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LAND USE POLICY

Ecosystem services from community-based forestry in Nepal: realising local and global benefits

Abstract

Community-based Forestry (CBF) is now a popular approach for landscape restoration, forest management, biodiversity conservation and support for rural livelihoods worldwide. The Himalayan country Nepal has been at the forefront of CBF for over four decades, with almost 40 % of the total population directly involved in protecting and managing more than 32 % of the country's forested land. However, in the past, the focus of CBF in Nepal was the provision of goods for local subsistence, and there has been limited analysis of the role of CBF in providing ecosystem services (ES) from restored forest landscapes. Based on material drawn from a literature review and a stakeholders' workshop, this paper analyses changes in Nepalese forest policies to provide a more holistic framework for CBF that provides a wider range of ES and to potentially underpin payments for ecosystem services in Nepal. The analysis indicates that Nepal's forest policy and practices are still dominated by a narrowly conceived notion of forest management that does not accommodate the holistic concept of ES. The study illustrates that CBF provides many ES from local to global benefits as result of forest restoration. For example, timber, firewood, food, and water have local importance, while climate regulation, flood/erosion control, and habitat improvement have global importance. Many innovative cases are emerging in the long journey of CBF in Nepal that demonstrate more diverse management strategies, new forms of tenure rights and autonomy in institutional spaces. These can potentially provide a catalytic platform for the wider adoption of the ES framework in CBF regimes, in order to focus and reward forest management more directly for the provision of services such as water, biodiversity, climate regulation and recreation. Consequently, this study discusses the issues and challenges that are impeding the implementation of the ES concept in Nepal and suggests some ways forward.

Keywords: Environmental policy; community forestry; sustainability; livelihoods; biodiversity conservation; ecosystem services

1 **1. Introduction**

2

3 Community-based Forestry (CBF) is a viable alternative to the historical patterns of state control and
4 industrial forest management. It has become an important approach for forest management,
5 biodiversity conservation and supporting livelihoods (Agrawal and Chhatre, 2006; Ojha, 2014;
6 Purnomo et al., 2012). CBF is primarily a management and ownership model in which the local
7 people have a central role in planning, decision-making and managing forest resources (Agrawal,
8 2010; Pokharel and Tiwari, 2013). The concept of CBF emerged in response to the failure of
9 centralised forest bureaucracy in conserving forests and biodiversity, reducing land degradation or
10 supporting the role of forests in contributing to human well-being in many parts of the world
11 (Agrawal et al., 2008; Bhattacharya et al., 2010; Bowler et al., 2012; Dougill et al., 2012). CBF is
12 increasingly being practised in many countries, with both native forests and plantations being
13 managed for livelihoods and conservation as well as for regulating and amenity values (RRI, 2014;
14 Harrison and Suh, 2004; Stevens et al., 2014).

15

16 According to RRI (2014), indigenous people or communities own or control 511 million hectares
17 (15.5%) of the world's forests as community-managed forests, the vast majority (97 %) of which are
18 in low and middle-income countries. In developing countries, approximately one-third of the forests is
19 under the ownership and /or management of indigenous and local communities (Ojha et al., 2009;
20 RRI, 2014). Nepal, a small mountainous country, is becoming a leader in CBF with 2.05 million
21 hectares of forest being managed by community groups deriving multiple benefits (DoF, 2015; Ojha,
22 2014). However, forest management and policies in Nepal have experienced many shifts. Failure of
23 successive government interventions (e.g., enforcement of tough acts and regulations, expanded forest
24 bureaucracy and army deployment) from the 1960s to the 1970s led to a new National Forest Plan
25 (1976) that laid the foundation for CBF (Gritten et al., 2015).

26

27 The success of CBF in Nepal demonstrates that active participation is instrumental in achieving
28 sustainable forest management (Adhikari et al., 2014). Management and land-use rights for certain

1 degraded forests were handed over to adjacent communities. Local people were encouraged to use
2 their indigenous knowledge and practices in forest management (Thoms, 2008) and, in most cases, it
3 was found that local people managed forests well if management fulfilled their interests (Roberts and
4 Gautam, 2003). This community-based forest management has resulted in the conversion of eroded
5 lands and shrub lands to managed pasturelands and forests (Gautam et al., 2004), a near-doubling of
6 forest productivity and a five-fold increase in grass and fodder yields in the mountain regions
7 (Fleming and Fleming, 2009). CBF has also delivered multiple benefits to local and wider
8 communities. It has proved successful in countries such as Brazil, Costa Rica and Nepal (Ojha et al.,
9 2016).

10

11 Ecosystem services (ES) are the benefits that humans obtain from nature (e.g., Costanza et al., 1997;
12 Fisher et al., 2009, MEA, 2005; TEEB, 2010; Wallace, 2007). The catchment values and services
13 from forest restoration in degraded mountainous areas of Nepal resulting from CBF (Paudyal et al.,
14 2015; van Oort et al., 2015) were not originally termed 'ecosystem services.' While there is often a
15 link implied between CBF and the provision of ES, few studies have explicitly addressed the
16 relationship between the two in Nepal (Paudyal et al., 2015). Furthermore, there is a lack of awareness
17 of the ES-based management approach among stakeholders and no clear policy or management
18 framework, empirical data, methods or assessment tools (Crossman et al., 2013; MEA 2005;
19 Muhamad et al. 2014; Paudyal et al., 2016). This deficiency clearly indicates a requirement for a more
20 refined, scientifically based practical approach that can be used in countries like Nepal to identify the
21 capacity of CBF in providing ES and to underpin payment mechanisms.

22

23 This paper aims to assess the relationship between CBF and ES in Nepal. The paper analyses the
24 evolution of CBF policies and the innovations that shifted forest management from a focus on
25 subsistence-oriented forest management, through a focus on the provision of timber and other
26 commercial resources to more holistic management objectives related to the concept of ES. We also
27 explore the potential for ES provision through CBF from the perspective of different types of
28 beneficiaries. Through document analysis and a workshop, we examined the potential opportunities to

1 utilise the ES approach in a way that would provide additional incentives for forest conservation and
2 sustainable management of forests. Some issues and challenges that impede the mainstreaming of ES
3 in CBF regimes are discussed and ways forward to address these challenges are suggested.

4

5 **2. Methods**

6

7 **2.1. Sources of literature**

8

9 The study involves an extensive literature review based on methods used by other researchers (e.g.,
10 Alamgir et al., 2014; Balvanera et al., 2012; Chaudhary et al., 2015; Fisher et al., 2009; Luederitz et
11 al., 2015). We used the Scopus database (www.scopus.com), the ‘single largest abstract and indexing
12 database’ (Burnham, 2006; Falagas et al., 2008; Kulkarni et al., 2009), the ISI Web of Knowledge,
13 and Google Scholar.

