Counting only the publications and other papers, which were commissioned by MSFP and defined as deliverables for the public domain, or produced by its own staff and by staff of the MSFP implementing agencies, over 300 documents were produced.

Several of the stakeholders, such as research organizations and the NGO implementing agencies, produced a number of case studies, background papers or other documents.

Some of these documents concern work undertaken in the field of sustainable forest management (SFM).

The purpose of this working paper was to place the MSFP-related SFM work into a wider national, and even into an international policy context.

Much emphasis in this paper has also been put on the findings and conclusions of the Forest Resource Assessment (2015), a MoFSC project funded by the Government of Finland. This has provided the forestry sector with some very useful findings and benchmarks.

This paper should be read in conjunction with an MSFP publication focusing on the Programme's initiatives on scientific forest management in the terai to be published later in 2016.

It is hoped that this effort will contribute to the analysis and promotion of SFM in Nepal. If this draft can facilitate the passing of the MSFP results to the actors and future contributors in the sector, then it has served the intended purpose.

Abbreviations

AFEC	Agriculture, Forestry and Environment Committee
ANSAB	Asia Network for Sustainable Agriculture and Bioresources
BCN	Bird Conservation Nepal
CAPA	Community Adaption Plan of Action
CF/s	Community Forest/s
CFM/G	Collaborative Forest Management / Group
CFUG/s	Community Forest User Group/s
cft	cubic feet
CITES	the Convention on International Trade in Endangered Species of Wild Fauna and Flora
cm	centimetres
DDC	District Development Council
DFID	Department for International Development
DFO	District Forestry Office
DoF	Department of Forests
DNPWC	Department of National Parks and Wildlife Conservation
DSCWM	Department of Watershed Management and Soil Conservation
DSCO	District Soil Conservation Offices
EC/s	Executive Committee/s
ECARDS-Nepal	Environment, Culture, Agriculture, Research and Development Society Nepal
ENPRED Nepal	Environmental Preservation Services for Development Nepal
ERI	Environmental Resource Institute
FAO	Food and Agriculture Organization (UN agency)
FECOFUN	Federation of Community Forestry Users Nepal
FP	Forest Policy (2015)
FRA 2015	Forest Resource Inventory (2015)
FSS	Forest Sector Strategy (2015)
GDP	Gross Domestic Product
GoF	Government of Finland
GoN	Government of Nepal

ha	hectare/s
hh/s	households
IA	Implementing Agency
IDS	Integrated Development Society
ITTO	The International Tropical Timber Organization
JFA	Joint Funding Agreement
LAPA	Local Adaptation Plan for Action
Li-BIRD	Local Initiatives for Biodiversity, Research, and Development
LFG/s	Local Forestry Group/s
LFP	Livelihood Forestry Programme (DFID funded)
m^3	cubic metres
MAI	Mean Annual Increment
M&E	Monitoring and Evaluation
MoFSC	Ministry of Forests and Soil Conservation
MPFS	Master Plan for the Forestry Sector (1988)
MSFP	Multi Stakeholder Forestry Programme (2012 - 2016)
NGO	Non-Governmental Organization
NRs	Nepali Rupees
NSCFP	Nepal Swiss Community Forest Programme (SDC funded)
NTFP/s	Non-Timber Forest Product/s
NUKFRP	Nepal UK Forest Research Project
OP/s	Operational Plan/s
PA	Protected Area
REDD+	Reducing Emissions from Deforestation and Forest Degradation
RIMS-Nepal	Resource Identification and Management Society Nepal
RRN	Rural Reconstruction Nepal
RSM	Regional Support Mechanism
SDC	Swiss Agency for Development and Cooperation, Embassy of Switzerland in Nepal
SFM	Sustainable Forest Management
TOC	Theory of Change
UNFF	United Nations Forum on Forests
VA	Value Added
VDC	Village Development Committee
YPO	Yearly Plan of Operation

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1 SUSTAINABLE FOREST MANAGEMENT

Sustainable forest management (SFM) is the management of forests according to the principles of sustainable development. Sustainable forest management has to keep the balance between three main pillars: ecological, economic and socio-cultural.

SFM aims to provide integrated benefits to all, ranging from local livelihoods, providing biodiversity and ecosystem services, reducing rural poverty, to mitigating effects of climate change.

The "Forest Principles" adopted at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992 captured the general international understanding of SFM at that time. The definition of SFM in Box 1 has been adopted by the Food and Agriculture Organization of the United Nations (FAO).

Box 1 The FAO definition of sustainable forest management

The stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfill, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems.

More simply, SFM can be described as the attainment of a balance between society's increasing demands for forest products and benefits, and the preservation of forest health and diversity. This balance is critical to the survival of forests, and to the prosperity of forest-dependent communities.

For forest managers, SFM means determining, in a tangible way, how to use the forest resources today to ensure similar benefits, health and productivity in the future. Forest managers must assess and integrate a wide array of sometimes conflicting factors, commercial and non-commercial values, environmental

considerations, community needs, and even global impacts, to produce sound forest plans.

There appears to be growing international consensus on the key elements of SFM (FAO 2016) – see Box 2.

A number of sets of criteria and indicators have since been developed to evaluate the achievement of SFM at the global, regional, country and management unit level. Criteria and indicators are tools which can be used to conceptualize, evaluate and implement SFM. The criteria define and characterize the essential elements, as well as a set of conditions or processes, by which SFM may be assessed - and periodically measured indicators reveal the direction of change with respect to each criterion. In addition to FAO, such institutions as ITTO, the Montreal Process and Forest Europe have developed sets of criteria and indicators for SFM.

Box 2 The Seven Thematic Areas of SFM

1. Extent of forest resources
2. Ecosystem health and biological diversity
3. Forest health and vitality
4. Productive functions of forest resources
5. Protective functions of forest resources
6. Socio-economic functions
7. Legal, policy and institutional framework.

According to voluntary reporting (UN 2014): "Concerning the harvested timber from the forests sold into the national market, Nepal, until today, has not used any sets of criteria and indicators for SFM. This is mainly due to the fact that Nepal's forestry has not been commercially managed as yet, and has not been able to explore the international timber market. Nepal's forestry has still been governed by the principle of conservation forestry. Currently, Nepal has developed sustainable forest management criteria and indicators according to the country situation and are in the phase of testing".

In section 6 of this working paper, the criteria and related indicators from Forest Europe are used to assess the sustainability of forest management in Nepal's conditions. First, however, some background information on the forestry sector is provided, the state of the nation's forest is described, and the impact of the Multi Stakeholder Forestry Programme (MSFP) on promoting sustainable forestry is reviewed.

2 FOREST POLICY, STRATEGY, AND KEY CHALLENGES IN NEPAL

Figure 1 illustrates one of the main challenges of SFM in Nepal - the local deforestation, i.e. reduction of the forest area during the past two decades. Deforested areas are reflected in red. In terms of area, most of the damage done have been compensated by natural regeneration and some by planting. The source is the newest forest resource assessment and its comparison with the previous measurements (the Forest Resource Assessment, FRA 2015). Even if the national level results have become somewhat encouraging, at many locations there are strong pressures on forest areas and tendencies of deforestation. The Government of Nepal (GoN) has made continuous attempts to meet this challenge – one aspect of this is through the introduction of collaborative forest management (CFM, via the CFM Directive in 2003), the newest modality of forest management in Nepal. It is hoped that this can address the high degradation of large, valuable tracts of productive forests in the Terai where community forestry (CF) is difficult to implement. CFM involves co-ordination between central government (MoFSC), local government (VDC and DDC) and close and distant users, previously excluded in community forestry, and aims at achieving multiple benefits, maintaining ecological balance, generating economic returns and improving livelihoods from the government managed forests (Khanal, 2003).

Figure 2 illustrates the distribution of population density according to the national census (2011). The concentration of population pressure on such areas as the south-eastern part of the country, are continuously reflected as a pressure against forests. The involvement of households in community based forestry is illustrated in Figure 3, using MSFP's six clusters as a benchmark - this can be compared with the pressures on forest resources in the MSFP operational area (see Figure 5). The dynamic of land-use driven by migration (e.g. forest regeneration on abandoned farm land) is likely one important explanatory factor but conclusive evidence of its impact has yet to emerge.

Figure 1 Change in the forest cover - a challenge for SFM in Nepal (FRA 2015)

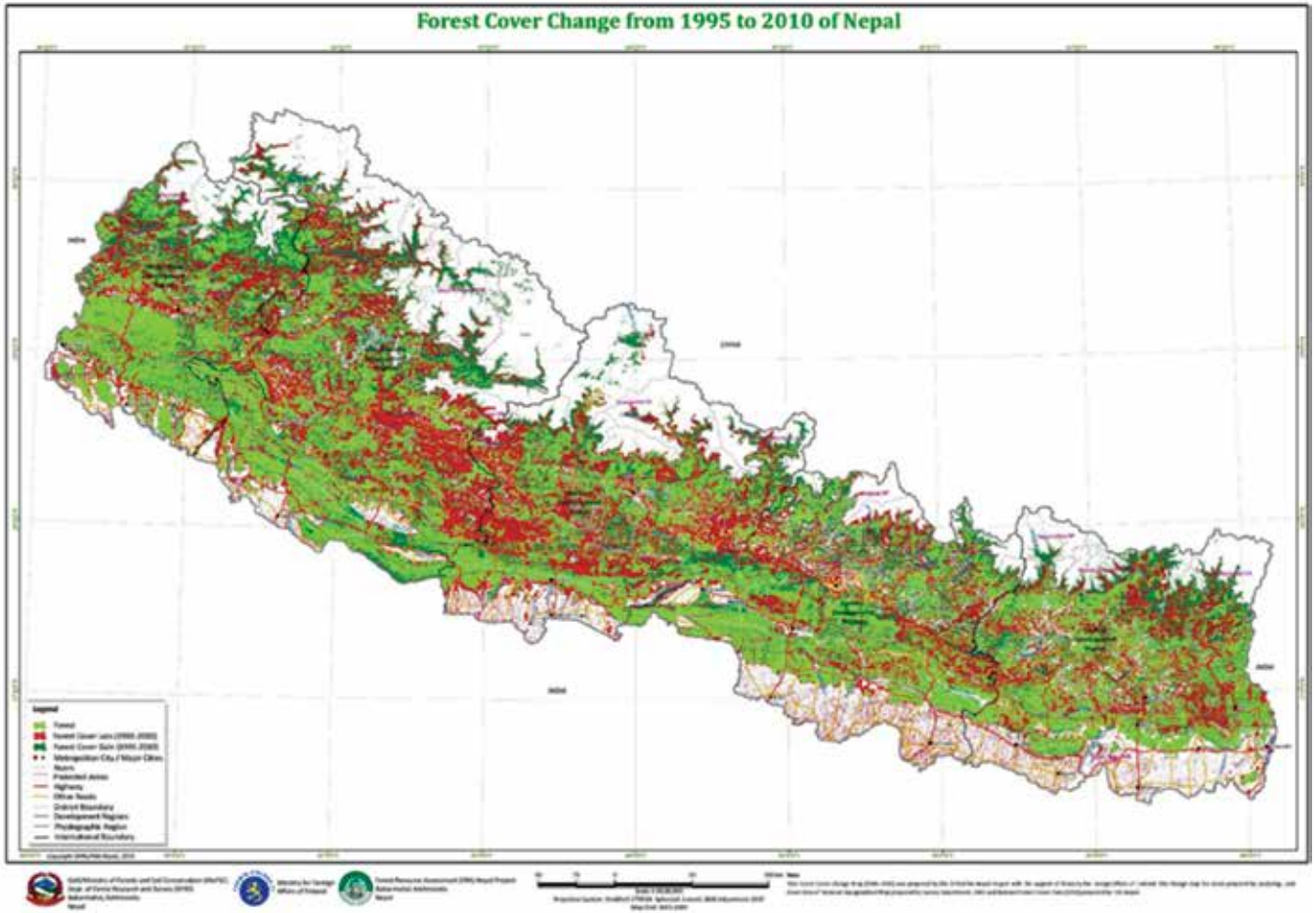


Figure 2 Population density in Nepal

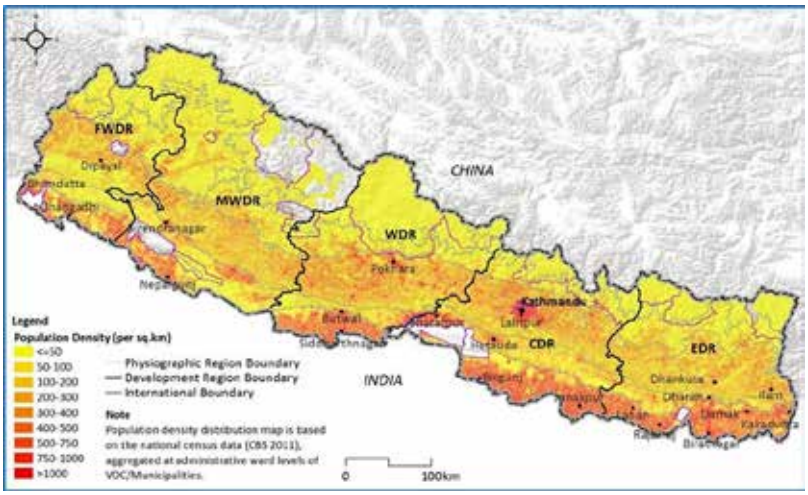
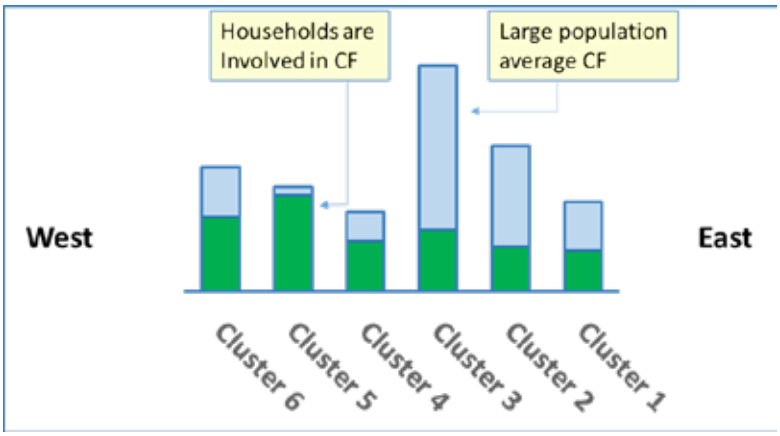


Figure 3 Involvement of households in community based forestry in MSFP area



Note: a household can be a member of several CF's, thus the shares are somewhat upwards biased.

