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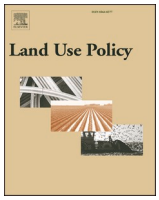

Community forestry in a changing context: A perspective from Nepal's mid-hill

Hari Krishna Laudari [a,b], Lok Mani Sapkota [c], Tek Maraseni [d,e,*,1,2], Poorneswor Subedi [f], Shiva Pariyar [g], Tika Raj Kaini [h], Shyam Babu Lopchan [a], Christopher Weston [b], Luba Volkova [b]

[a] Ministry of Forests and Environment, Singh Durbar, Kathmandu, Nepal
[b] School of Agriculture, Food and Ecosystem Sciences, The University of Melbourne, Australia
[c] Department of Forest Ecosystems and Society, Oregon State University, Corvallis, Oregon, USA
[d] University of Southern Queensland, Toowoomba 4350, Queensland, Australia
[e] Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences, Lanzhou 730000, China
[f] Ministry of Industry, Tourism, Forests and Environment, Gandaki Province, Pokhara, Nepal
[g] University of Canterbury, Christchurch, New Zealand
[h] Trichandra Multiple Campus, Kathmandu, Nepal

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ABSTRACT

Community forestry (CF) is one of the major forest management modalities in the world. A growing body of literature documents various outcomes and interactions of people with CF, but limited studies have assessed the mode of forest-people interaction considering changing socio-economic and environmental contexts by employing a broader theoretical framework. Our study employed Ostrom's social-ecological system (SES) framework accompanied by a meta-synthesis of peer-reviewed literature (n = 74), review of policy documents and census reports (n = 28), interviews with four stakeholder groups (n = 47) and group discussions with district-level forest user groups (n = 20), to explore the changed context in Nepal's mid-hills since 1990 s. The study revealed transformational changes in socio-economic and environmental contexts of Nepal's mid-hills compared to the conditions in which the CF was developed during 1990 s. Changes in the forces (or factors) of SES, including demography, socio-economic development, government policy and environmental discourse are so pronounced that its feedback to the social-ecological system is discernible. For example, the evolving dynamics have changed the mode of forest-people interaction and their relationship by altering land use practices, resource use patterns, farm-forestry linkage, and pool of human resources, which is reflected in diminishing participation, social capital, collective action, and (voluntary) contribution to CF management. Such (emerging) dynamics in the social-ecological system could further jeopardise CF institutions and their deliberation, weaken the forest-food security nexus, augment leadership gaps in forest management, and impede the country's efforts in achieving global climate and development goals. To revitalize CF in this changing context, we suggest that community forests should be managed in three different models: urban, protection and production by putting payment of ecosystem services in place. As Nepal is a global leader in CF and its policies are informing forest and land use policies around the world, the outcomes of our study could offer an insight to the decision-makers of other countries for recalibrating land use policies by considering evolving local and global dynamics and their feedback to SES.

1. Introduction

Community forestry (CF) shares the common goals of improving the ecological conditions of forests and increasing social and economic benefits to local communities through enhancing communities' access to and control over forests (Charnley and Poe, 2007). Community forestry

* Correspondence to: University of Sunshine Coast, Queensland, Australia.
E-mail address: Tek.Maraseni@usq.edu.au (T. Maraseni).
[1] University of Southern Queensland, Toowoomba, Queensland, Australia
[2] Senior International Scientist with the Chinese Academy of Sciences, China

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is a major form of forest management involving local communities in protecting and managing an estimated one-third of the forest areas globally (FAO, 2016; Laudari et al., 2020; Maraseni et al., 2019). In the last four decades, CF has received enormous global attention along with legal recognition and programmatic support from national governments. Initially, CF was developed to conserve forests, recognize the customary rights of forest dependent communities, and fulfil their forest products and livelihoods needs. More recently community forestry programs have been expanded to address inequality, tackle climate change, and achieve sustainable development goals (Aryal et al., 2020; Oli et al., 2016).