14

15 The literature search was undertaken in December 2015 and focussed on three areas of interest, i.e.
16 ecosystem services, a shift in forest policies and outcomes of CBF, particularly in the context of
17 Nepal. The search first identified articles containing the words ‘ecosystem services(s)’ OR
18 ‘environmental service(s)’ AND ‘Nepal’ in the title, abstract and keywords. Many combinations of
19 keywords (Figure 1) were used to find more articles. We conducted a quick review of the abstracts of
20 the retrieved articles to evaluate their relevance to ecosystem services. Out of 177 articles, this search
21 revealed only 11 papers that addressed ecosystem services in Nepal. To capture additional relevant
22 information, we continued to search using databases for articles including conference proceedings,
23 book chapters, government publications, technical reports, agency reports, student theses and
24 synthesis papers in regards to ES in Nepal. We also visited various organisations in Kathmandu (the
25 Ministry of Forest and Soil Conservation (MFSC), World Wildlife Fund, Nepal, the Integrated Centre
26 for International Mountain Development and other governmental and non-governmental agencies)
27 and collected nine grey literature reports and unpublished documents related to ES. A few recent
28 important ES articles were collected and appraised briefly (e.g., Arkema et al., 2015; Braat and de

1 Groot, 2012; Daw et al., 2015; Guerry et al., 2015; Grima et al., 2016; Polasky et al., 2015; Reyers et
2 al., 2015; Scarlett and Boyd, 2015; Scolozzi et al., 2014; Wong et al., 2015). The aim of reviewing
3 these articles was to glean the latest developments in ES science as practised in other countries and to
4 utilise this learning in the context of Nepal.

5
6 In the second part of the literature review, we carried out a similar search for documents having the
7 words ‘forest policies’ OR ‘forestry sector policies’ AND ‘Nepal’ related to forest policies. We found
8 some 208 articles, of which 15 were selected as being most relevant for our forest policy review.
9 Some important policy documents were also collected from the MFSC. Moreover, we performed a
10 Scopus search using the combination of keywords ‘community forestry’ OR ‘community-based
11 forestry’ AND ‘Nepal’ to find articles related to CBF. In this case, we focused solely on peer-
12 reviewed articles because of the huge number of hits in Scopus. In a quick review, the number of
13 relevant papers fell to 29 that addressed CBF outcomes, that is, issues related to water, biodiversity,
14 carbon, forest cover, forest quality, forest restoration, governance, local forestry institutions, working
15 plans, and local capacity in forest management.

16
17 **#Figure 1 approximately here#**

19 **2.2. Applied thematic analysis**

20

21 The most significant articles, reports and policy documents related to CBF and ES were selected,
22 reviewed and qualitatively analysed. For this, we utilised the ‘applied thematic analysis’ (ATA)
23 approach (Guest et al., 2012) to analyse the evolution of CBF and its relationship with ES, as applied
24 to a recent study in South Africa (Sitas et al., 2014a). ATA involves the synthesis of key concepts in
25 one methodological framework and their adaptation to an applied research context (Guest et al., 2012,
26 2013). This process is designed to identify and scrutinise themes from textual data in a transparent and
27 credible way (Guest et al., 2012; Tuckett, 2005). Themes are created through induction and verified
28 through deduction, moving back and forth between concepts and the data (Guest et al., 2012). It

1 promotes a more discursive interpretation and represents a view of reality through the text to find
 2 topics that are progressively integrated into higher order themes as a process of de-contextualisation
 3 and re-contextualisation (see Figure 2; Subvista, 2010). The results were grouped into five broad
 4 themes with multiple sub-themes (Table 1).

5

6 #Figure 2 approximately here#

7

8 **Table 1: Themes and sub-themes identified for review and in-depth analysis**

Emerging theme	Sub-themes
1. Evolution of forest policy	a. Private forests b. Forest nationalisation c. Participatory forestry d. Holistic management
2. Benefits and services from CBF	a. Source of local livelihoods b. Healthy forests c. Economic benefits d. Social benefits e. Positive environmental externalities f. Water provision and regulation g. Habitat conservation and biodiversity h. Non-timber forests products
3. Assessing and valuing ecosystem services	a. Qualitative assessment b. Quantitative evaluation c. Mapping and spatial analysis d. Social value e. Economic value
4. Changes in ecosystem services	a. Quantifying changes over time
5. Issues and challenges	a. Narrow-focused forest policies and practices b. Unclear tenure c. Existing institutional framework d. Lack of information on ES e. Lack of technical and institutional capacity f. Improper use of benefits and services
6. Way forward for the ecosystem services approach	a. National policy on ecosystem services b. Mainstreaming ES approach in the country's development plan

Emerging theme	Sub-themes
	<ul style="list-style-type: none"> c. Strengthening institutional capacity d. Reform tenure rights over ES e. Capacity building f. Application of the transdisciplinary approach g. Innovation in ES assessment and valuation

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2.1. Analysis of benefits and services from CBF

Various themes emerged through the process of ATA; we discuss each of them in detail in different sections. However, changes in benefits and services from CBF before and after CBF (present condition) could not be assessed from the literature alone. Therefore, we organised a workshop among the major informants from MFSC, Department of Forests (DoF) and the Department of National Parks and Wildlife Conservation (DNPWC), Department of Soil Conservation and Watershed Management (DSCWM) and the key representatives from the Federation of Community Forestry Users, Nepal (FECOFUN) in December 2015 in Kathmandu. A list of the benefits and services that a CBF landscape can provide (e.g. Birch et al., 2014; Paudyal et al., 2015) was presented in the workshop, and the past and present status of each of the benefits and services were discussed. The opinions were scaled between ‘0’ and ‘10’, where ‘0’ indicates no benefits and services and ‘10’ indicates fully stocked and high supply potential. In the beginning, participants assigned a value for each benefit and service from 0 to 10 regarding their status before CBF, that is, in relation to their status in the 1970s or 1980s and the same process was repeated for their present status, that is, their status after 2010. Participants were allowed to change their ratings at any time. First, the process was completed at the individual level among workshop participants, and the process subsequently proceeded in a group. The numerical ratings given by individuals and groups for each benefit and service were entered into an Excel worksheet, analysed and presented in a radar diagram.