MSFP has been active in promoting the updating process of Nepal's Forest Policy (FP) and Forest Sector Strategy (FSS). The GoN had already earlier come up with a political statement, the "Forest Vision". The FP and especially the FSS were carefully prepared, following a thorough analysis of the performance of the two-decade long Master Plan for the Forestry Sector (MPFS), and was funded by MSFP to form a basis for the participatory multi-

stakeholder strategy formulation process. SFM is the basic guiding principle both in the FP and the FSS. The latter states: "In order to achieve this goal, the Forestry Sector Strategy will deliver five major outcomes" (FSS 2015); these are listed in Box 3.

Box 3 The 5 Major Outcomes of the Forest Sector Strategy (2015)

1. Forest productivity and sustainable supplies of products and services enhanced
2. Biodiversity, watersheds and ecosystem services improved
3. Livelihoods and forestry sector contribution to national economic development improved
4. Forestry sector organizations and institutions devolved, competitive, accountable and inclusive
5. Climate resilient society and forest ecosystems.

It has been customary in Nepal to use SFM in the meaning of either "sustainable" or "scientific" forest management. At least for this paper, the term "sustainable" is preferred and it is used according to its international definition. Of course, science can provide important principles, and ethical, logical, rational, unbiased and transparent practices. They should be applied in measuring performance when SFM is practiced, in an evidence based manner. Specification of block-wise management scheme, and a planned harvest rotation for a piece of forest land, should not be considered sufficient to make foresters' work "scientific".

The GoN policy has been primarily conservation oriented. This applies to protected areas, their buffer zones and other management regimes, especially to government managed forests, but also to participatory local forest groups. "Dead and fallen trees" are stipulated as those that are preferred for local use, and even after the earthquakes of 2015, the ruling was to allow reconstruction through the use of 4-D trees (dead, dying, diseased and deformed), especially from the well-stocked lowland forests. In addition to the terms "sustainable" and "scientific", also "active" management has been mentioned in connection where harvesting of live trees is prescribed, but these are isolated small scale trials.

The main programmes of the forestry sector over the past two decades was governed by the Master Plan for the Forestry Sector Nepal (MPFS 1988).

The MPFS was written in the spirit of the era: it was very centrally planned, and emphasized the GoN role. However, rational policy and planning, sustainability of the resource base, and local participation were among the sound guiding principles. In retrospect, these can be considered as key aspects for the reasonable success of MPFS, especially in the promotion of community forestry.

A number of efforts, academic and other, have been made in Nepal to create and test criteria and indicators for SFM. Some of these include the following:

i. "Identification of Criteria and Indicators for Sustainable Community Forest Management Management" (Vacik H., Khadka C., Uprety H.D., Wolfslehner B., Paudel G., Pandey G., 2009);
ii. "An Assessment of Sustainability of Community Based Forest Management of Tropical Forest: A case study from buffer zone community forests" (Dhungana, 2010);
iii. "Comparing a top-down and bottom-up approach in the identification of criteria and indicators for sustainable community forest management in Nepal (Vacik H., Khadka C., 2012);
iv. the GoN has also made some effort in selecting and testing criteria and indicators for SFM, "Voluntary National Report to the 11th Session of the United Nations Forum on Forests" (UNFF10, 2014).

It may be risky to generalize too much, but it seems that the sampled scientific literature has found at least partial evidence to indicate that: a) it is meaningful but challenging to create criteria and indicators for SFM and to apply them in Nepalese conditions; and b) on a research and pilot scale, investigations find positive results that support such management regimes as SFM and such delivery modalities as community forestry.

For example, the study by Dhungana (2010) on buffer zone SFM in Chitwan district in the south of Nepal, concluded that the socio-economic aspect is the most important: "the income source plays a vital role for the SFM", and "planning … is relatively participatory and the voice of woman and marginalized people is heard in decision making". Further: "users are adopting the negotiation (win-win) process to resolve conflicts". The forest conditions in

this study were satisfactory, however, indicating more issues in the regeneration of forests than in the growing stock. The operational plan (OP) played an important role, and the monitoring was systematic, and fuelwood and grass collection played a very important role as part of the implementation. Overall, the ecological sustainability was found to be satisfactory.

However, since SFM remains in the initial stages of implementation, there remain challenges that restrict the smooth uptake of SFM in the field:

- the majority of foresters still have a protection-oriented mindset to existing forest resources, rather than a commercial management perception;
- there is limited awareness and few extension programmes for scaling out SFM practices;
- there is a gap between the existing SFM-friendly rules, regulations and policies, with planning and implementation of SFM schemes,
- there is inadequate co-ordination between the stakeholders, and networking systems need significant improvement.

3 THE CURRENT STATE OF NEPAL'S FORESTS

There are at least two main reasons why Nepal's sustainable forest management (SFM) should be looked at in an international context: (i) SFM is increasingly an internationally recognized effort, and comparability is an asset; and (ii) global commodities, including carbon and water, set demands and offer opportunities.

From the nation's point of view, it is important to understand how the forestry sector meets the criteria and indicators of SFM. From the standpoint of programme's within the forest sector, such as the MSFP, it is essential to understand where interventions are most needed, and how these efforts contribute to the three main pillars of SFM: ecological, economic and socio-cultural.

Evidence seems to indicate that the area of the forests of Nepal has been stabilizing in recent years, after many decades of deforestation (FRA 2015). This, however is a rough generalization on national aggregate level only, and does not tell the whole story. When focusing on a local level, or when investigated at the level of biological diversity, sustainability is often in question.

The reasons for deforestation and for the degradation of forests are relatively well known. The drivers are human needs, land-use changes and bad practices, combined with some natural environmental damage in Nepal's often fragile conditions.

The sustainability of the forest resources of Nepal is a function of the above negative impacts, and attempts to rectify the situation, with such approaches as conservation and sustainable forest management. Underlying socio-economic factors are likely to be as important as attempts at rational forest management. Two such major socio-economic drivers are out-migration and the need for cooking fuel.

Already, casual readers and writers have hailed the results from the FRA 2015 as indicating a major increase in Nepal's forests. This is likely to be because of the emphasis on the measurement of the area (of forest cover), disregarding issues in comparability of FRA 2015 results with earlier time periods. It seems that there is some evidence that deforestation (loss of area) has slowed down, and has locally been reversed. However, when looked at in more detail, there is a mixed basket of conclusions, especially when volume degradation is analyzed.

Evidence from the FRA 2015 and the National Forest Inventory (Dept. of Forest Research and Survey, 1999) shows that degradation (loss of biomass) has continued. Comparison of the stem volume of trees between 1999 and 2015 indicates a decrease from an average of 178 m^3 per hectare to 165 m^3 per hectare – which is equivalent to a volume loss of 7.3% during the period (or 0.4% compound annual volume degradation rate). The losses were found to be largest for big trees - the tree category of over 20 cm in diameter had lost 12-14% of tree numbers in 19 years.

The harvesting level of stem wood from Nepal's forests has been at about 3.4 million m3 in the recent past as measured from stumps in the forests (FRA 2015). A large part of this is used as timber and poles, but a part goes to fuelwood as well. The total level of fuelwood consumption in the country is estimated to be in the order of 8-12 million m^3 (cubic metres) – (FRA 2015). Most of the fuelwood is not large size stem wood but is collected as 4-D wood (dead, dying, diseased and deformed trees), as advised by the GoN regulations. In addition, fuelwood comes from private and non-forest lands, from branches, lopping, pole and sapling cutting and includes bamboos and other species, which are not customarily included in stem wood inventory.

The total annual drain of wood from Nepal's forests can be estimated from available data to be in the order of 12 to 14 million m^3. This is less than the biological yield potential of the forests if they were managed under SFM. However, even if the utilization has been in this range, the forests are not capable of regenerating properly.

The underlying volume degradation can be thought of as being driven by several factors. Consumption driven factors, such as collection of fuelwood, fodder, litter, deadwood and a variety of non-timber forest products (NTFP),

certainly play a role in degradation of biomass. From the forest utilization point of view, these are important contributors to the formal and informal livelihoods of rural communities. A partial view on these processes can be obtained by looking into the measurement of frequency and the type of disturbances in the forests.

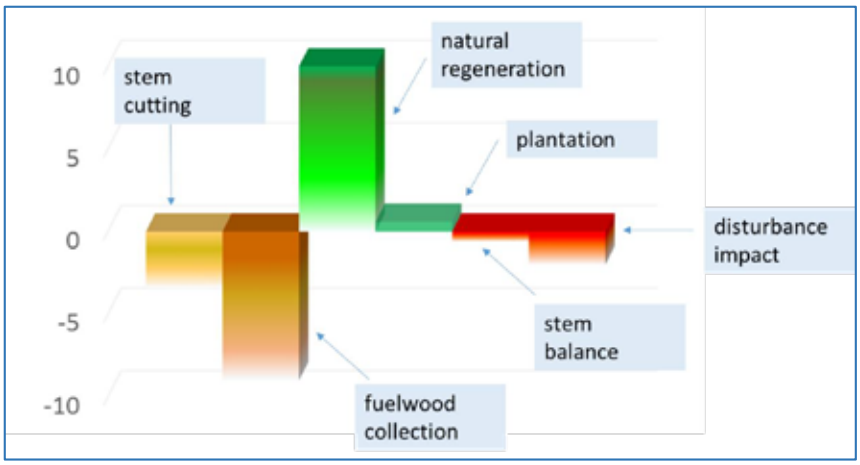
The FRA 2015 concluded that nearly two-thirds of the total forest area in Nepal was affected by grazing. Tree cutting, bush cutting, sapling cutting, lopping and forest fire were also common. Fifteen types of disturbance were identified by trained ecologists. The evidence is quite clear: observation plots each had an average of 3-4 types of disturbance. The risk of having at least one disturbance was 85% in the High Mountains and Himal, and 94% in the Middle Mountains. The FRA 2015 does not give explicit estimates for Chure and Terai, but considering the high occurrence of comparable disturbances, and a high population pressure, it's likely that the disturbance risk is even higher than in mountain regions. It seems safe to tentatively conclude that the disturbance risk is over 90% for the whole of the country's forests on average. It is clear that this identified level of disturbance is one of the drivers of volume degradation and insufficient regeneration and growth of forests.

The lack of sufficient recovery is reflected in the 0.4% compound annual volume degradation rate, which is equivalent to about 4.0 million m^3 of volume loss per year. As a result, there is a continued net loss of an estimated 0.6 million m^3 of stem wood, in addition to the harvesting removals (4.0 - 3.4 = 0.6).

Figure 4 is an approximate summary of the annual wood balance of Nepal. It is mostly based on FRA 2015 information with inputs from REDD+ (2014) and FAO (2014). Multiple actors in the sector are making afforestation and reforestation efforts, but deforestation, and especially degradation of forest canopy and volume seem to be dominant. It should be noted that:

a) the stem wood cutting estimate is based on estimated stem wood removals over 5 years,
b) the net balance of stem wood is based on volume degradation over 15 years,
c) and disturbance and plantation impacts on the wood balance are indicative only.

Figure 4 Approximate annual wood balance in Nepal around 2012



Source: FRA 2015 on stemwood, REDD+ on fuelwood, other proxies by MSFP (in million m³)

Overall, the presented orders of magnitude of component parts seem to be reasonably robust, although the analysis should, of course, be made more rigorous, as this seems to have important implications on sustainability and forest policy.

In conclusion, the forests of Nepal are not sustainably managed at present, and they are not under SFM by its definition, neither by implementation of national policy or strategy, nor by analytical investigation of the ground evidence.

However, there are many positive aspects, as recorded in Box 4.

Box 4 Positive Aspects of the Nepalese Forestry Scenario

1) The forest ecology is very diversified and has a strong regeneration power.
2) The new forest policy and forest sector strategy guide forest practices toward sustainable forest management.
3) Participatory and multi-stakeholder institutions are in place for improved governance.
4) Possibly most importantly, land-use and demographics may be showing reduced pressure.
5) Many incentives of the right kind are in place – for example, the increasing value of carbon sequestration, the increasing value of environmental services, and the increasing value of biological diversity and recreation.

4 IMPLEMENTING THE MULTI STAKEHOLDER FORESTRY PROGRAMME

4.1 The Background to SFM and MSFP

MSFP is only the most recent step in a sequence of efforts to promote SFM in Nepal. The legacy of much earlier work, both by Nepali actors and by international cooperation partners, provided a sufficient basis for moving ahead on the path towards SFM. Much of the evidence base for SFM in Nepal originates from the 1980's and 1990's. Both practical scale implementation of management of natural and plantation forestry, and experiments and smaller scale trials of domestic and exotic species have been tried, tested and reported. Both local research institutions and development projects have been involved in implementing and documenting the results. Some of the evidence has been collected in manuals, such as the Handbook of Afforestation, the MoFSC SFM Guidelines, and the Community Forestry Inventory Guidelines (2014).

The available literature covers such aspects as regeneration trials, plantation trials with exotic species (such as *Eucalyptus camaldulensis*, *Tectona grandis*). These trials are mostly on lowland Terai areas. Some of these have already generated experience of over 50 years. Other documented trials include natural forests, such as hill sal (*Shorea robusta*) or *Schima-Castanopsis*-type natural forests (*Schima wallichii, Castanopsis spp.*). The latter ones are predominantly in hilly regions, and up to the elevations of over 2,000 metres.

Some of these analytical trials include experiments of different treatments, such as thinning with medium or long term rotations, or coppicing for shorter term biomass production. Generally, favorable results have been achieved: a number of feasible alternative treatments have been documented, and made applicable in different ecological and management conditions. Early adopters have emerged both in LFG's and on private lands, where skillful farmers have been able to apply results from trials.

The trials have documented favorable yields of biomass, carbon and wood, in varying conditions and under differing treatment regimes. For example, in a typical middle hill situation in Bhaktapur district at an elevation of 1,700 to 1,800 metres, a *Schima-Castanopsis* natural forest treatment trial (included coppicing) produced a total of 11.1 to 15.7 metric tons of green biomass per hectare per year. The same forest type but on lower altitude (950 to 1,120 metres) produced 13.8 to 16.7 metric tons of green biomass per hectare per year. In the latter, the wood content was 52-60% of the total. The MPFS (1988) referred to a NUKFRP study result of mean annual increment (MAI) of 6.5 tons per hectare in the middle mountains for broadleaved plantations. These two studies would indicate a production equivalent of over 10 m^3 of wood per hectare per year on average.

4.2 The Design of SFM under MSFP

The implementation of MSFP employed a multi-stakeholder approach and institution building on all levels from national to village level. The programme was designed to support the GoN efforts on several levels, and in 4 components to produce four outcomes:

Outcome 1: Government and non-state actors jointly and effectively implementing inclusive forest sector strategies, policies and plans.

Outcome 2: Private sector (farmers, entrepreneurs and financial institutions) increase investment and jobs in the forestry sector.

Outcome 3: Rural communities – especially poor, disadvantaged and climate vulnerable people and households – benefit from local forest management and other investments.