3. Results and discussion

3.1. Himalayan degradation – the driver of forest policy evolution in Nepal

In the past 100 years, a range of legal provisions has been enacted to resolve forest management problems in Nepal (Gautam et al., 2004). Widespread concerns about Himalayan degradation and perceived consequences were the main driver of a paradigm shift in forest policy. The *National Forest Plan (1976)* laid the foundation of CBF by recognising that the crisis could not be reversed without support from local communities in forest management (Gritten et al., 2015). Subsequently, the *Master Plan for Forestry Sector 1988* stimulated the development of CBF, which expanded rapidly throughout the 1990s under the *Forest Act (1993)* and *Forest Regulations (1995)* based on the earlier successful implementation of decentralisation policies (MFSC, 2013). The CBF process was further strengthened by the *Local Self-Governance Act (1999)* that devolved management rights and reinforced principles of bottom-up planning in the forestry sector (MFSC, 2014a).

Our analysis indicated that there were four important stages in forest policy that responded to different social and ecological contexts (e.g., Sigdel-Baral, 2015; Ojha et al., 2014; MFSC, 2013): (i) Indigenous management and privatisation of forests (before 1957); (ii) forest nationalisation (1957 to 1976; (iii) participatory forestry and decentralisation (1976 to recent); and (iv) new innovations (2000 – recent) (*Table 2 and Annex S1 - online supplementary materials*).

Table 2: Major stages and paradigms associated with forest policy changes in Nepal and their impact on forest management and the supply of ecosystem services (ES).

Policy paradigms	Timeframe	Key policy changes	Status of forest and ES
Indigenous management and privatisation	Before 1957	<ul style="list-style-type: none">• No formal policy• Ranas orders treated as government policy• Informal and indigenous management system	<ul style="list-style-type: none">• Large forest area and abundant supply of most of ES
Forests	1957 – 1976	<ul style="list-style-type: none">• Private Forest Nationalisation Act, 1957;	<ul style="list-style-type: none">• Severely reduced forest area

Policy paradigms	Timeframe	Key policy changes	Status of forest and ES
nationalisation		Forest Act 1961 and Forest Protection - Special Provision Act 1967	and ES <ul style="list-style-type: none"> • People experienced problems arising from many disservices such as flooding, landslides.
Participatory forestry and decentralization	1976 to recent	<ul style="list-style-type: none"> • National Forestry Plan 1976; • Master Plan for the Forestry Sector 1989; Forest Act 1993; and Forest Regulation 1995 	<ul style="list-style-type: none"> • Forest area decreased until the 1980s and ES gradually increased afterward in the mountain region.
Innovations in forestry sector	2000 – recent	<ul style="list-style-type: none"> • Forest Policy, 2000 • Leasehold Forestry Policy 2002 • Nepal Biodiversity Strategy 2002 • Forest Carbon Policy 2008 • Forest Policy 2014 	<ul style="list-style-type: none"> • Forest area and ES gradually increased in the mountain region. • Envisioned potential benefits from diverse forest ES to the local people and the economy.

1

2 **Stage 1 (before 1957). Privatisation and indigenous management of forests:** Forest lands were
3 largely under private control until the end of the Rana Regime¹. The Rana rulers encouraged people to
4 convert hill forests into agriculture with the aim of generating increased taxes on agricultural
5 products. In addition to clearing lands for agriculture, a massive felling of forests occurred in the
6 Terai² region from the late 1920s to export timber to India (Joshi, 1993). Powerful officials and
7 related elites had an entitlement to forests in the form of Birta³. As a result, one-third of the country's
8 forests was converted to agricultural lands. However, large forest areas remained under traditional
9 management systems and private ownership (Joshi, 1993).

10

11 **Stage 2 (1957 – 1976). Forest nationalisation:** In 1957 the government nationalised all forests by
12 enacting the *Private Forest Nationalisation Act* (Ojha et al., 2009). This action generated controversy
13 and fear among people about their ownership of private forests; it accelerated deforestation and
14 impacted on indigenous forest management systems (Hobley, 1985, 1996; Hobley and Malla; 1996).

¹ Rana Regime: The family dynasty of Rana Prime Ministers, who ruled Nepal for 104 years from 1846 – 1950.

² Terai: Flat land lying between the Siwalik Hills and the Nepal-India border; the term is used to denote both geographic and cultural connotations.

³ *Birta*: Land granted by the state to nobles or government officers as gifts and salary.

1 The tragedy continued despite new institutions (e.g., Ministry of Forestry being set up),
2 comprehensive legislation (e.g., *Forest Act 1961* and *Forest Protection - Special Provision Act 1967*)
3 and other mechanisms of authority (e.g., heavy penalties, quasi-judicial rights, and military support
4 for enforcement). Failure to address livelihoods of forest-dependent people, massive migration and
5 government mismanagement had severe impacts on forests (Gautam et al., 2004). Resultant rampant
6 deforestation causing raw material shortages, landslides and water scarcity in the mountains and
7 flooding in the lowlands. This situation caused many people both inside and outside the country to
8 consider the Nepal in environmental crisis in the mid-1970s (Eckholm, 1975, 1976), affecting both the
9 condition of the Himalayas and local livelihoods (Ojha et al., 2014). The provision of ES was
10 undermined, and economic returns and local benefits from forests were limited.

11

12 ***Stage 3 (1976 to recent). Decentralisation and Participatory forestry:*** Decentralisation and the rise
13 of participatory forestry were triggered by this sense of crisis and the attention of a global
14 environmental movement drawing attention to the failure of central government control to reduce
15 forest loss and degradation (Gilmour and Fisher, 1991; Ojha et al., 2009). Consequently, forest policy
16 and practices changed from an emerging awareness of new models (the 1980s) to more flourishing
17 implementation (the 1990s) and innovation (2000 onwards).

18

19 The 1976 National Forestry Plan recognised the need for people's participation in, and
20 decentralisation of, forest management (Gautam et al., 2004). Community ownership classes of
21 Panchayat⁴ Forest and Panchayat Protected Forest were introduced in 1977 in amendments to the
22 *Forest Act 1961*. The *Master Plan for the Forestry Sector (1988)* was the foundation for participatory
23 policy reform that provided the basis for CBF for the next 25 years. This was considered a
24 breakthrough in the history of Nepalese forest management (Gautam et al., 2004). It gained
25 momentum after the advent of multi-party democracy in 1990. The landmark *Forest Act, 1993*
26 legitimised the Community Forest User Group (CFUG) as a self-governing local institution
27 responsible for protecting, managing and using a patch of national forest (Ojha et al., 2014). The

⁴ Panchayat: Local political unit during that time.