Outcome 4: Forest and trees sustainably managed and monitored by government, communities and private sector and climate resilient.

Of the designed outcomes, outcome 4 is most closely related to SFM in the physical and ecological sense. However, outcomes 2 and 3 are intimately related to the socio-economic sustainability, and provide support to livelihood improvement and equitable and inclusive benefit sharing, as well as creation

of social capital. Outcome 1 has been designed to create a multi-stakeholder structure, both from bottom up and from top down, to enhance and complement the national forest sector governance.

Implementation efforts were concentrated in MSFP's 43 operational districts (23 core districts, and 20 thematic districts). In these districts, MSFP directly supported the GoN forestry structures, with complementary work through non-government organizations, which consisted of 9 main implementing agencies (IAs) and many local service providers.

MSFP field implementation reflected the GoN priorities, and was strongly oriented towards participatory-based delivery at the community level. In reaching the local forestry groups (LFGs) and in promoting SFM, MSFP used a three-tier approach:

a) most, but not all of the districts were selected for promotion of SFM,

b) in these SFM districts, overall support was given to LFG's and the District Forest Offices (DFOs) in the form of institutional support,

c) a mosaic of intensively supported LFG's was selected, in which SFM activities were supported, implemented and financed.

Annex 1 gives a summary presentation of MSFP field delivery by SFM emphasis and delivery channel.

MSFP was designed to follow the MPFS, and to carry forward the legacy of participatory local forest management. The Programme's Theory of Change (TOC) is not explicit – see Annex 2 – however, the designed framework for MSFP was wider than in past and previous projects, and SFM still plays a major role as a guiding principle for the sector's implementation. As described in Annex 2, the role of SFM in MSFP implementation logic and as a pathway to achieving impacts, can be described as follows:

- SFM builds on social capital at community level, and adapts to changes - biophysical, social, cultural, and including migration and inclusion.
- Improvement in subsistence availability and use of fodder, litter and fuelwood.
- Improvement in availability and use of timber.
- Improvement in availability and use of non-wood forest products.

- Improvement in availability and use of ecosystem services.
- Sustainable forest resources.
- Inclusive livelihood development.
- Climate compatible development.

SFM is a unifying principle, tying together all the MSFP actions in forest land. All the legal modalities of forest management have their respective specific regulations and guidelines for management to guide them to SFM principles and practical implementation. Interventions supported by MSFP include the recently updated Inventory Guidelines for Community Forestry, a major effort to guarantee evidence-based sustainable practices.

One of the specific legacies handed on to MSFP is participatory community forestry. This was clearly indicated in the programme document, and MSFP's TOC reflects the pathway to impact, and the MSFP yearly plans of operation reflect the delivery modality. The impacts from MSFP initiatives run primarily through the local forestry groups (LFGs). The key aspects of promotion of SFM through LFG's have been the following:

- promotion of multi-stakeholder policy development which enhances the role of participatory local forest management - this includes the forest sector strategy (FSS) and the LFG guidelines, in the preparations of which, MSFP was actively involved;
- sustainable management for the conservation of biodiversity, to maintain an ecological balance along with increasing the regular supply of forest products;
- promotion of a range of participatory tenure arrangements and delivery mechanisms, especially community, collaborative and other LFG based forestry;
- the formation of LFG's and handing over of GoN land to be governed and managed by LFG's - this includes constitutions and operational plans (OPs);
- preparation of management plans and efficient implementation with improved coordination and collaboration among stakeholders;
- capacity building of institutions, including the LFGs, civil society implementing agencies and the Department of Forests (DoF);
- promotion of inclusive governance and sustainable management practices

by LFG's, including the quality of OP's and women's participation in decision making processes;

- promoting the creation of social capital within communities, especially for women and the socially excluded - this includes employment and livelihood creation;
- equitable distribution of benefits among collaborators to assist in alleviation of poverty and encourage social inclusion;
- assurance of active participation of all users, both peripheral and distant (in relation to CFM), in the management of the forest and to ensure convenient supply of forest products.

Figure 5 illustrates the spatial distribution of MSFP operations, and indicates the types of activities and implementation channels; further details are recorded in Annex 1.

Figure 6 illustrates the estimated pressures against the sustainability of the forest resource base in the MSFP operational area. The estimate is equivalent to one decade of deforestation, as based on the latest estimated deforestation rates per district.

Figure 7 illustrates the tenure arrangements on an aggregate level in the MSFP operational areas. The illustration is by MSFP Cluster, and can be roughly compared to the forest degradation pressure as illustrated in Figure 1 and indicated in Figure 4. The tenure situation is a cumulative response to over 20 years of handing over GoN forest land to community management groups and the establishment of LFG's. MSFP has during its operation had some, but rather limited, impact on the local or overall level of LFG formation or saturation. Considering the population pressure and degradation risk, it may be that the districts, forests and households of MSFP Cluster 2 would still remain the high priorities for future efforts.

Figure 5 MSFP working districts, implementing partners, channels and activities

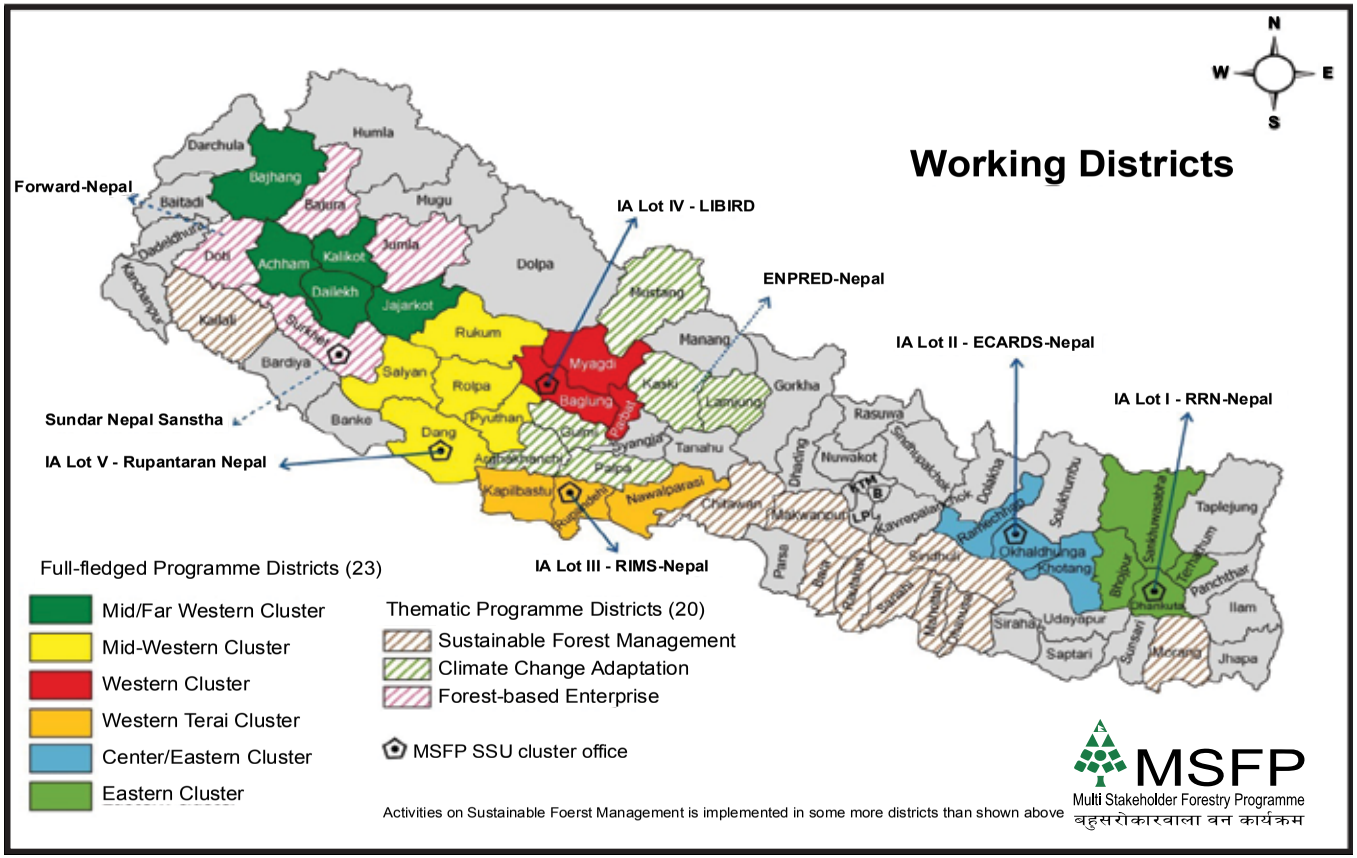
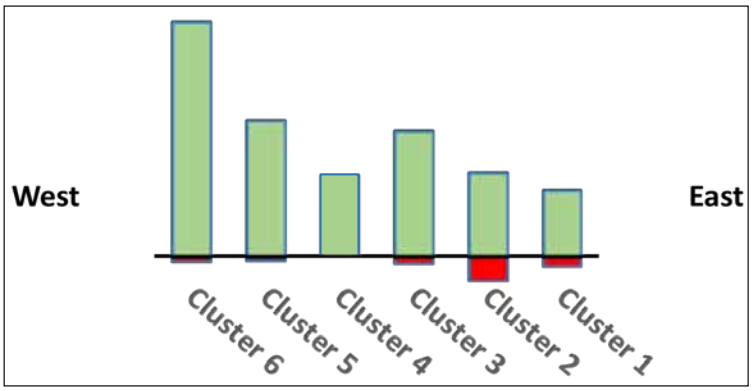
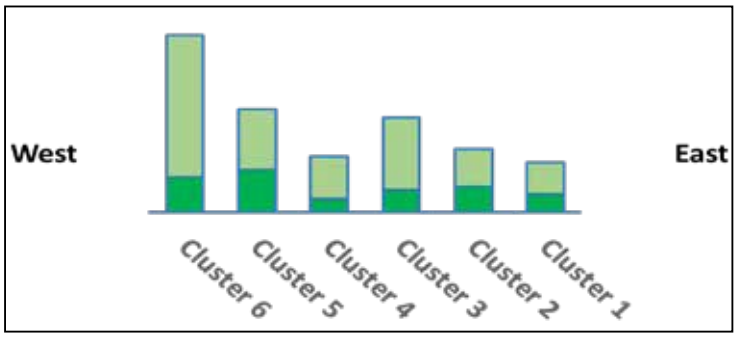


Figure 6 Pressure on forest resources in the MSFP areas by cluster



Note: sources are the MSFP baseline and the FRA 2015, see the text on definitions;
Legend: green = forest area; red = pressure on resources)

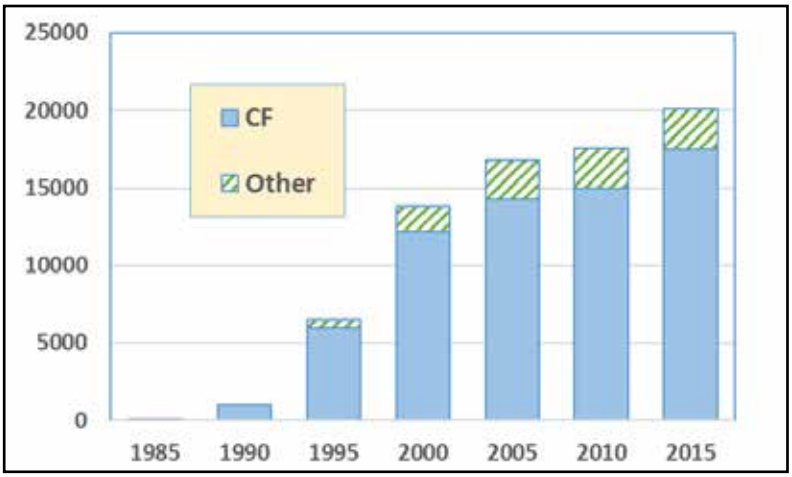
Figure 7 Forest area and allocation to communities in MSFP area by Cluster



Sources: FRA 2015 on forest area, DoF (2014) and MSFP on LFGs areas;
legend : light green = forest area in Cluster; dark green = total LFG area

Figure 8 illustrates the estimated growth in the number of LFG's in Nepal over the last 30 years. The estimate is based on a critical review on any literature references found, as well as on a review of the LFG databases (including those by DoF, FECOFUN, MSFP and ERI). As the available information is not up-to-date, and the status and functionality of the LFG's is often questionable, a warning on over-interpretation must be given here. Also, it is known that a large portion of the OP's have not been adequately revised, although MSFP and its implementing partners, both NGO and GoN, have actively supported the updating process in the operational districts.

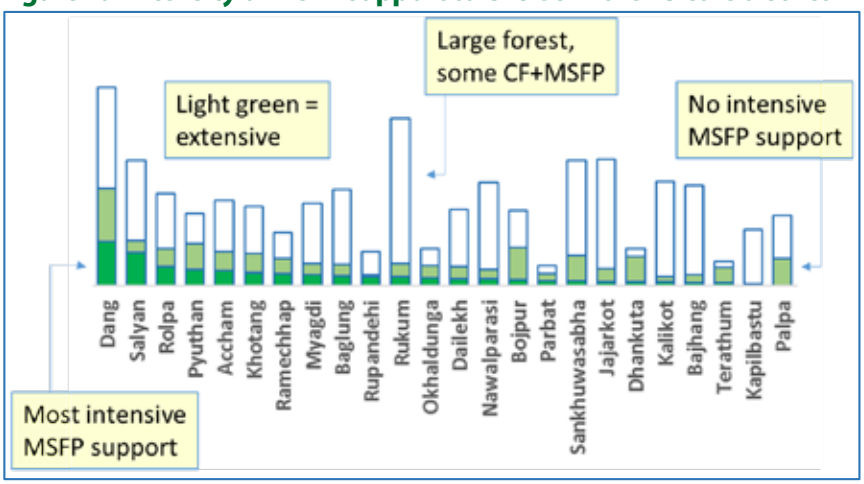
Figure 8 Estimated number of LFG's in Nepal from 1985 to 2015



Note: estimates for this document and illustrative purpose only.

Figure 9 illustrates the intensity of SFM efforts by MSFP provided to the LFG's. The analysis covers the 23 core districts, where MSFP has been an active SFM promoter for the longest period of time. It is relevant to bear in mind the following as background: MSFP carries the legacy of SFM which it has inherited from past activities - including the MPFS by GoN, the Livelihoods and Forestry Programme (LFP) by DFID, and the Nepal-Swiss Community Forestry Project (NSCFP).

Figure 9 Intensity of MSFP support to CFUG's in the 23 core district



The histogram of Figure 9 illustrates which portion of the total number of community forestry user groups have been supported by MSFP. The highest intensities are in Rupandehi, Kapilbastu and Salyan districts. This is understandable as these core districts have a low total number of CFUG's. Some of the districts with mid-range intensities (40-50%) are former DFID and SDC districts, but many are new to LFG's. One can conclude that even in traditional areas, saturation has not been reached, and there is scope for further interventions (both in existing LFG's, and in the formation of new ones, i.e. handing over of GoN managed forests to communities). The policy of GoN strongly supports the expansion of LFG's.

4.3 Implementation of SFM in MSFP

Most of the implementation of SFM was carried out through LFG's in the multi-stakeholder framework. From the point of view of SFM, the key activities were the following:

- formation of LFGs,
- handing over of forest land to LFGs,
- engagement of households, especially the marginalized and poor,
- preparation of operational plans (OPs) for LFGs,
- revision of OPs with additional emphasis on social inclusion, SFM and climate change,
- intensive facilitation of implementation of OPs for the most in need,
- seedling production for planting,
- afforestation and reforestation,
- introducing SFM in regeneration areas.

As successful SFM cannot be carried out without solving the issues of climate change mitigation and adaptation, complementary planning and implementation was included:

- preparation of climate change adaptation plans,
- facilitating implementation of climate adaptation,
- provision of services and grants to households to reduce vulnerability.

Early in the Programme, it was understood that the economic and socio-cultural aspects of SFM were at least as important as the ecological ones in MSFP implementation. The key activities included in this regard were:

- quick impact support to poorest households (the livelihood promotion programme),
- creation of employment in SFM related work (the private sector programme),
- forest product value chain identification and facilitation,
- facilitation of forest-based enterprise start-ups,
- strengthening the capacities of forest entrepreneurs and enterprises.

4.4 MSFP Outputs, Results and Emerging Impacts in SFM

The objectives of MSFP were formulated in a logframe, which included detailed indicators, implementable activities, and an elaborate M&E framework for the assessment of performance. Altogether, the programme supported 23 core districts, 729,036 ha of forest land which are being managed by 10,834 local forestry groups (LFG) - this is the total number of extensively and intensively supported LFGs (cf. Figure 9). Table 1 summarizes the main achievements of MSFP in key SFM related activities; the reported figures are total cumulative numbers for the period of 2012 to 2016.

MSFP's achievement levels related to SFM vary by different key activity. As indicated by traffic lights in Table 1, there seems to be two area, where it is likely that the targets set in the beginning of the programme, will likely not be reached including introduction of SFM in afforested or reforested areas (indicated in red). This is not a surprising result as those regeneration locations are scattered and not necessarily under intensive management.

Of the remaining key activities, seven have already reached the targets ahead of time (indicated in green), another four are on track or progressing (indicated in yellow).

Some of the key results, most directly related to SFM, include the following.

1) Continuing the legacy of the participatory approach and expansion of community-based forest governance, MSFP supported the formation of 807 new LFGs, comprising over 80,000 additional households with new management responsibilities and user rights in over 60,000 ha of forest

Table 1 MSFP Achievement, key SFM related activities (cumulative 2012-2016)

Key SFM related activity	Target	Achieved	Traffic light
Formation of LFG's	400	807	
Handing over of forest land to LFG's (hectares)	40,000	61,983	
Engaging of households, especially marginalized and poor	40,000	83,227	
Preparation of operational plans (OP) for LFG's	400	807	
Revision of OP's for inclusion, SFM and climate change	5,700	2,914	
Intensive facilitation of implementation of OP's	5,000	4,025	
Seedlings planted	25,000,000	22,973,523	
Afforestation and reforestation (hectares)	2,200	8,810	
Introducing SFM on regenerated areas	240,000	12,948	
Preparation of climate change adaptation plans	6,000	2,529	
Facilitating implementation of climate adaptation	-	1,960	
Households receiving services to reduce vulnerability	229,000	239,617	
Quick impact support to poorest households	105,000	79,468	

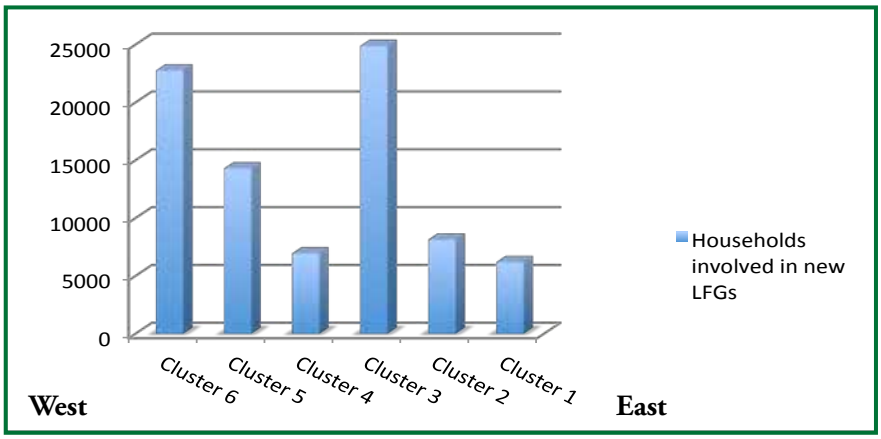
Source: M&E of MSFP; handing over and afforestation are in hectares, others are in numbers.

land (see Figure 10). For improved SFM, over 3,000 LFG OPs have been created or revised. Over 4,000 LFG's have received intensive support in the implementation of their OP's. In addition, around 2,500 climate change adaptation plans have been prepared and their implementation facilitated.

2) In terms of improved governance and inclusion in the LFGs, the representation of the disadvantaged in the Executive Committees (ECs) has improved. Around 74% LFGs have at least 33% women in the ECs. During the 4 years of programme implementation, in MSFP-supported LFGs, the representation in key decision posts has increased from 27% to 38% for women, from 51% to 85% for the Janajati and Dalit. Altogether, MSFP has delivered livelihood support to 289,617 households (offering benefits to over 1,100,000 people). Of these households, 32% were women-led households and 53% belonged to disadvantaged groups.

3) Reforestation and afforestation: through the plantation of 22.9 million trees, a start has been made on reforesting the most severely degraded forest areas, waste lands, river banks, encroached land and road corridors. The survival rate for the plantations carried out in 2013-2014 was estimated to be at 62%, and some sporadic evidence shows that survival rate has remained at least above 50%. In terms of area, 8,810 hectares of forest has been regenerated through planting. A much wider area is characterized by improved regeneration, as some of the disturbances such as fire and grazing, have been better controlled.

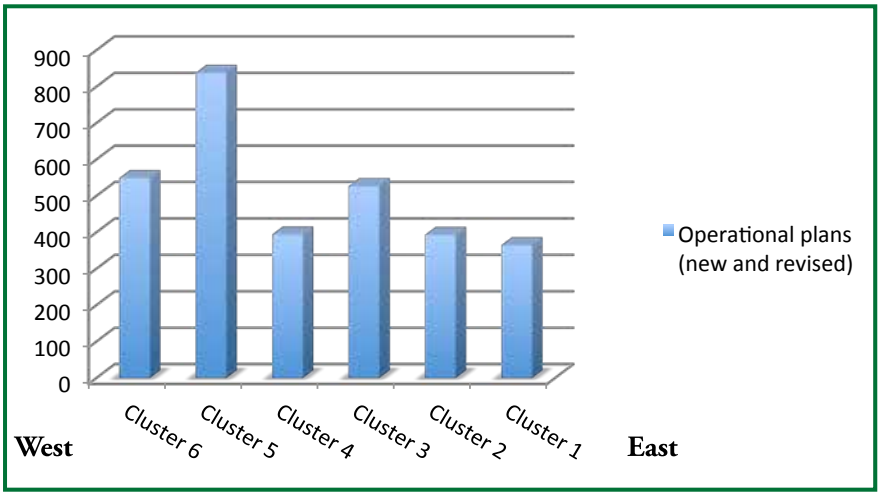
Figure 10 Households involved in new LFG's by MSFP (cumulative 2012-2016)



Source: M&E of MSFP. Note: over 90,000 new hh's in total (this key target has been met)

Figure 11 illustrates MSFP's achievements in one of the activities, where the set targets have not been fully reached: creation and updating of the OPs of the LFGs. It is interesting to note that the performance varies widely between Clusters. The highest performer has been Cluster 5, where already almost half of the forest area is under the management of LFGs, and it has the highest LFG area in absolute terms (see Figure 7). This is probably due to a "snowball" effect, and learning by doing, as almost 50% of the forest area has been handed over to LFGs. This can be compared with Figure 3, which indicates a very high involvement rate of households in Cluster 5 – one reason for which maybe that some of the households are members of several LFGs.

Figure 11 Operational plans, new and revised by MSFP (cumulative 2012-2016)



In terms of field delivery, the Programme was designed to "use both hands" - (i) through the GoN structure, the conventional and sustainable public professional service; (ii) and through civil society organizations acting as implementing agencies, the IAs. One can cautiously conclude that the variation in the delivery of the LFP OPs crucially depends on the capacity, priorities and incentives of both GoN and civil society implementers, and of course on local conditions, and the quality of the human resources.

5 CASE STUDIES FROM MSFP

The following case studies illustrate many of the aspects of SFM discussed above, and reveal the emerging impacts of SFM

A Case Study of Tilaurakot Collaborative Forest, Kapilvastu District

The Tilaurakot Collaborative Forest is located in the Terai, in Kapilvastu district and was handed over to the community as a community-public partnership in 2011. The local community managing the forest constitutes 22,622 hhs, belonging to 23 VDCs; they manage the forest according to a 10 year Operational Plan which has been approved by the DoF. Of the total population involved in the management, 49% are women, and 15,000 are defined as distant users who live far away from the forest area.

Forest Resource and Biodiversity

The forest extends over an area of 6,612.60 hectares of forest land, which comprises natural forest of Sal (*Shorea robusta*) and Asna (*Termanalia tomentosa*) as dominant species, in association with Bijayasal (*Pterocarpus marsupium*), Satisal (*Dalbergia latifolia*), Khair (*Acacia catechu*), Simal (*Bombax ceiba*), Teak (*Tectona grandis*), Banjhi (*Anogeissus latifolia*). Some NTFPs also occur - such as Sarpa ganda (*Ravoulfia serpentina*), Sikakai (*Acacia conicinna*), Chiraita (*Swertia chirayita*) and Pipla (*Piper longum*). The forest also provides a habitat for wild fauna like Chital (*Axis axis*) and Pigmy hug (*Sus salvanius*), many bird and a few reptile species.

According to the DFO of Kapilvastu, before handing over the forest to the local community the forest condition was very poor due to over-grazing, and illegal collection of poles, timber and other NTFPs.

The Sustainable Forest Management Process

After the people from the southern Terai repeatedly raised their voice demanding that traditional user rights and access to forest resources was enshrined in forest law, the concept of Collaborative Forest Management (CFM) evolved to address the needs and sentiments of distant users who were previously excluded and deprived of benefits from community forest because of distance. Another reason for creating the CFM modality, was to provide technical support to the communities from the DFO and DDC as these areas of terai forest are large, often badly degraded and it was generally not possible for small communities to tackle the high degradation rates through community forestry models.

The CFM Directive in 2003 defined collaborative forest as a sustainable forest management system for attaining livelihood and economic development and other benefits through a forest management plan jointly approved by both the GoN and the stakeholders. The CFM practice involves close co-ordination between the central government (MoFSC) through its district officials, local government (the VDCs and the DDC) and the close and distant users.

Results of SFM at Tilaurakot CFM

After the handing over of the forest to the local community forest as a collaborative forest, and after agreement on the operational plan, Tilaurakot CFMG, with the help of MSFP began the implementation of SFM practices on 25 ha of land. During the planning, the DFO officials had assisted the stakeholders in dividing the entire forest into compartments and sub-compartments, and then blocks of equal size. This has contributed to increasing the productivity of the forest in terms of timber and fuelwood yield, the opening of the canopy for promoting regeneration (see photos 1 and 2), and advancing the growth of young sapling and poles.

Additionally, through regular patrolling, illegal harvesting and grazing has been significantly reduced, and incidence of forest fire controlled; regeneration on barren and degraded land has also much improved. An 80 km fire line surrounding the compartments and sub-compartments has been constructed in order to reduce the risk of forest fire. The fire line was also used as a forest road which assists in forest patrolling and reducing the risk of illegal collection

of forest products. Such activities have promoted gradual improvement in the condition of the forest.

Photo 1: Regeneration before CFM

Photo 2: Regeneration after 4 years of SFM practice

Source: the District Forest Office, Kapalvastu

The Protective and Productive Function of the Forest

The SFM practices at Tilaurakot CFMC have significantly contributed to improving the health of the forest ecosystem, has increased growing stocks, and enhanced the provision of forest products and services to the stakeholders (see Figure 13). Biodiversity has also been enhanced with an increase in some species of wild flora including Bijayasal *(Pterocarpus marsupium)*, Satisal *(Dalbergia latifolia)*, Sarpa ganda *(Ravoulfia serpentina).*

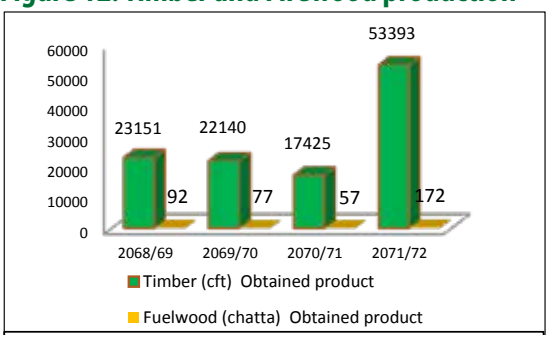
The available data shows that regeneration per hectare for different species has increased markedly – for example the number of regenerated Sal saplings was 800 per hectare in 2012, whereas after the introduction of SFM on the 25 ha., it has risen to 6,934 in 2016. Regeneration of other tree species also increased significantly during the same period.

In addition, the CFMG members declared an area of 76.5 ha, covering 25m either side of rivulets, and 10m either side of the East-West highway as soil conservation zones, and planted bamboo and teak in the degraded forest areas and on the riverbanks.

Socio-economic Benefits

The sustainable management of this forest has also contributed to socioeconomic aspects of the CFMG through generating economic returns and improving livelihoods – see Figure 12, which compares production over the last 4 years for both timber and fuelwood.

Figure 12: Timber and Firewood production



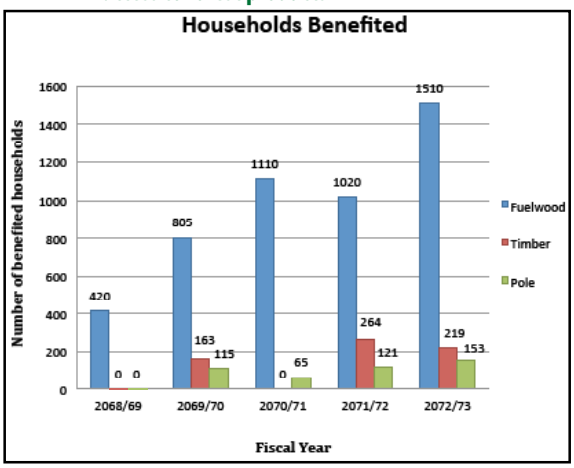
Source: DFO, Kapilvastu

In the same way, the SFM modality has generated improved employment opportunities, and strengthened good governance, coordination and collaboration among and between members and other concerned stakeholders.