1 political role of CFUGs also grew, and the FECOFUN emerged as a prominent actor in national
 2 policy processes. The CBF regime was expanded to conservation areas through the creation of Buffer
 3 Zone (BZ) community forests and poverty reduction related to providing the poor with leasehold
 4 access to public forests (Table 3). Community forestry in this stage can be considered to be in tension
 5 between a strong focus on landscape restoration and forest conservation and the need to produce
 6 commercial products to address livelihood and development objectives.

7

8 **Table 3: Overview of the major community-based forestry regimes in Nepal**

Key CBF regimes	Community forests	Leasehold forests	Buffer Zone forests	Collaborative forest management
Formally started	1978	1993	1996	2003
Implemented ecoregion	Mainly middle hills in the beginning, but extended across the country	Middle Hills and Foot of Siwalik Hills	Surrounding protected areas across the country	Low-lying Terai region with large blocks of forests
No. of districts covered	74 (except Mustang)	49	27	8
No. of CBF groups formed	18,960	6,712	4,527	13
No. of family involved	2,392,755	62,735	146,135	243,997
Group size (no. of families/CBF)	127	10	164	18769
Total area covered (ha)	1,798,733	38,997	181,600	39,457
Ave. forest size/group (ha)	94.9	5.8	1748	344.6
Main regulatory legislations	Forest Act 1993, Forest Regulations 1995	Forest Act 1993	NPWC Act 1973 and BZM Regulations 1996	CFM policy, 2000
Facilitating government agency	DoF (Centre) and DFO (district)	DoF (at Centre), and DFO (district)	DNPWC (Centre) and Park Office in the field	DoF (at Centre) and DFO (district)

9 Source: DoF, 2015; MFSC, 2013; Ojha, 2014.

10 Note: BZM -Buffer Zone Management; CBF – Community-based Forestry; CFM - Collaborative Forest
 11 Management; DFO - District Forest Office; DNPWC - Department of National Parks and Wildlife
 12 Conservation; DoF - Department of Forests; NPWC - National Parks and Wildlife Conservation

13

1 The introduction of a new policy for the management of the high-value, intact natural forests in the
2 *Terai* region imposed some restrictions on CBF, because of fear among technocrats of losing power,
3 and this was regarded as a regression in the implementation of CBF (Ojha, 2006).

4

5 ***Stage 4 (2000 – present). Innovations in forestry sector:*** With the rise of a strong civil society, multi-
6 stakeholder inclusion in management decisions, improved livelihoods, poverty reduction, ES and
7 climate change have been targets for innovation in forest policy since 2000. Reduction of Emissions
8 from Deforestation and forest Degradation (REDD+) emerged after the 2007 Bali Conference of
9 Parties to the UN Framework Convention on Climate Change. This presented a prospect of payments
10 for increased forest carbon stocks under CBF (Ojha et al., 2014). While multiple benefits have always
11 been inherent in the CBF concept, there has been a shift away from a focus on timber to a range of
12 management objectives that deliver a variety of benefits to local people. In addition, the recognition of
13 the potential of CBF for PES and ecosystem-based adaptation to climate change (MFSC, 2013) has
14 provided a platform for the ES approach as a new paradigm in CBF. This means that a broader set of
15 beneficiaries from CBF activities has now been delineated, beyond the local community.

16

17 It is evident from the above analysis that concerns over the Himalayan environmental crisis, changing
18 national politics and community empowerment were pivotal in the paradigm shift in forest policies
19 and caused CBF to flourish in Nepal. The forests established under CBF regimes have provided a
20 variety of benefits and services that are analysed in the next section.

21

22 **3.2. Bare hills to dense forests and changing multiple ES benefits from community-** 23 **managed forests**

24

25 Much of the early emphasis of CBF in Nepal was to restore forest cover on degraded lands to improve
26 catchment values through reducing soil erosion, improving water quality and reducing pressure on the
27 remaining natural forests. Beyond this, CBF has brought economic, ecological and socio-political
28 benefits to local people (Birch et al., 2014), as co-benefits from these activities. These co-benefits

1 have been derived from novel ways of managing forest ecosystems that provide models for ensuring
2 landscape and community sustainability (Bhandari et al., 2016; Maren et al., 2013). Co-benefits are
3 not limited to the local scale. For example, carbon sequestration and climate regulation can be
4 considered benefits for regional to global communities (Paudyal et al., 2015). ES and benefits to local,
5 regional and global societies have accrued during the past four decades (Figure 3).

6

7 Statistics from a recent forest assessment indicate that the result of CBF has been a substantial
8 increase in Nepal's forests (DFRS, 2015). Most of the increased forest cover is in the middle hills,
9 where CBF has been successfully implemented (DFRS, 2015). CBF is now perceived as having
10 improved the biophysical forest condition in supporting biodiversity and providing many more life-
11 sustaining services in comparison to the government-managed forests (Gautam et al., 2002; Niraula et
12 al., 2013; Thoms, 2008). There is a feeling of dedication and ownership among local people and,
13 therefore, there is stricter control of illegal activities resulting in improved health of forests and
14 consequently an increased provision of goods and services (Ojha et al., 2009).

15

16 Expert perceptions from this study and analysis of the literature indicate that nine categories of
17 benefits have been significantly enhanced as a result of the increased forest cover. However, herbs
18 and medicine production were considered to have decreased slightly over this period (Figure 3a-b).
19 Relevant benefits and services are described briefly below.

20

21 ***Contribution to subsistence livelihoods of local communities:*** Livestock, agriculture, and forests
22 form essential components of the predominantly agrarian economy in Nepal and are intricately linked
23 (Paudel and Ojha, 2013). For example, small farmers practice subsistence farming and rely heavily on
24 forests for grass and fodder to feed their livestock, collect leaf litter to use on their farms and collect
25 firewood which is the main source of energy for cooking and heating. CBF supplies forest products
26 for daily uses, e.g., firewood, timber, grass, fodder and leaf litter which provides a major share of
27 rural economy and livelihoods (Adhikari et al., 2007; Gilmour et al., 2004; Thoms, 2008) and
28 increased production of edible wild foods.

1 **#Figure 3 approximately here#**

2

3 ***Increased economic benefits:*** CBF provides ‘green’ jobs to more than a million poor people in Nepal
4 (Adhikari et al., 2007). Also, a significant amount of revenue has been generated from directly selling
5 various value-added forest products (Adhikari et al., 2007; Kanel and Dahal, 2008). These funds
6 support local infrastructure development such as roads, bridges, drinking water supply and school
7 buildings (Gurung et al., 2011; Maharjan et al., 2009). Moreover, CFUGs promote inclusive business
8 and enterprises for income generation targeting poor people (MFSC, 2013). These activities
9 contribute significantly to national economic growth (Gurung et al., 2011; Maharjan et al., 2009).
10 These financial benefits can potentially be enhanced by promoting the ES approach in CBF and
11 developing income streams for CFUGs for some services that could further support the local and
12 national economy (MFSC, 2013).

13

14 ***Social benefits and empowerment of local communities:*** The CFUG has been recognised as the
15 strongest legitimate and democratic grassroots institution in Nepal. This vibrant local institution
16 manages common pool resources in a way that successfully challenges Hardin’s presumption of ‘the
17 tragedy of the commons’ (Ostrom, 1990). The Forest Act 1993 empowers the local people through a
18 participatory decision-making process and benefit distribution (Pokharel and Niraula, 2004). The
19 CFUG under this legal framework is a self- governing, empowered local institution. Learning from
20 CBF has enhanced democratic practices at the grassroots level in Nepal (Shrestha et al., 2009).The
21 establishment of representation of both women and men from each household as CFUG members has
22 enhanced women’s participation in forest management (Ojha et al., 2009). An increasing trend of
23 women and marginalised people serving in decision-making positions shows a promising state of
24 empowerment (Agarwal, 2010). However, there is much to be done to fully empower and engage
25 marginalised people in decision-making (Sapkota et al. 2016). CBF has also enriched a range of
26 cultural services, such as landscape amenities, recreation and learning opportunities (Paudyal et al.,
27 2015). The FECOFUN has also emerged as the largest and strongest civil society network in the

1 country and promotes deliberative discourse that aims to secure access and rights of local people in
2 forest management (Ojha et al., 2014).

3

4 ***Environmental benefits:*** Besides providing important ecosystem goods and societal benefits, the CBF
5 regime supplies many environmental benefits (as positive environmental externalities) such as local to
6 global climate regulation, conservation, water purification, soil retention, landslide and flood control
7 (Fleming and Fleming, 2009; Steven et al., 2014). CBF has enhanced carbon sequestration, increased
8 forest carbon stocks and provided habitat for biodiversity (Birch et al., 2014). Consequently, the
9 REDD+ initiative has been piloted in CBF regimes for potential use in forest carbon trading because
10 of the robust local institutions and the improvement in forest quality (Poudel et al., 2014)

11

12 ***Freshwater provision and regulation:*** An increase in cover and density of the forests will reduce
13 average water yield (Gilmour, 2014; Ghimire et al., 2013; van Dijk and Keenan, 2007). However,
14 other hydrological characteristics such as quality water, groundwater recharge and low flows due to
15 improved infiltration are generally enhanced (Ghimire et al., 2014; Barges Tobella et al., 2014; van
16 Dijk and Keenan, 2007) and their effects are clearly observable in community-managed forests in
17 Nepal (Birch et al. 2014). CBF regimes support aquatic environments that have been managed for the
18 fishery, irrigation, drinking and recreation benefits (Paudel and Ojha, 2013) and supply a variety of
19 ES to communities (Sharma et al., 2015). These aquatic environments are a source of subsistence
20 livelihoods for the poor and indigenous people (Chaudhary et al., 2016) and community forests are the
21 source of clean water for local people and those in the lower parts of catchments (Ghimire et al.,
22 2014).

23

24 ***Habitat conservation and biodiversity:*** Biodiversity conservation was not considered important
25 during the initial stage of CBF in the 1970s. However, restoring degraded forest lands and habitats
26 and conserving biodiversity was described as an outcome of CBF from the late 1980s (Khadka and
27 Schmidt-Vogt, 2008; Shrestha et al., 2010), became an important driver of CBF from the end of the
28 1980s and was effectively institutionalised in the 1990s (Bajracharya et al., 2005; MFSC, 2013).

1 Increasing forest cover and quality has rapidly improved the habitat conditions, the richness and
2 abundance of important plants and wild animals (Maren et al., 2013, Pandey et al., 2014; Webb and
3 Gautam, 2001). There is evidence of increasing wildlife populations in community forests, although
4 this can also lead to the loss of domestic animals and crop damage due to wild animals that are not
5 seen as benefits to the local community (Shrestha et al., 2010). Multi-purpose forest management
6 practices, enrichment plantations, protection of critical habitats and species hotspots, and fire control
7 have also enhanced biodiversity in CBF (Paudel and Sah, 2015). However, weeding and bush clearing
8 have had some negative impacts (Paudyal et al., 2015). More than a thousand community forests have
9 been conserving biodiversity and contribute to the economic benefits obtained from ecotourism
10 (Paudel and Ojha, 2013).

11

12 **NTFPs and medicinal herbs:** Many different types of non-timber forest products (NTFPs) are found
13 in community forests and are recognised for their contribution to rural livelihoods (Gauli and Hauser,
14 2011; Uprety et al., 2016). Their availability varies (Acharya et al., 2009) but many CFUGs have been
15 managing a variety of NTFPs, such as medicinal herbs, oils, bamboo or broom grass, as a sustainable
16 supply of raw materials used in small-scale enterprises (Kunwar et al., 2013).

17

18 Through the effective restoration of degraded forests, CBF provides many services and benefits to
19 local, regional and global communities. Many ES are gradually increasing through restored forest
20 cover and changes in species composition. For example, a recent study in Dolakha indicated that 17
21 out of 18 ES had been significantly enhanced as a result of the implementation of CBF since the
22 1990s (Paudyal et al., 2015). While catchment benefits have been a strong driver of CBF, there has
23 been little analysis of these benefits and few financial incentives focused on supporting the production
24 of those benefits.

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3.3. Common approaches for assessing and valuing ES

“Measurement is the first step that leads to control and eventually to improvement. If you can't measure something, you can't understand it. If you cannot understand it, you cannot control it. If you can't control it, you can't improve it.”—H. James Harrington (Tzanakakis, 2013, p363)

Many benefits from CBF are considered common goods or common pool resources (Paudyal et al., 2016). Conventional markets and the best existing institutional frameworks are insufficient to manage those goods and services (Costanza et al., 2014). To shift the management of CBF from a narrow focus on timber and local subsistence products to a more holistic set of objectives it is essential to improve the understanding of ES, specifically, how they are defined, assessed, mapped and valued. However, few studies have focused on the quantification and valuation of ES from community forests because of the lack of awareness of the benefits of ES-based management, the absence of clear policy (Paudyal et al., 2015) and the dearth of empirical data, methods and tools (Birch et al., 2014).