Fifteen local people now work as forest watchers on a long term employment contract; in total, they receive an annual salary of NRs 1,834,125

In addition, unskilled labourers are employed for about 15,246 person days, equivalent to NRs 5,107,410 per annum. One technician and one accountant are also working as permanent employees of the CFMG, earning a combined total NRs 352,800.

Figure 13 Increased no. of forest users with access to forest products



Source, DFO, Kapilvastu

A total of NRs 4.27 million was spent for all operations during the last 5 years, during which period revenue totaled NRs 10.71 million (data from DFO, Kapilvastu).

Under the agreed CFM regulations, the benefits of forest management are equally distributed (50:50) to both the community and the GoN-DFO.

In conclusion, the SFM initiative at the Tilaurakot Collaborative Forest has resulted in improved forest management, coordination between stakeholders, forest production, biodiversity, employment opportunities, access to forestry products, and the local economy. The initiative has also balanced the interests and needs of all the stakeholders, through the establishment of platforms for consultation and negotiation, at community, group, village and district level. This multi-stakeholder approach has been successful in efficient planning and effective implementation, and in creating trust, transparency and harmony, especially in the handling of funds and the forest resources.

(Case prepared by Dhananjaya Jayasawal, Cluster Programme Coordinator, Butwal Cluster, MSFP)

Sustainable Forest Management in the Sallaghari Community Forest in Ramechhap District

Background and Forest Resources

Sallaghari Community Forest (CF) situated in Manthali Municipality, was first handed over to the community in 1994. It comprises an area of 92.95 ha, and is managed by 124 hhs, of which 9 are identified as very poor, 54 as poor, 53 as medium, and 8 as well-off hhs. The CFUG has an executive committee of 11 members, of which five are women.

▲ *The Sallaghari Community Forest, Ramechhap*

The Sallaghari CF is dominated by natural pine forest, most of the trees of which are 70 years old, with an average crown cover of 65%, and a growing stock of 120 m3/ha. Although SFM is less discussed and practiced in the mid-hills, in 2014 the Sallaghari CFUG prepared a SFM operational plan, which is now under implementation.

Ecosystem Health and Planning for Improvement

The CF is utilized mainly for fuelwood and timber for fulfilling local demand. However, the over-matured forest had not been adding to total growth and there was nominal regeneration. In addition to regular thinning and pruning, the user group had been planting trees, aiming to both increase regeneration and the number of pole sized trees according to their original operational plan. However, the undercover was not increasing as expected due to the dense crown cover, and in addition, the long dry winter period increased the risk of forest fires, which posed a further threat to the ecosystem of the CF.

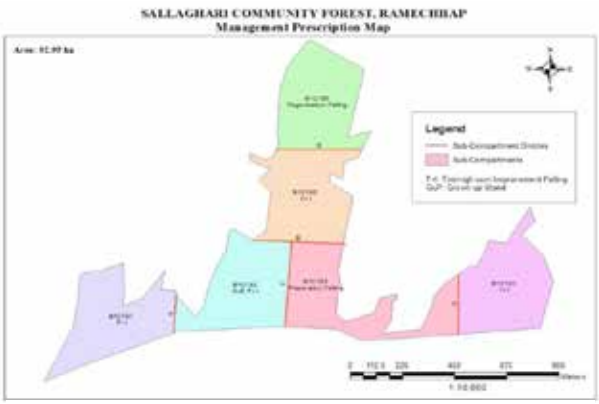
Perceiving the limited improvement in the forest condition, the CFUG had a discussion with the DFO in Ramechhap, regarding potential options for improving forest quality and maximizing benefits. It was eventually agreed that they would introduce SFM in the CF, a) to improve the forest, production and benefits, and b) to provide a demonstration of SFM in the mid-hills. The DFO agreed to provide technical and financial support through MSFP for the preparation of the SFM operational plan and the subsequent implementation.

▲ *Orientation to users on the SFM operational plan in Sallaghari CFUG*

The Forest Management Effort

The SFM plan for the Sallaghari CF has been prepared and approved for 10 years, unlike other CF OPs, which are generally for five years. The new SFM OP is focused on timber production and natural regeneration, and the total forest area is now considered as a single compartment with a crop cycle of 60 years; it has been divided into six sub-compartments and 10 working sites in each sub-compartment with 19 years as the regeneration cycle – see Figure 14.

Figure 14: Management prescription map of Sallaghari CFUG



The new OP applies the uniform shelter wood system for the CF, leaving about 16 good quality trees per ha as mother trees for seed production.

Expectations on Benefits

According to the OP, at least 62 trees will be harvested annually from each working site which will provide at least 3,387 cft timber and 5.65 chatta of fuel wood. Considering the current market price, it is expected that the CFUG will sell the timber for about NRs 1.08 million annually with the internal rate of return of 42.5%.

▲ *Orientation to users on tree marking for harvesting*

In order to add value, the CFUG also plans to sell sawn timber in the market, with the option of establishing their own sawmill and furniture enterprise in the near future to further maximize benefits.

The SFM OP has a clear provision with regard to benefit sharing among the users. In line with CF development guidelines, the CFUG will re-invest at least 25% of the income into forest development, and 35% on activities targeted for livelihood improvement of poor households. The remainder will be invested on activities as decided by the General Assembly of the CFUG, with a focus on generating local employment opportunities.

(Case prepared by Dipak Bishwokarma, Cluster Programme Coordinator, Okhaldhunga Cluster, MSFP)

6 MEASURING THE SUSTAINABILITY OF NEPAL'S FORESTS

For the purpose of this working paper, the European set of SFM criteria and indicators are tested, on the basis of MSFP being a co-operative effort between Nepal and three European donors. There are six criteria – see Box 5 - and 34 indicators, which are detailed in Annex 2 of this paper.

Box 5 The Six Criteria for Measuring SFM – Forest Europe

C1. Maintenance and Appropriate Enhancement of Forest Resources and their Contribution to Global Carbon Cycles.
C2. Maintenance of Forest Ecosystem Health and Vitality.
C3. Maintenance and Encouragement of Productive Functions of Forests (Wood and Non-Wood).
C4. Maintenance, Conservation and Appropriate Enhancement of Biological Diversity in Forest Ecosystems.
C5. Maintenance and Appropriate Enhancement of Protective Functions in Forest Management (notably soil and water).
C6. Maintenance of other socio-economic functions and conditions.

The above criteria and related indicators are used later in this working paper to assess the sustainability of forest management in Nepal's conditions. Some can be measured quite accurately and based on up-to-date information, others have to be subjectively and tentatively judged. The criteria and indicators are here applied at: (i) national level, (ii) MSFP level, and (iii) case study level.

6.1 Criterion 1: Maintenance and Appropriate Enhancement of Forest Resources and their Contribution to Global Carbon Cycles

Forest area: Nepal has recently carried out a modern and thorough Forest Resource Assessment (FRA 2015). The good news is that the total forest area seems to have stopped decreasing in the past two decades; the estimated forest area has now reached 44% of the land area when shrub lands are included. However, this result should be taken very cautiously, as it depends on the classification and methodology used in the measurements. In the 44% area are included forests with just 5%-10% density, measured by tree canopy cover.

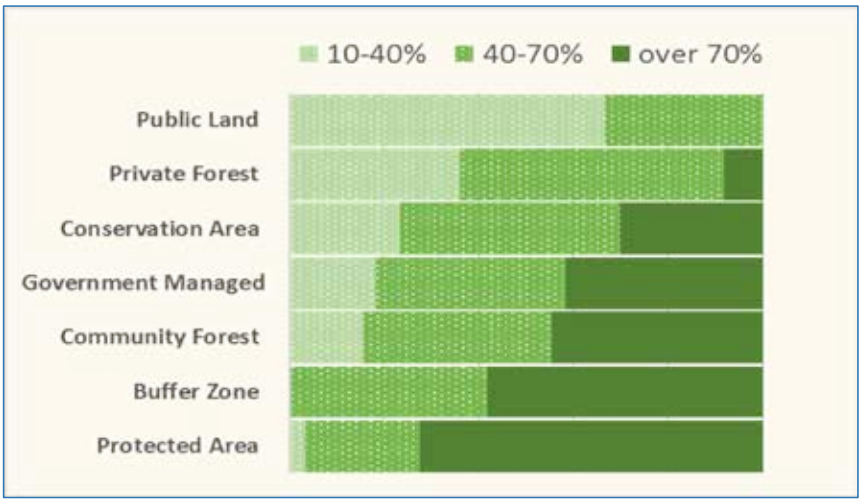
Nevertheless, the implication is that something must have gone right in terms of conditions. It is not quite clear how much the policies or underlying land-use shifts have been contributing respectively, but it is likely both have made some contribution.

Forest density: Figure 15 illustrates the density of Nepal's forests as measured by canopy cover. For practical classification purposes, here 70% canopy cover (equivalent of less than 30% of openings in tree crown cover) is considered fully dense. Rather well, and quite remarkably, the management regimes have been capable of doing what they were expected. Thus, protected areas, including the buffer zones, have maintained a rather dense forest cover.

As the public land areas of forest has the least dense canopy cover, it is encouraging to note that there are concerted efforts now being made to regularize the ownership and management of these significant areas.

Community forests and GoN-managed forests also have a reasonable tree crown cover, both approximately 40%, with 40% of the areas in the higher density classes. This ex post analysis does not, as such, suggest that a radical improvement can be achieved by handing over GoN managed forest to LFGs, and the results depend on the histories of the handed over areas. The promotion of LFGs should be made on other grounds, especially on the potential for benefit sharing and longer-term sustainability.

Figure 15 Density of Nepal's Forests by Management Regime



Source: FRA 2015. Nationwide estimates through measurement of tree canopy cover.

Growing Stock: according to the FRA 2015, the total growing stock of Nepal's forests was estimated at 982 million m^3. This is equivalent to an average of 165 m^3 per hectare. It is important to observe that the degradation of forests still seems to be an important dynamic in Nepal's forests, as the estimate of growing stock was 178 m^3 per hectare a couple of decades ago. This implies that average volume degradation is at 0.4% compound annual rate.

Age structure and diameter distribution: with the degradation of forests, and prevailing use practices, openings are commonly introduced in the canopy of Nepal's predominantly old forests. There is evidence that the growing conditions and biological regeneration potential are generally quite high - especially if such disturbances as grazing are controlled. As the end result, the diameter distribution has changed – significantly, the diameter class of 10-20 centimetres has increased; and simultaneously, the average number of trees (over 10 cm) per hectare has increased from 408 to 430, in the last two decades.

Forest carbon: Nepal has been active and progressive in initializing the national REDD+ programme. According to the FRA 2015, the total carbon stock of forests of Nepal was estimated at 1,157 million metric tons in the year 2012 - in the forests proper this is equivalent to 177 metric tons per hectare.

The lowland area of the Terai had 138 metric tons of carbon per hectare on average, while the High Mountains and High Himal had 268 metric tons per hectare on average. This is especially interesting from the carbon sequestration point of view. The REDD+ effort has been planned to concentrate on the Terai region in the south, and should there increase the carbon from present levels. The second implication is that the high carbon contents of mountain areas should be simultaneously at least maintained - this is one motive for high conservation efforts in the mountains. The implication of observed volume degradation is of fundamental importance to the carbon sequestration effort. The baseline negative trend offers opportunities for decreasing the degradation, exactly the objective of REDD+ - and consequently, an opportunity for performance-based and evidence-based financial compensation.

6.2 Criterion 2: Maintenance of Forest Ecosystem Health and Vitality

Disturbances: forest disturbances have a very high relevance from the point of view of the sustainability of Nepal's forests. A disturbance is defined as a temporary change in average environmental conditions that cause a pronounced change in an ecosystem. The type and intensity of disturbances affecting the growth of vegetation in sample plots were recorded and analyzed at the national level by the FRA 2015. Disturbances were classified by the following categories:

- landslide: signs of landslide and/or flooding observed;
- grazing: presence of hoofmarks and dung of animals, broken tops of seedlings and saplings, signs of trampling, disturbed forest litter;
- lopping: cutting of the side branches of trees for fodder;
- leaf litter collection: collection of dead leaves on the forest floor;
- bush cutting: signs of cutting of shrubs, bushes and seedlings;
- forest fire: signs of forest fire observed caused by natural and human activities;
- encroachment: encroachment in forest for cultivation and plantation;
- resin tapping: tapped trees, ordinarily pines, were identified by cuts made in the boles of trees to enable resin to ooze out;
- cutting of saplings and poles up to 30 cm diameter at breast height;
- tree cutting: cutting of trees over 30 cm diameter at breast height;
- insect attack: plant leaves with signs of insect attacks (e.g. holes, nests, etc.);
- plant parasites: presence of parasitic plants in trees;
- plant disease: disease caused mainly by fungi (e.g. black rot) or bacteria (e.g. rotting). If a tree was rotting due to resin-tapping, the disturbance was recorded as resin-tapping, not as a plant disease;
- wind, storm, hail: signs of trees broken and erosion on forest floor caused by wind, storm, hail;
- other human-induced disturbances: disturbances by humans other than those described above (e.g. removing the bark from the base of a tree, snaring, foot trails, forest roads, etc.).

Of the above listed disturbances, it was found that the most important ones at a country level in Nepal in the order of damage done were: (i) grazing, (ii) tree cutting, (iii) sapling and pole cutting, (iv) forest fires, and (v) lopping.

Disturbances differed in terms of the geographic eco-system.

High Mountains and Himal: in 15% of the forests in this zone, there was no impact, in 37% minor impact, in 34% medium impact, and in 14% there were considered to be major disturbances. Disturbances caused by humans were much more frequent than natural disturbances - grazing (62%) and tree-cutting (35%) were the most commonly reported disturbances in these forest zones, and most disturbances were found in Cupressus forests (Himalayan Cypress), the least in Cedrus forests.

Middle Mountains: about 94% of the sample plots were found to be affected by disturbances in this zone: no impact in 6%, minor impact in 42%, medium impact in 34%, and major impacts in 18%. Grazing (63%), sapling and pole stage tree-cutting (42%), tree-cutting (37%) and lopping (36%) were the most common disturbances. One of the most interesting findings was that the community forests had lower levels of disturbances caused by humans than the GoN managed forests.

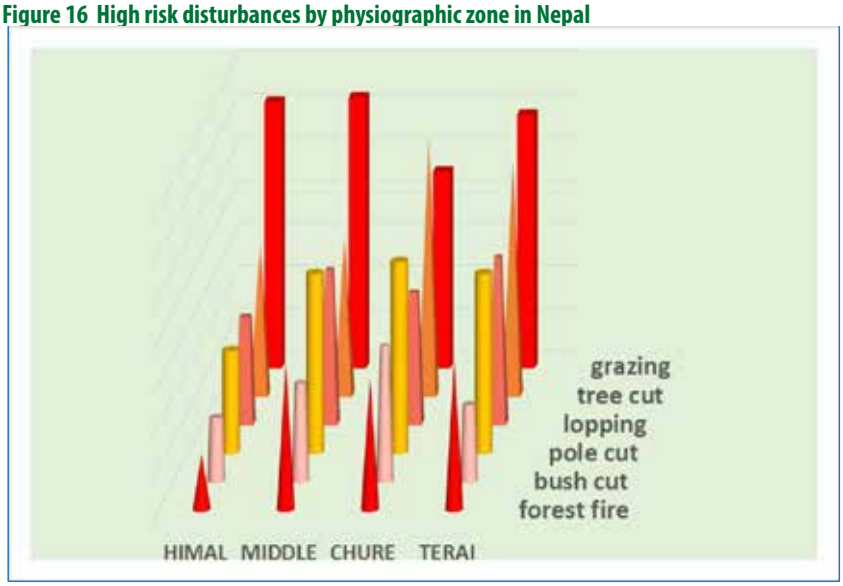
Chure: the results on management modality and disturbances were somewhat surprising for the Chure zone. Buffer zones had the highest cutting disturbance of trees, saplings, poles and bushes, as well as litter collection. Community forests had the same kind of disturbances but at a lesser intensity. In addition, grazing was quite high. Grazing was also the dominant disturbance in the GoN managed forests. The core protected areas were well protected, perhaps also because of their relative remoteness. On average, 3.8 categories of disturbance were found in the test plots. Landslides were a major source of natural disturbance in the Chure, unlike in the Terai - but changes in river alignment, a major cause of disturbance in the Terai, was absent in the Chure area.

Terai: the FRA 2015 found that the Terai forests were highly disturbed by grazing, tree, sapling and pole cutting, and forest fires. Collaborative forests had high rates of grazing, lopping and tree and bush cutting. The community

forests investigated also had a wide range of semi-intensive disturbances, including grazing and cutting of trees, poles and saplings. Buffer zone disturbances were quite low, probably due to their remote locations. Core protected forests had high disturbance rates from wildlife grazing and forest fires.

Risk of disturbances: Figure 16 summarizes the risk of the highest disturbance risk factors in the forests of Nepal. Grazing risk, measured as a likelihood, is highest, as almost two thirds of Nepal's forest are impacted. Several other risks are also high – tree and pole cutting, and lopping.

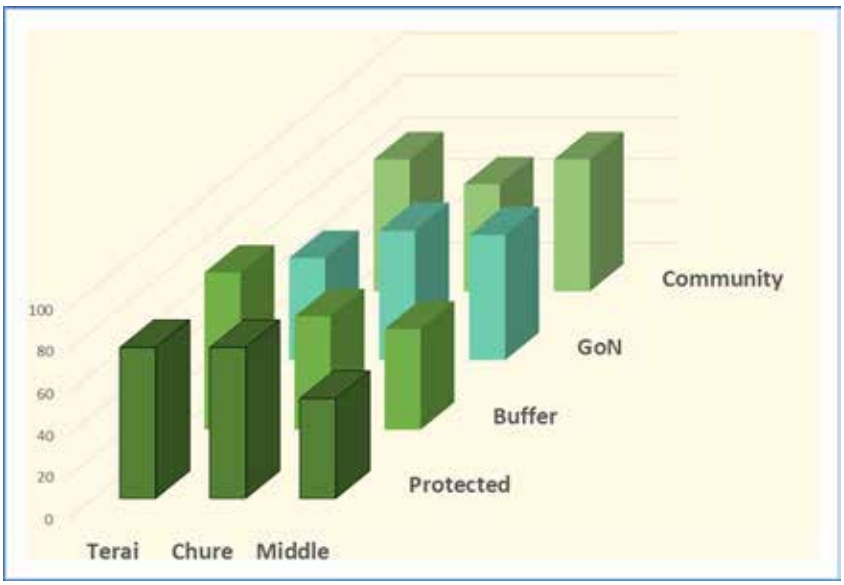
Figure 16 High risk disturbances by physiographic zone in Nepal



Source: FRA 2015. Likelihood of six dominant disturbance risks.

Figure 17 illustrates the effectiveness of different management regimes in minimizing the risk of forest disturbance. The measure used is the average of avoided risks for each modality and physiographic zone. Six main disturbances were selected and the calculation was based on data from the FRA 2015. The main disturbances identified were: (i) grazing, (ii) tree cutting, (iii) lopping, (iv) cutting of poles and saplings, (v) bush cutting, and (vi) fire. The measure of likelihood of each was their occurrence on respective sample plots of the FRA 2015.

Figure 17 Effectiveness of management regime against disturbances



Source: FRA 2015. Based on the risk of six main disturbances, see text for further information.

Forest land degradation: the largest single recent factor on forest land degradation in Nepal was the sequence of earthquakes in 2015. Estimates of the damaged areas varies from the high of 23,376 ha (FAO) and low of 2,807 ha (Department of Soil Conservation and Watershed Management, DSCWM) - even the larger estimate was only about 0.2% of the land area, but this is not to say that the damage was insignificant. However, the earthquakes can be seen to have exacerbated the natural trend of movements of typically steep slopes and unstable soils. The impact on SFM is relatively small. The damage done to the infrastructure, of course, does have an additional negative effect, as does the pressure caused by the quick need of reconstruction material.

6.3 Criterion 3: Maintenance and Encouragement of Productive Functions of Forests (wood and non-wood)

Stem wood (round wood in Forestry Europe terminology): the removal of wood from Nepal's forests has been recently measured by the FRA 2015. The method included the measurement of stumps on sample plots over a period of five years (2008-2012). The estimated total annual removal of stem

wood from Nepal's forests was estimated at 3.4 million m^3, but the number of harvested trees was not available for the Terai. The estimated average harvested tree size for the other physiographic zones was 0.16 m^3. If trees harvested from the Terai were of the same average size, the total number of removed trees from Nepal's forests can be estimated at over 20 million annually. Table 2 gives the estimates of harvesting by zone.

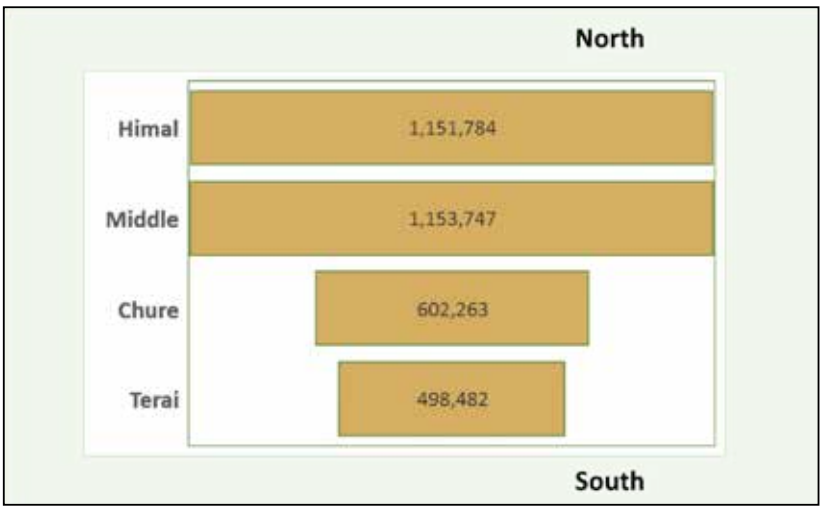
Table 2 Estimated annual stem wood harvest from Nepal's forests by zone

Zone	No. of trees	m^3	Avg. tree, m^3
Terai	3,117,718	498,482	0.16
Chure	4,433,531	602,263	0.14
Middle	10,941,444	1,153,747	0.11
Himal	2,811,607	1,151,784	0.41
Total	21,304,300	3,406,276	0.16

Source: FRA 2015, 5-year average. Terai tree size and number are estimates by MSFP.

The estimated volumes of wood harvesting (m^3 per year) are illustrated by Figure 18. The mountainous areas (Middle Mountains, High Mountains and Himal) cover over two thirds of Nepal's forest area. The harvesting volumes of these two zones are also over two thirds of the national stem wood volume.

Figure 18 Estimated annual stem wood harvest from Nepal's forests by zone (m^3)



Source: FRA 2015, 5 year average in m^3. Harvest for Terai is an estimate by MSFP.

Several conclusions can be reached on the stem wood harvest from Nepal's forests: one is that the average size of harvested tree is very small (0.16 m3 = 160 liters). This well reflects the typical kind of uses to which wood is put, and the available harvesting technique as well.

The information on forest growth in Nepal is scarce, and the published data of the FRA 2015 also does not include this information. Some indirect observations can, however, be made. Firstly, the estimated average harvesting rates by physiographic zone indicate rather low levels of removals (highest removals in the Terai zone at 0.71% per year, lowest in the High Mountains and Himal at 0.25% per year). This likely reflects the differences in biological growth potential, and the intensity of harvesting, among other factors.

There are a number of studies, varying in the level of analytical effort, which shed some light on the production potential of Nepal's forests. The MPFS (1989) referred to a NUKFRP study result of mean annual increment (MAI) of 6.5 tons per hectare in the Middle Mountains for broadleaved plantations. Eucalypt and pine plantations are known to produce much higher yields in favorable conditions. Table 3 summarizes the MPFS 1989 estimates of sustainable wood yields (in tons per hectare), by physiographic zone.

Table 3 Estimated annual wood yields from Nepal's forests by zone (Mt/ha)

[tons per ha]	Low	high	Average
Terai	5.1	7.0	6.3
Chure	3.4	4.9	4.2
Middle	2.0	2.7	2.4
Himal	1.6	3.6	2.4

Source: MPFS (1988). Natural forests, overbark.

The numbers in Table 3 are estimates - they indicate the yield potential of forest land if put under SFM. We already know that this cannot be done quickly in the conditions of Nepal (both logistics and politics act as constraints), and it would take time anywhere. From the sustainability point of view this means that present harvesting levels are only a small portion of sustainable yield levels; based on Table 2, only 17% of the potential yield is harvested in the Terai, 28% for the High Mountains and Himal zones, with the other

physiographic zones in between. These estimates have been made with proper conversions between biomass tons and wood cubic metres.

ANSAB (2014), in a study commissioned by MSFP, estimates that at least 9.5 million m^3 of timber can be produced from Nepal's forests, nearly three times the estimate of the current harvest (Table 2). It is one of several sources giving speculative estimates of the long term supply potential, but the report does not make the basis of the estimation explicit. FAO (2009) in the Forestry Outlook Study for Nepal estimates a total potential at 21.7 million m^3, of which 8.3 million was considered to come from "potential production forests".

Non-wood goods: according to ANSAB (DoF 2013), the traded volume of non-timber forest products (NTFPs) was about 11,680 tons in 2012. MSFP has been active in identifying and promoting a number of NTFP's. In many cases this has been in the form of enterprise promotion, often in the context of LFG. In a number of cases, the effort has included the ecological aspect, such as domestication of medicinal herbs (such as Chiraito), and in other cases, MSFP support has been given in the form of promoting and strengthening the value chain of the NTFP.

The typical uses of NTFP's include the following:

- fodder
- animal bedding
- construction material (other than wood)
- religious plants
- support for climbers
- fiber
- insecticides and herbicides
- beverage
- fumitory, masticator
- soap/cosmetics
- legumes or pulses
- biofuel.
- medicinal plants
- fruit and nuts
- utensils, handicrafts
- veterinary medicine
- vegetables
- spices, condiments, flavorings
- seeds
- ornamentals
- drying/tanning
- vegetable oils and fats
- starches and cellulose

According to the FRA 2015, in the Terai, 370 species of flora and fauna and avifauna were found to be used to produce NTFPs. Altogether, out of the total of 164 tree species in the Terai, 128 species were used to produce NTFP's. Furthermore, 54 species of shrubs and 84 species of herbs, 9 species of ferns,

30 species of climbers were used in the Terai for NTFP's. The most common medicines were *Phyllanthus emblica, Terminalia chebula, Aegle marmelos,* and *Piper longum. Ficus benghalensis,* and *Ficus religiosa* have a religious use. *Syzygium cumini* is used for its fruit, and *Bauhinia vahlii* for its fibre. *Mallotus philippensis* is used to support climbing vegetables, and Shorea robusta for leaf plates and cups as well as for resin and seed oil, agricultural implements and a number of other purposes.

In the Chure, 666 species of flora are used as NTFPs, and of the 281 tree species recorded, 240 species were used for producing NTFP's. In addition, 144 species of shrubs, 187 species of herbs, 22 species of ferns, 3 species of epiphytes and 70 species of climbers, are also used as a basis for NTFPs. A total of 305 species of NTFPs were used for medicinal purposes in the Chure zone.

In the Middle Mountains, 868 species of flora are used as NTFPs, and of the 326 tree species recorded, 283 were used for producing NTFPs. A total of 435 species were used for medicinal purposes, from 190 species of shrubs and 291 species of herbs.

In the High Mountains and Himal, 755 species of flora were used as NTFPs, and of the 275 tree species recorded, 227 species were used for producing NTFPs. In addition, 78 animal species were used for NTFPs.

6.4 Criterion 4: Maintenance, Conservation and Appropriate Enhancement of Biological Diversity in Forest Ecosystems

Genetic resources, and diversity of tree species: the forests of Nepal have a very high diversity of tree species. The country's forest ecosystems can be categorized into 10 major groups: (i) tropical, (ii) subtropical broad-leaved, (iii) subtropical conifer, (iv) lower temperate broad-leaved, (v) lower temperate mixed broad-leaved, (vi) upper temperate broadleaved, (vii) upper temperate mixed broadleaved, (viii) temperate coniferous, (ix) subalpine, and (x) alpine scrub. These ecosystems are of international importance both in view of the number of globally threatened wildlife and floral elements as well as the diversity of ecosystems represented within these areas (ICIMOD and MOEST, 2007).

Nepal has a high level of biological diversity. There are 5,160 species of flowering plants, 1,120 species of non-flowering plants (696 of which are tree species), 635 species of butterflies, 185 species of freshwater fish, 43 species of amphibians, 100 species of reptiles, 844 species of birds, 181 species of mammals (FRA 2015). Most of the habitats are in the forests.