The science of assessing and valuing ES has been growing rapidly since the Millennium Ecosystem Assessment in 2005 (Braat and de Groot, 2012). Five approaches are potentially relevant to CBF based on input requirements, time frames and quality of outputs: (a) qualitative assessment (e.g., Burkhard et al., 2009; Baral et al., 2014a; Paudyal et al., 2015); (b) quantitative measurement (e.g., Alamgir et al., 2016a, 2016b; Crossman et al., 2013; Baral et al., 2013); (c) economic valuation (e.g., Baral et al., 2014b); (d) social value (e.g., Sherrouse et al., 2014); and (e) mapping and visualisation (e.g., Zarandian et al. 2016).

Efforts to assess ES in CBF are relatively limited because of the small scale of CBF operations and the wider scales that need to be encompassed to assess services (van Oort et al., 2015). Qualitative approaches (i.e., local people's perceptions, expert opinion, semi-structured interviews and field observations) can provide rapid assessments (MEA 2005; Burkhard et al., 2012a; Busch et al., 2012; Scolozzi et al., 2014) that are linked to local understanding (Paruelo, 2012; van Oort et al., 2015; Zarandian et al., 2016) but are not likely to be sufficiently repeatable or independent to support

1 payment or reward schemes (Krueger et al., 2012; Jacobs et al., 2015). These qualitative approaches
2 are a good fit with the participatory nature of CBF and can reveal social values, and preferences based
3 on simple visualisation tools that would be appropriate in CBF (Paudyal et al., 2015; van Oort et al.,
4 2015).

5
6 Quantitative approaches using field measurements, models, and proxies are preferred for repeatable,
7 independent assessment but obviously entail higher costs in data collection, expertise, and time (Baral
8 et al., 2014a; Egoh et al., 2011). Using proxies and models also poses challenges because models
9 developed for one location may not apply to other geographic settings (Eigenbrod et al., 2010).

10

11 Many ES are often not addressed in planning and decision-making because there is no financial value
12 attached to them (Kareiva et al., 2011; Yi et al., 2016). Considerable effort has been invested in
13 developing economic and financial evaluation methods (De Groot et al., 2012; Costanza et al., 2014).

14 Assessing the present value of future benefits using a discount rate is central in these analyses.

15 However, these valuation methods have not been applied in situations where local communities are
16 involved in CBF (Paudyal et al., 2015; van Oort et al., 2015; Bhatta et al., 2015). Practical valuation
17 approaches can potentially support payments to communities for their efforts in CBF.

18

19 The values perceived by society are often inadequately captured by conventional utilitarian valuation
20 methods, which neglect the value of the psychological well-being derived from an individual's
21 relationship with nature (Kumar and Kumar, 2008). These social-cultural values cannot be monetised
22 (Gee and Burkhard, 2010) and decision-making tools involving wider consideration of social choices
23 and preferences of stakeholders need to be developed (Sherrouse et al., 2014).

24

25 Maps and spatial representations can be powerful for capturing information on different services and
26 visualising the impacts of management (Burkhard et al., 2012a, 2012b; Crossman et al., 2012),
27 particularly for local people who may not be able to read or understand tables or graphs. Among many
28 methods used, participatory mapping and repeat photography in association with Geographic

1 Information Systems are considered useful in the context of CBF (Brown, 2004; Plieninger et al.,
2 2013; Paudyal et al., 2015).

3

4 **3.4. Trends of benefits and ES change in community-managed forests**

5

6 In the last four decades CBF has been instrumental in rejuvenating degraded mountain ecosystems in
7 Nepal and in delivering a variety of benefits that correspond to ES (Figure 4). Until the late 1950s,
8 despite some deforestation, the abundance of forest and sound indigenous forest management
9 practices meant that the supply of benefits and ES was comparatively high. However, these benefits
10 and ES services declined severely in the following two decades due to techno-bureaucratic failure in
11 forest management (Ojha et al., 2009, 2014). This situation continued until the late 1980s. With the
12 establishment of CBF, the creation of substantial new plantations and the protection of degraded
13 forests, the situation started to reverse in the early 1990s.

14

15 **#Figure 4 approximately here#**

16

17 **3.5. Issues and challenges**

18

19 Despite the documented successes, our analysis revealed several problems and challenges arising in
20 integrating ES within CBF in Nepal. Current policies, regulations and the institutional settings are not
21 flexible enough to allow for innovations in CBF (Paudel and Ojha, 2013). They focus on a narrow,
22 subsistence approach with government decisions exclusively focused on timber and fodder
23 production, a few NTFPs and biodiversity conservation that appears to be aimed at ensuring the
24 protection of trees. The techno-bureaucratic set up of the forest administration and officials with
25 inadequate exposure to the wider perception of ecological functions and services are also significant
26 limiting factors (Giri and Ojha, 2011). While the country's macro policy has recognised the potential
27 of ES in poverty reduction, a practical implementation mechanism is missing, and no further actions
28 have been initiated (NPC, 2011).

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The potential economic and ecological benefits of ES arising from CBF have not been assessed, documented or considered in the policy-making process. The narrow focus on conservation and a few tangible forest products has meant that CBF has not had significantly diversified impacts on rural employment or local economies (Pokharel and Baral, 2009). Despite the considerable current supply and potential to increase this in future, the range of benefits and services from community forests has been under-recognised. While, for example, water provision and regulation are key outcomes that have already entered into the informal transactions among CFUGs, municipalities, and private firms, prevailing regulatory instruments do not provide any guidance about ownership, transaction, and benefit-sharing from water services available in and from community forests (Paudel and Ojha, 2013).

Despite a growing interest, institutional arrangements (e.g., dispersed authorities and jurisdictional fragmentation, limitations on agency capacities) constrain the mainstreaming of ES and its incorporation into public-sector decisions (Scarlett and Boyd, 2015). In Nepal, the narrow conceptualisation and focus of the government’s existing institutional framework do not support mainstreaming in policy and practice. The MFSC is the primary agency responsible for mainstreaming the ES concept. However, over half-a-dozen ministries and departments are formally and informally connected in ES management and potential PES schemes besides the MFSC, such as the Ministry of Agriculture, the Ministry of Environment, the Ministry of Energy, the Ministry of Irrigation, the Ministry of Land Reform and the Ministry of Local Development. ES are also closely linked to the functions of DoF and the DNPWC within the MFSC. However, these agencies are sharply split, having narrowly conceived mandates and authorities. Among the various models of CBF, Buffer Zone Management is overseen by the DNPWC, while the other three regimes (see Table 3) are under the jurisdiction of DoF with different operational modalities and levels of devolution of management. Despite the dual goals of conservation and livelihoods, the BZ program is strongly aligned with the DNPWC focus on megafauna conservation. The program largely ignores potential ES, except for ecotourism. CBF falls under DoF but, as indicated above, this institution does not

1 easily internalise the holistic notion of ES. Therefore, under present conditions the mainstreaming of
2 ES within the existing institutional framework is complex and challenging.