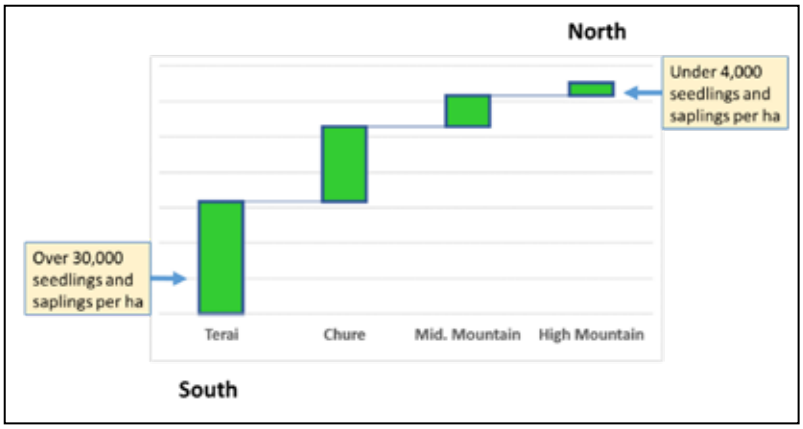
As the FRA 2015 has established 2,544 permanent sample plots, the monitoring of biological diversity becomes feasible. The FRA 2015 observed 443 tree species, belonging to 99 families, although in a one off measurement, it is difficult to judge the dynamics of diversity. The number of tree species, which were identified by the FRA 2015 by zone, were as follows:

- Terai 164
- Chure 281
- Middle Mountains 326
- High Mountains and Himal 275.

The FRA 2015 found indications that the species composition has been changing rather markedly in the last couple of decades. For example, the volumes of *Shorea robusta,* T*erminalia alata* and *Abies spp*. show a decreasing trend, at least when measured by stem volume. On the other hand, *Quercus spp*., *Rhododendron spp., Pinus wallichiana* and *Schima wallichii* show an increasing volume trend.

Regeneration: Figure 19 illustrates the regeneration capacity of Nepal's forest by physiographic zone. Regeneration potential has been found to be reasonably good, on average. The FRA 2015 found that there are over 11,000 small trees (over 10,000 little seedlings and over 1,000 larger saplings) per hectare on average. Thus, if the distribution would be even, there would hardly be any problem in terms of regrowth. However, the distribution is quite skewed, depending both on ecological conditions, such as altitude, and the occurrence of disturbances, such as grazing.

Figure 19 Regeneration status by physiographic zone in Nepal's forests



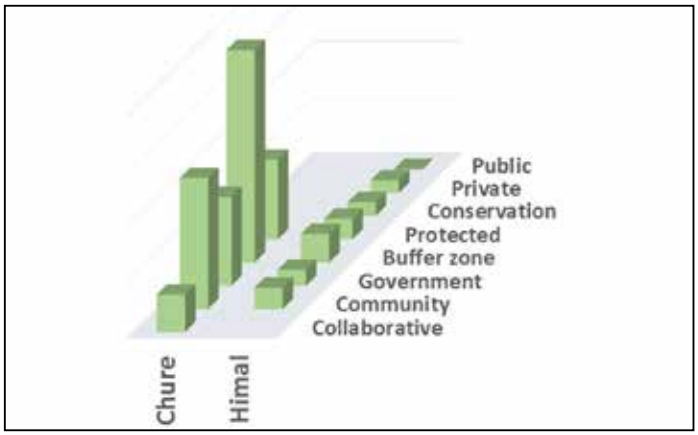
Source: FRA 2015. Average frequency of future generation trees per area.

Figure 20 illustrates the performance of different forest management regimes in taking care of the regeneration status of the forests. This summary data was readily available from FRA 2015 for two zones only, the Chure and the High Mountains and Himal. It can be observed that most of the management regimes, which are geared to take care of the resource by protection or management, are capable of doing so, at least moderately well.

In the more favorable ecological conditions of Chure, all modalities, on average, are able to support reasonable regeneration status. However, one should of course read these results with care. Collaborative forest management seems to be performing less well, but the management regime has been created in conditions of high land-use pressures (such as grazing from below) and Sal forests, where dense tree crown above does not favor regeneration.

Naturalness and introduced species: introduced tree species have been used in forest plantations, especially some decades back. However, larger scale and single species plantations are rarely favored by LFG's. The species selection by LFG households usually favors local multiple use species. However, there are cases and purposes when some small scale exotic plantations are preferred, for example Eucalytus spp. as poles for construction.

Figure 20 Regeneration status by management regime in Chure and High Mountain areas



Source: FRA 2015. Indicator = number of seedlings and saplings per hectare

In the Terai, out of 70 shrub species, three species (*Agave cantala, Chromolaena odorata* and *Ocimum gratissimum*) are considered invasive. In Chure, of the total of 193 shrub species, three (*Lantana camara, Ipomoea carnea,* and *Cassia occidentalis*) are considered invasive. In the Middle Mountains, several invasive shrub species were identified by FRA 2015: the main invasive species are - *Lantana camara, Clerodendrum canescens, Duranta repens, Eriobotrya dubia, Ficus subincisa, Hypecoum parviflorum, Premna interrupta* and *Rubus alexeterius*. The invasive species posing the highest threat are considered as *Chromolaena odorata, Ageratina adenophora* and *Eichhornia crassipes;* while *Ageratum conyzoides, Argemone mexicana, Hyptis suaveolens* and *Leersia hexandra* are in the low threat category.

Deadwood: for all of the areas, the measured volume of deadwood seems very low. This can be partly explained by the policy and practice of not harvesting a live tree but instead following old 4-D practices, the promotion of collecting dead, dying, diseased and deformed wood. The finding has an implication both on the carbon sequestration (low carbon in the form of deadwood) and on biodiversity, as many parts of the ecosystem are dependent on species living on deadwood, including fungi and insects, which again feed higher nutrition cycles and diversity. This finding should put the present management practices, and possibly guidelines as well, in question. A similar need of updating the best management practices and guidelines has been commonly found in many other countries, which usually have no such 4-D deadwood collection practices.

Forest fragmentation: according to the FRA 2015, the average size of forest patches, outside protected and buffer zones, in the Middle Mountains was 59 ha, as against 45 ha in the High Mountains. However, in the whole of the country, the distribution of contiguous forest fragment sizes is very skewed - and in the mountainous conditions, even the definition of continuous cover is often a difficult concept.

Threatened forest species: many species of animals and plants are threatened. For example, among the 208 known species of wild mammals, nine are critically endangered, 25 endangered, 14 vulnerable, and seven near threatened. 18 species of trees found in the mountains are also reportedly threatened.

Many of the threatened species of flora and fauna are wetland dependent. A number of species, including 9 plants, 55 mammals, 64 reptiles and amphibians, 149 birds, and 21 fish are included in the IUCN Red List.

In addition, 15 species of plants, 52 mammals, 108 birds and 19 reptiles and 3 insects have been listed in the CITES Appendices.

The number of critically endangered, endangered, and near threatened species significantly increased between 2004 and 2010. Birds that rely on wetlands and inhabit the tropical and subtropical and lower temperate zones are particularly at risk. An estimated 56% of Nepal's nationally threatened birds inhabit the forests, and over a quarter in the wetlands. Most of these threatened species occur at elevations of below 1,000 metres (BCN and DNPWC, 2011).

Protected forests: of the total area of forests in Nepal, 1.03 million hectares (17.3%) fall in protected areas (see Table 4), and the remaining 4.93 million ha (82.68%) outside. Protected areas are divided into (i) core, 0.79 million ha, and (ii) buffer zone, 0.24 million ha. Figure 21 illustrates the distribution of forests by protection status and physiographic zone. Buffer zone management regulations have been introduced and are being implemented.

Table 4 Protected areas of Nepal (hectares)

National Parks	Area
Chitwan	93,200
Sagarmatha	114,800
Langtang	171,000

National Parks	Area
Rara	10,600
Khaptad	22,500
Shey Phoksundo	355,500
Bardiya	96,800
Makalu Barun	150,000
Shivapuri Nagarjun	15,900
Banke	55,000
Wildlife Reserves	
Koshi Tappu	17,500
Parsa	49,900
Sukla Pantha	30,500
Hunting Reserve	
Dhorpatan	132,500
Conservation Areas	
Annapurna	762,900
Kanchenjunga	203,500
Makalu-Barun	150,000
Ramsar sites	
Beeshazar	320,000
Ghodaghodi	256,300
Jagdishpur	22,500

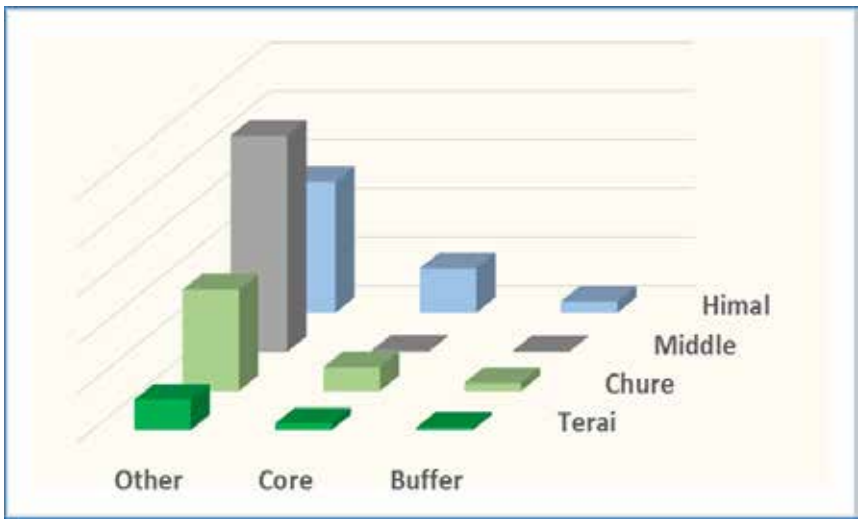
As can be observed in Figure 21, the Middle Mountains are under-represented in terms of protection, compared to other physiographic zones; as a result, this zone should require special emphasis in terms of future protection. Indeed, some actors, notably WWF, Hariyo ban and USAID, have put emphasis on protected north-south corridors; one such example is the Chitwan-Annapurna Landscape.

According to the FRA 2015, 69 species of tree and plant were important according to their international as well as national conservation and trade status. Of these, three species *(Aster peduncularis subsp. Nepalensis, Himalayacalamus fimbriatus, H. porcatus, Homalium nepalense, Hypericum cordifoliumand Ruta cordata)* are endemic. Seven species: *Cinnamomum glaucescens, Dalbergia*

latifolia, Juglans regia, Nardostachys grandiflora, Taxus wallichiana, Valeriana jatamansi and Shorea robusta are legally protected under the Forest Regulations of 1995 (amended in 2001).

Two species, *Dalbergia latifolia* and *Cycas pectinata* are classified as vulnerable on the IUCN Red List (IUCN 2013). Plants with high medicinal value and those medicinal plants prioritized for research and development (MPRD) or for agro-technology development (MPAD) by the Department of Plant Resources, have also been classified. Forty-four species are included in the appendix II of CITES (DPR 2014), among them 39 belonging to the *Orchidaceae* family.

Figure 21 Nepal's forests by protection status and physiographic zone



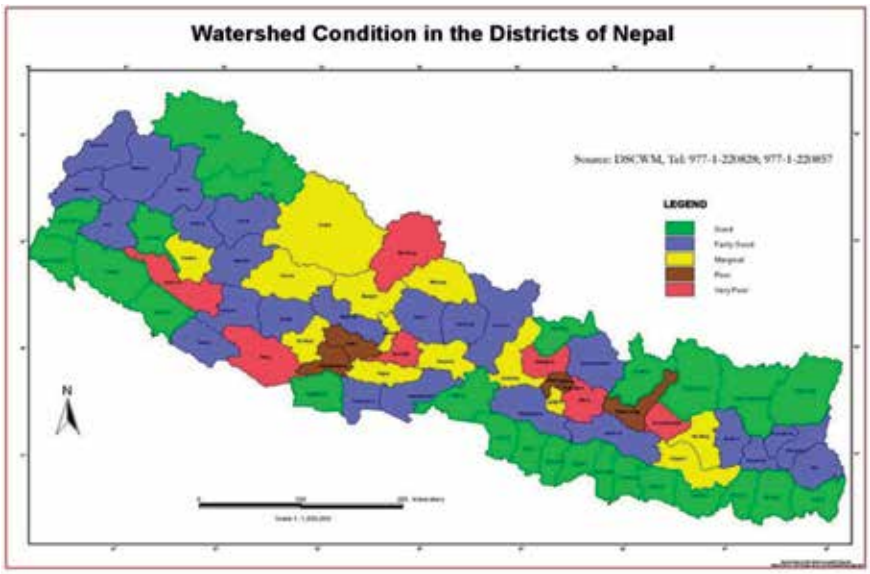
6.5 Criterion 5: Maintenance and Appropriate Enhancement of Protective Functions in Forest Management (notably soil and water)

Protective forests – soil, water and other ecosystem functions - infrastructure and managed natural resources: the Himalayan region and its water resources play an important role for biodiversity, agriculture and hydropower, serving more than 1.3 billion people in the downstream basin areas of ten large Asian rivers that originate in the mountains. Environmental services provided by the natural resources are the basis for a substantial part of the region's total economy and have an importance far beyond the region.

The combined effect of geologically unstable, steep and rugged mountain topography and intense monsoon rainfall make the country prone to high soil erosion rates. Cultivation of marginal hill slopes to meet the demands of an increasing population further aggravates the naturally high soil erosion rate. Deforestation and degradation due to grazing and other disturbances (eg. earthquakes), and poorly maintained marginal lands contribute to the degradation of the watersheds.

Figure 22 illustrates the average conditions of Nepal's major watersheds. The ones indicated by red and brown color are the ones in the poorest condition. The MSFP operational area covered many of the most challenging conditions. These include Okhaldhunga and Ramechhap in Cluster 2, Mustang in Cluster 4, Dang in Cluster 5, and Surkhet in Cluster 6.

Figure 22 Nepal's Main Watersheds



Source: DSCWM, MoFSC

Both agriculture and forestry are challenged by watershed degradation in general and soil erosion in particular. Intensive monsoon rainfall causes heavy soil erosion in the mountains. It has been reported that Nepal loses 240 million tons of fertile topsoil annually as soil erosion. This has strong implications on such forestry operations as tree planting, and of course on harvesting.

Soil conservation and watershed management activities are being carried out according to the principles of integrated watershed management. The Department of Soil Conservation and Watershed Management (DSCWM) was to some extent actively involved in MSFP. The primary viewing angle is to conserve soil and water resources, but successful interventions indicate that integrated rural development and a landscape approach are needed for optimal results.

6.6 Criterion 6: Maintenance of other socio-economic functions and conditions

Contribution of forest sector to GDP: MSFP financed a thorough study on the forest sector's contribution on Gross Domestic Product (GDP). This was a fundamental contribution as no estimation in the Standard National Accounts (SNA) framework had been done specifically for the forest sector previously. The end result of the study indicates a contribution of 2.2% of total GDP. The low estimate comes from the fact that only activities inside the forest borders were assessed. Earlier studies, international comparison, and analysis of Value Added (VA) of single products or processes, all indicate that a clearly bigger portion of forest based VA is created in processing and trading outside the forest itself. Before this is properly researched, we may assume with low risk, that this is at least 5% of GDP.

In addition, though, the potential value of environmental services, which are presently not included in GDP calculations, was estimated at 17.3%, additional to the present GDP. However, this is not included in the present SNA framework.

Government revenue: the annual rent capture of the GoN from the forest sector seems to have fluctuated around NRs 500 million during the last decade. On the positive side, this should not be a major disincentive for VA creation from forest resources; on the negative side, the sector seems to be in net loss from the public economy point of view, at least if the donor's annual funding of the sector is not included.

Wood consumption and wood based energy: the FAO (2009) estimated that 78% of Nepal's energy consumption was from fuelwood. They also estimated that the sustainable fuelwood production could be 2.1 tonnes per

hectare per year. REDD+ project of Nepal estimated that the total current fuel wood demand for Nepal is about 10.5 million tons per year. This dominates the total wood consumption of Nepal - compare this with the approximate annual wood balance, as presented in Figure 4.

Recreation in forests: Nepal's tourist statistics show that almost a half of tourists visiting Nepal trek in the protected areas (PAs), generating considerable economic opportunities in rural areas and contributing to poverty alleviation objectives of the GoN. Tourism creates business for skilled human resources and investors, and employment for both skilled and unskilled labor. This also generates the majority of the revenue of the PAs, and in Nepal, an estimated 50% of the PA revenue is ploughed back to the local community for biodiversity conservation, livelihood improvement and sustainable development.

In conclusion, the forest resources of Nepal are extremely rich, but are under-utilized, and have huge currently un-tapped potential for enhanced production through sustainable forest management, and for creating employment to alleviate rural poverty.

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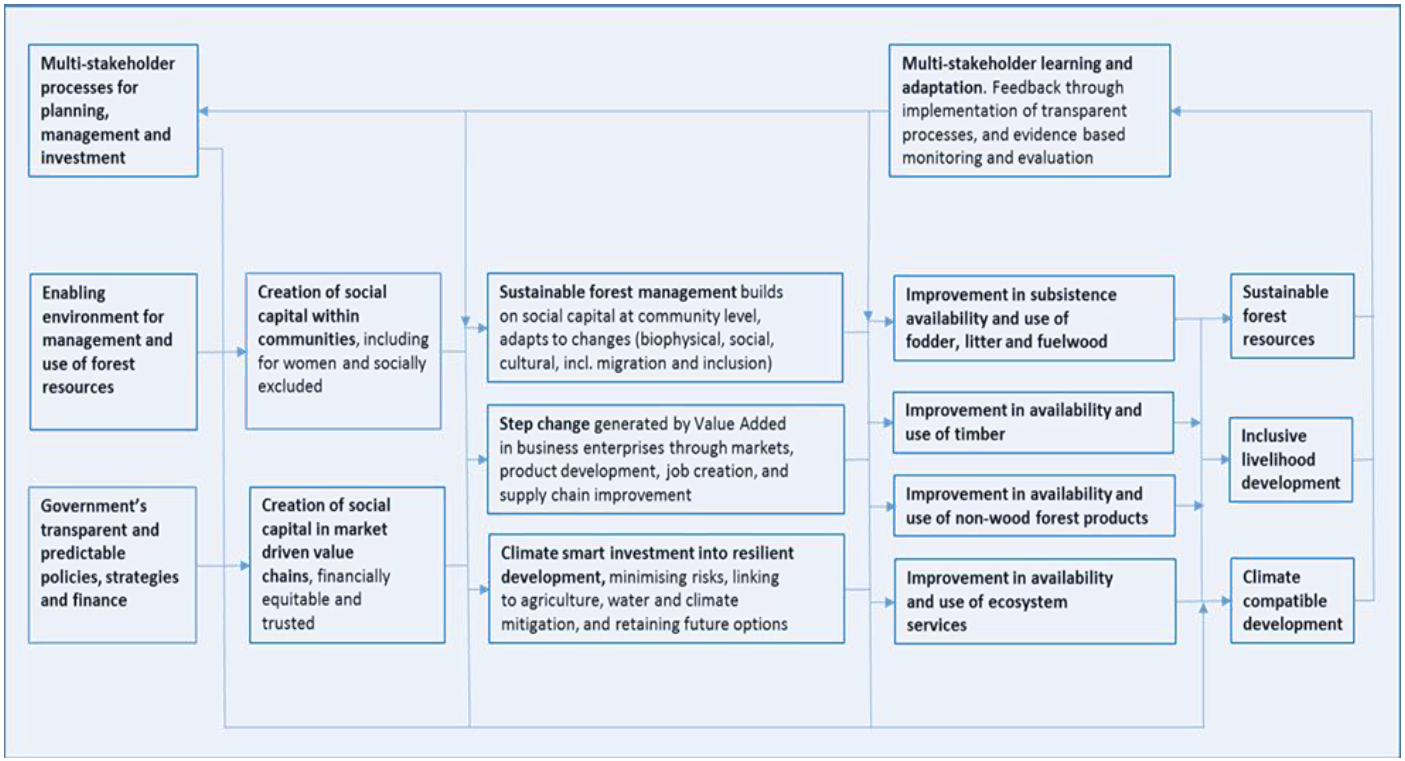
ANNEXES

Annex 1 MSFP implementation by district and channel, including SFM

	District	Cluster		Coverage/Theme	Channel
1	Dhankuta	1	Eastern	Full-fledged, includes SFM	RRN and DFO
2	Bhojpur	1	Eastern	Full-fledged, includes SFM	RRN and DFO
3	Terhatum	1	Eastern	Full-fledged, includes SFM	RRN and DFO
4	Sankhuvasabha	1	Eastern	Full-fledged, includes SFM	RRN and DFO
5	Morang	1	Eastern	SFM	DFO
6	Okhaldhunga	2	Center/Eastern	Full-fledged, includes SFM	ECARDS and DFO
7	Khotang	2	Center/Eastern	Full-fledged, includes SFM	ECARDS and DFO
8	Ramechhap	2	Center/Eastern	Full-fledged, includes SFM	ECARDS and DFO
9	Dhanusa	2	Center/Eastern	SFM	DFO
10	Mahottari	2	Center/Eastern	SFM	DFO
11	Sarlahi	2	Center/Eastern	SFM	DFO
12	Sindhuli	2	Center/Eastern	SFM	DFO
13	Rupandehi	3	Western Terai	Full-fledged, includes SFM	RIMS, DFO and DSCO
14	Kapilbastu	3	Western Terai	Full-fledged, includes SFM	RIMS, DFO and DSCO
15	Nawalparasi	3	Western Terai	Full-fledged, includes SFM	RIMS, DFO and DSCO
16	Palpa	3	Western Terai	Climate Change Adaptation, and SFM	ENPRED and DFO
17	Rautahat	3	Western Terai	SFM	DFO
18	Bara	3	Western Terai	SFM	DFO
19	Makwanpur	3	Western Terai	SFM	DFO
20	Chitwan	3	Western Terai	SFM	DFO
21	Baglung	4	Western	Full-fledged, includes SFM	LIBIRD and DFO
22	Parbat	4	Western	Full-fledged, includes SFM	LIBIRD and DFO
23	Myagdi	4	Western	Full-fledged, includes SFM	LIBIRD and DFO

	District	Cluster		Coverage/Theme	Channel
24	Mustang	4	Western	Climate Change Adaptation	ENPRED and DSCO
25	Kaski	4	Western	Climate Change Adaptation	ENPRED and DFO
26	Lamjung	4	Western	Climate Change Adaptation	ENPRED and DFO
27	Dang	5	Mid Western	Full-fledged, includes SFM	Rupantaran and DFO
28	Salyan	5	Mid Western	Full-fledged, includes SFM	Rupantaran and DFO
29	Rukum	5	Mid Western	Full-fledged, includes SFM	Rupantaran and DFO
30	Rolpa	5	Mid Western	Full-fledged, includes SFM	Rupantaran and DFO
31	Pyuthan	5	Mid Western	Full-fledged, includes SFM	Rupantaran and DFO
32	Arghakhanchi	5	Mid Western	Climate Change Adaptation / SFM	ENPRED and DFO
33	Gulmi	5	Mid Western	Climate Change Adaptation / SFM	ENPRED and DFO
34	Bajhang	6	Mid/Far Western	Full-fledged, includes SFM	IDS and DFO
35	Achham	6	Mid/Far Western	Full-fledged, includes SFM	IDS and DFO
36	Kalikot	6	Mid/Far Western	Full-fledged, includes SFM	IDS and DFO
37	Dailekh	6	Mid/Far Western	Full-fledged, includes SFM	IDS and DFO
38	Jajarkot	6	Mid/Far Western	Full-fledged, includes SFM	IDS and DFO
39	Surkhet	6	Mid/Far Western	Forest Based Enterprise / SFM	Sundar Nepal and DFO
40	Jumla	6	Mid/Far Western	Forest Based Enterprise / SFM	Sundar Nepal and DFO
41	Bajura	6	Mid/Far Western	Forest Based Enterprise / SFM	Forward Nepal and DFO
42	Doti	6	Mid/Far Western	Forest Based Enterprise / SFM	Forward Nepal and DFO
43	Kailali	6	Mid/Far Western	SFM	DFO

Annex 2 Theory of Change of MSFP



Note. As described by the Donor Focal Point (the author) of MSFP

Annex 3 Criteria and Indicators for SFM (Forest Europe)

Criterion 1: Maintenance and Appropriate Enhancement of Forest Resources and their Contribution to Global Carbon Cycles	
Indicator	***Description***
Policies, institutions and instruments to maintain and appropriately enhance forest resources and their contribution to global carbon cycles	
1.1 Forest area	Area of forest and other wooded land, classified by forest type and by availability for wood supply, and share of forest and other wooded land in total land area.
1.2 Growing Stock	Growing stock on forest and other wooded land, classified by forest type and by availability for wood supply.
1.3 Age structure and/or diameter distribution	Age structure and/or diameter distribution of forest and other wooded land, classified by availability for wood supply.
1.4 Forest carbon	Carbon stock and carbon stock changes in forest biomass, forest soils and in harvested wood products
Criterion 2: Maintenance of Forest Ecosystem Health and Vitality	
Indicator	***Description***
Policies, institutions and instruments to maintain forest ecosystem health and vitality	
2.1 Deposition and concentration of air pollutants	Deposition and concentration of air pollutants on forest and other wooded land
2.2 Soil condition	Chemical soil properties (pH, CEC, C/N, organic C, base saturation) on forest and other wooded land related to soil acidity and eutrophication, classified by main soil types
2.3 Defoliation	Defoliation of one or more main tree species on forest and other wooded land in each of the defoliation classes
2.4 Forest damage	Forest and other wooded land with damage, classified by primary damaging agent (abiotic, biotic and human induced) and by forest type
2.5 Forest land degradation	Trends in forest land degradation

Criterion 3: Maintenance and Encouragement of Productive Functions of Forests (Wood and Non-Wood)	
Indicator	***Description***
Policies, institutions and instruments to maintain and encourage the productive functions of forests	
3.1 Increment and fellings	Balance between net annual increment and annual fellings of wood on forest available for wood supply
3.2 Roundwood	Quantity and market value of roundwood
3.3 Non-wood goods	Quantity and market value of non-wood goods from forest and other wooded land
3.4 Services	Value of marketed services on forest and other wooded land
Criterion 4: Maintenance, Conservation and Appropriate Enhancement of Biological Diversity in Forest Ecosystems	
Indicator	***Description***
Policies, institutions and instruments to maintain, conserve and appropriately enhance the biological diversity in forest ecosystems	
4.1 Diversity of tree species	Area of forest and other wooded land, classified by number of tree species occurring
4.2 Regeneration	Total forest area by stand origin and area of annual forest regeneration and expansion
4.3 Naturalness	Area of forest and other wooded land by class of naturalness
4.4 Introduced tree species	Area of forest and other wooded land dominated by introduced tree species
4.5 Deadwood	Volume of standing deadwood and of lying deadwood on forest and other wooded land
4.6 Genetic resources	Area managed for conservation and utilisation of forest tree genetic resources (in situ and ex situ genetic conservation) and area managed for seed production
4.7 Forest Fragmentation	Area of continuous forest and of patches of forest separated by non-forest lands

Criterion 3: Maintenance and Encouragement of Productive Functions of Forests (Wood and Non-Wood)	
Indicator	***Description***
4.8 Threatened forest species	Number of threatened forest species, classified according to IUCN Red List categories in relation to total number of forest species
4.9 Protected forests	Area of forest and other wooded land protected to conserve biodiversity, landscapes and specific natural elements, according to MCPFE categories
4.10 Common forest bird species	Occurrence of common breeding bird species related to forest ecosystems

Criterion 5: Maintenance and Appropriate Enhancement of Protective Functions in Forest Management (notably soil and water)	
Indicator	***Description***
Policies, institutions and instruments to maintain and appropriately enhance of the protective functions in forest management	
5.1 Protective forests – soil, water and other ecosystem functions - inFRA 2015structure and managed natural resources	Area of forest and other wooded land designated to prevent soil erosion, preserve water resources, maintain other protective functions, protect infrastructure and managed natural resources against natural hazards
Criterion 6: Maintenance of other socio-economic functions and conditions	
Indicator	***Explanation***
Policies, institutions and instruments to maintain other socioeconomic functions and conditions	
6.1 Forest holdings	Number of forest holdings, classified by ownership categories and size classes
6.2 Contribution of forest sector to GDP	Contribution of forestry and manufacturing of wood and paper products to gross domestic product
6.3 Net revenue	Net revenue of forest enterprises
6.4 Investments in forests and forestry	Total public and private investments in forests and forestry

Criterion 5: Maintenance and Appropriate Enhancement of Protective Functions in Forest Management (notably soil and water)	
Indicator	***Description***
6.5 Forest sector workforce	Number of persons employed and labour input in the forest sector, classified by gender and age group, education and job characteristics
6.6 Occupational safety and health	Frequency of occupational accidents and occupational diseases in forestry
6.7 Wood consumption	Consumption per head of wood and products derived from wood
6.8 Trade in wood	Imports and exports of wood and products derived from wood
6.9 Wood energy	Share of wood energy in total primary energy supply, classified by origin of wood
6.10 Recreation in forests	The use of forests and other wooded land for recreation in terms of right of access, provision of facilities and intensity of use

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