3
4 Existing land tenure and ownership rights are also impediments to the wider implementation of an ES
5 model. The improved forest condition under the CBF regimes is due to the clear tenure arrangements
6 (Chhatre and Agrawal, 2009; Larson, 2011). Many studies have also established a useful link between
7 use rights over forests and the rejuvenation of denuded mountains in Nepal (Gautam et al., 2003). The
8 impacts of applying existing use rights in managing ES are not well-studied in CBF regimes (Paudel
9 and Ojha, 2013). However, land tenure and use rights are key elements for the successful application
10 of ES and in the promotion of forest conservation, as well as for possible payment systems (Duchelle
11 et al., 2014; Larson et al., 2013). Tenure insecurity has been identified as a key challenge to
12 implementing PES in many developing countries (Duchelle et al., 2014) and Nepal is no exception.

13
14 Some stakeholders consider that a lack of proper ES information and the weak capacity of
15 government institutions, as well as the lack of skilled human services and financial resources, are
16 significant barriers to mainstreaming ES in CBF regimes (Sitas et al., 2014a; Balvanera et al.,
17 2012).The decision-making process in Nepal is severely affected by the absence of biophysical
18 information, particularly on the quantity and value of ES (that is, supply, demand, and delivery) in the
19 country's diverse contexts of scale, space, and time (Paudyal et al., 2015). While an extensive range
20 of tools and heuristics exists elsewhere and support ES-based approaches (for example maps,
21 databases, frameworks, evaluation methods and computer programs), most of them require significant
22 data, resources and technical competency that are neither available nor useful in developing countries
23 (Daily et al., 2009; MEA, 2005; Sitas et al., 2014b; TEEB, 2010).

24
25 Nepal's political process has been driven by crisis management over the last 20 years, and national
26 policy has been focused on human development. This has limited any investigation of the ES
27 approach and its potential for both development and conservation. Moreover, conflicts have
28 frequently arisen between 'green groups' who are 'anti-development' and 'pro-developers' who are

1 considered 'anti-environment.' At the local level, this plays out in situations such as the long-standing
2 conflicts between MFSC and other ministries to obtain forest areas for infrastructure development
3 projects. These competing claims impede the discussion and mainstreaming of the holistic concept of
4 ES in the national policy framework (NPC, 2015). Despite the high potential of the green sector to the
5 country's economy, the present contribution is insignificant. CBF regimes have largely contributed to
6 biodiversity conservation and local livelihoods (MFSC, 2014b). Little attention has been paid to PES
7 for larger watershed or hydropower catchment management, a development that has provided
8 resources for PES in other countries. There has also been little study of the relationship between CBF
9 and ES supply and neither has the question been posed whether interventions to sustain ES have had
10 positive or adverse effects on biodiversity conservation and livelihoods (Sitas et al., 2014a).

11

12 **3.6. Ways forward**

13

14 The emphasis on CBF in Nepal is changing from a focus on providing basic forest products for rural
15 communities to a more holistic management concept encompassing a wider range of ES. Despite the
16 impediments indicated above, the level of awareness about ES is increasing among local
17 communities, researchers, and policymakers. This study recommends the following actions to
18 increase the potential for mainstreaming the ES concept in CBF in Nepal, which was revealed as a
19 result of the analysis of ES and CBF literature and information obtained during the expert workshop:

20

- 21 • **National ES Policy:** The analysis indicates that Nepal needs a forward-looking and flexible
22 national policy to institutionalise the ES approach with the aims of contributing to poverty
23 reduction, economic well-being and the sustainable management of natural resources (Bhatta et
24 al., 2014). Such a policy should recognise the contribution of local communities in managing
25 forests to ensure sustainable provision of multiple ES at various scales (from local to global –
26 see Paudyal et al., 2015) and provide the communities with financial and non-financial
27 incentives. The policy should focus on the promotion of international investment in sustainable
28 management of ES, building technical capacity and competency of stakeholders and

1 establishing effective institutional arrangements and mechanisms for ES governance with the
2 purpose of ensuring equitable benefit- sharing from ES and potential payment mechanisms. It is
3 equally important to formulate legal instruments (laws, rules and regulations) and to harmonise
4 policies and legislation and enhance cooperation across sectors to promote the ES framework.
5 Recent public policy developments in the USA (White House, 2015a, 2015b) demonstrate
6 potential policies and regulatory arrangements.

- 7 • **Mainstreaming ES approach in Nepal’s development plans:** Mainstreaming the ES
8 approach from local to national planning is essential. While the ES concept has been in place
9 since the Tenth Five-year Plan (NPC, 2015), as the next step it is crucial to adapt this concept
10 to sectoral policies and plans that are linked to ES, such as agriculture, forest, water, local
11 development, urban development, energy, infrastructure, and conservation. Moreover, existing
12 forestry-related legislation, especially the Forest Act, Soil and Water Conservation Act and
13 National Parks and Wildlife Conservation Act need to incorporate the ES approach.
14 Additionally, this concept should be mainstreamed through local government plans that will
15 enhance local efforts in the management and sustainable supply of ES. Mainstreaming of ES is
16 also required in the multi-sectoral planning processes that drive development, and in framing
17 and aligning ES with development priorities (Sitas et al., 2014a).
- 18 • **Strengthening institutional competency:** The successful application of ecosystem services
19 depends on institutional design, organisational capacity, and their interplay with various forms
20 of markets (Corbera and Brown, 2008). Lessons learnt from many countries (e.g., the USA)
21 indicate a need for a national authority to provide strategic leadership and overall coordination.
22 Furthermore, other institutions such as intermediary organisations, the private sector, and
23 certification agencies need to be established and strengthened. The MFSC as the apex body
24 may be an appropriate place to begin. It can formulate legal instruments and coordinate relevant
25 ministries and agencies to address policy reforms and the application of the ES concept.
- 26 • **Reform of tenure rights over ES:** Tenure clarity and security are considered essential
27 requirements to generate local benefits from ES (Benner, 2014). The ES approach provides

1 some new opportunities for securing local tenure rights, but piecemeal interventions by project
2 proponents at the local level are insufficient in the absence of a broader national framework for
3 tenure reform related to different ES from various land use types. The potential for substantial
4 changes offers useful insights that should recognise customary rights in particular. Improved
5 local rights and capacity for rule enforcement, monitoring, and sanctions are needed to ensure
6 the sustainability of the approach. Serious commitment to an ES framework challenges the
7 deep-rooted economic and political interests of ‘business as usual’ (Larson et al., 2013). To
8 support the role of CFUGs as ES providers, their tenure rights or management (use) rights over
9 the ES resources should be acknowledged (Birch et al., 2014).

10 • **Capacity building:** As the ES approach is at an early stage in Nepal, capacity building of
11 government, private and community organisations is strongly suggested as being necessary for
12 successful implementation of the ES approach. Nepal must develop simple ES tools and
13 methods for assessment and evaluation of various ES that should be practical and
14 understandable to local communities, the business sector, and field-level experts. For this
15 reason, stakeholders need to be sensitised to the value of an ES framework as an instrument for
16 poverty reduction and the enhancement of local livelihoods. Developing technical knowledge
17 and skills among public, private, academic and community institutions needs to be a key
18 program for implementing an ES framework. In addition, developing the ES knowledge base,
19 including the implementation and dissemination of success stories from Nepal and abroad, is
20 equally important.

21 • **Application of a transdisciplinary approach:** The sustainable management of a CBF regime
22 based on an ES framework requires a critical understanding of ES supply and demand, their
23 synergies, and trade-offs both spatiotemporally and across a range of stakeholders. This
24 understanding is needed to inform policy design aimed at ensuring secure access to local
25 communities and fair distribution of benefits (Mastrangelo et al., 2015). A transdisciplinary
26 approach provides a platform for cross-sectoral engagement in defining the problem and in
27 setting a research agenda, which will further ensure that outputs are sufficiently user-inspired
28 and user-appropriate for tackling specific social-ecological problems (Harris and Lyon, 2013;

1 Sitas et al., 2014b). Using this approach, a wider group of stakeholders will be given the
2 opportunity to internalise the concepts of ES from local to national plans that positively affect
3 the decision-making process (Reyers et al., 2010, 2015). Though achieving transdisciplinarity
4 presents a substantial challenge in research and practice, integration of multiple areas of ES
5 research and effective communication will support more general institutional understanding and
6 implementation.

- 7 • **Innovation in the assessment of ES.** CBF has brought about various innovations for ES
8 management in Nepal that reflect how local communities value and manage the complex and
9 diverse mix of ecosystems, functions, and services. When we explore the interactions between
10 forest and people at a household level, we observe an even greater diversity of management,
11 local practices, and use patterns. These practices reflect strong linkages between ES and
12 livelihoods that depend on ES type, the nature of the market, and local institutions.
13 Furthermore, multiple factors such as tenure security, autonomy in decision-making and access
14 to benefits will drive innovations for managing multiple ES and adopting new ways of
15 contributing to livelihoods (Adhikari and Boag, 2013).

- 16
17 • **Multi-stakeholder platform for learning and facilitation:** Nepal's experiences of CBF show
18 that a network of experts and facilitators from various government agencies, non-government
19 agencies, civil societies, and international donor communities can be instrumental in initiating
20 capacity-building and awareness raising. The network would provide more efficient
21 communication that is necessary for improved understanding of global realities regarding ES
22 approaches and efficient decision-making (Sitas et al., 2014a). This type of problem/solution-
23 driven learning network would facilitate information flows and knowledge-sharing within a
24 transdisciplinary framework that fosters social learning and doing (Cowling et al., 2008;
25 Cundill et al., 2012). This type of network is of particular importance in the face of an uncertain
26 future and a changing climate (Keenan, 2015)

27

1 **4. Conclusions**

2
3 CBF has made considerable advances over the last four decades in Nepal, where favourable policies,
4 legislation and guidelines have provided a clear framework for implementation (Ojha et al., 2014).
5 The changing political landscape, the willingness of communities to innovate, and the support
6 provided by the government and international organisations are key reasons for this success (Gautam
7 et al., 2004; Ojha et al., 2014). In this respect, CBF in Nepal has won the confidence of a wide range
8 of stakeholders and an increased popularity in the community (Ojha et al., 2009) and the approach has
9 been expanded to other developing countries (MFSC, 2014a).

10
11 CBF in Nepal has demonstrated a capacity to increase the supply of many ES over the past four
12 decades (Paudyal et al., 2015) in contrast to a global deterioration in ES (e.g., Costanza et al., 1997;
13 de Groot et al., 2002; MEA, 2005). For instance, ES such as timber production, firewood, and fresh
14 water are declining in many parts of the world, but they have increased substantially in Nepal
15 (Paudyal et al., 2015). This abundance in ES flow results primarily from the efforts of local people to
16 convert degraded agricultural lands and grasslands to forests and increase forest density (Gautam et
17 al., 2002; Niraula et al., 2013) and have improved catchment values and the quantity of water for
18 irrigation and hydropower to downstream users (Bhandari et al., 2016). However, these multiple
19 benefits have not been quantified and are still not widely understood.

20
21 At present, the management of community forests is focused on the supply of ecosystem goods and
22 some services for domestic use. The ES from community forests are utilised by a wide community
23 locally, regionally and globally. However, few tangible rewards from these wider beneficiaries have
24 accrued to local communities. CFUGs therefore need to explore emerging financial opportunities by
25 utilising their strengths in operational innovation and organisational capacity. Linking CBF with the
26 ES approach and market instruments offers the potential for increased incentives for CFUGs to supply
27 ES. An ES approach can contribute significantly to a more sustainable management of resources and
28 add income that would be instrumental for livelihood improvement (Gurung et al., 2011). This will

1 require changes in institutional arrangements to promote a wider understanding, clear tenure and
2 ownership rights and sound science to support assessment and payment arrangements.
3
4 Mainstreaming of ES into policy and practice requires an understanding of the complex decision-
5 making processes across the various institutions involved in managing ecosystems. This paper has
6 contributed to an understanding of the background, benefits and challenges of including ES in CBF.
7 The trade-off between the growing need for food and fibre and life-sustaining services is complex.
8 Further research is needed to systematically assess the supply, delivery, and values of services derived
9 from diverse ecosystems. Decision-making needs to be based on sound research evidence. Such
10 research requires a strong transdisciplinary approach that fully engages local communities, academia,
11 policy-makers and other stakeholders.

12

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14

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18

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