As CF programs evolve, their success depends on how well it aligns with the needs and capacities of local communities (Sapkota et al., 2020). However, the dynamics of rural landscapes, where CF is generally practiced, have substantially changed since the late 1980s when the current CF programs were designed (Fisher et al., 2018), thereby altering local communities' interactions with forest resources. For instance, the outmigration of youths is widespread, and the villagers' dependency on the CF is decreasing in many developing and middle-income countries such as Cambodia, Indonesia, Lao PDR, Thailand, and Vietnam (Poudel, 2019; RECOFTC, 2021). Such new development is likely to reduce users' participation in CF processes, which can potentially weaken CF institutions that rely on the effective and meaningful participation of local people for managing the forest sustainably (Agrawal, 2005). However, ongoing comprehensive outmigration limits the participation of the young population in the design and implementation of CF institutions and undermines the prospect of strong leadership that such institutions require (Poudel, 2019). Without the active leadership, capacity, and participation of local communities, the successful progression of CF can be in jeopardy (Baynes et al., 2015; Maryudi et al., 2012; Springate-Baginski and Soussan, 2003). It is thus essential to account for changing socio-economic perspectives as they affect the practice (governance) and outcome of CF (Agrawal, 2003, 2002, 2001; Agrawal and Chhatre, 2006; Charnley and Poe, 2007; Sikor, 2006).

To date, most studies have reported patterns and outcomes of interactions of people with their forests in the light of changing socio-economic and environmental contexts (Chettri et al., 2021; Feurer et al., 2018; Fisher, 2017; Fox, 2018; Jagger et al., 2022; KC et al., 2021; J. Robson and Berkes, 2011; Sapkota et al., 2019; Shahi et al., 2022; Takahashi et al., 2022) and are centred around exploring the impact of outmigration and/or remittance on forest transition or livelihood. Even recent studies are being mono-deterministic and mono-consequential. For example, the impact of only outmigration and/or forest transition on collective action has been assessed in community forestry systems, including Nepal, Mexico, India and Bhutan (Bista et al., 2023; Lorenzen et al., 2020; Poudyal et al., 2023; Smith et al., 2023; Sunam et al., 2021; Tripathi et al., 2020; Verma et al., 2021). A natural progression from these studies is to portray a bigger picture of the social-ecological system (SES) in which multiple factors interact with one another to produce multiple outcomes that affect institutions governing natural resources and land use practices. However, scholarship in this front is entirely lacking. For example, assessment of how the global changes or forces impact the socio-environmental dynamics within community forestry regimes (Hajjar et al., 2021b; Shyamsundar et al., 2021), and how the local and (inter) national communities' needs and capacities in managing CF have been changing, and how well they are responding considering changed context is still required (Pain et al., 2021). A better understanding of these dynamics and relationships will assist in identifying the scale and extent of interactions and navigating trade-offs and designing interventions that are suitable for local social and environmental dynamics (Hajjar et al., 2021b; Oldekop et al., 2021; Ostrom, 1990).

The aim of this study is to navigate how socio-economic, environmental, and institutional factors, impact socio-ecological systems in which CF is functioning. These factors include economic development (access to roads and markets), demographic composition, time poverty, and contemporary (inter) national forestry and environmental policies and discourses. We have chosen Nepal's mid-hills as a case because it is the region where the CF program was primarily conceived and originated in the country and has the largest number of CF among the physiographic regions (Laudari et al., 2022, 2020; MoFE, 2020). Another reason is that Nepal is regarded as one of the pioneer countries in CF and its policies are informing forest policies around the world (Laudari et al., 2022; Poudyal et al., 2020). The third motivation is that rural landscapes of Nepal, particularly of mid-hills have been subject to rapid socio-economic transformation (Chettri et al., 2021; Hajjar et al., 2021b; Sapkota et al., 2021; Shrestha and Fisher, 2018). A comprehensive analysis of these changes, as they could bring multiple implications to CF management, will assist in identifying better policy options for meeting the evolving needs and expectations of people. Our study is guided by three analytical questions: (1) what the socio-economic and environmental context for CF development was in Nepal during the 1990s; (2) what new trends and dynamics have appeared in Nepal's mid-hills recently; and (3) how the changes in a socio-economic, environmental, and institutional contexts are impacting CF process, institutions and deliberation, and forestry regime of the country. We consider that this study will have global implications given the context where countries' socio-economic and institutional contexts are changing and affecting their land use policies and practices.

2. Methodology

2.1. Theoretical framework

Forest and tree-based landscapes represent complex SES and support the livelihoods of millions of people globally (Oldekop et al., 2021). Community forestry is considered as complex SES as it includes initiatives, sciences, policies, institutions, and processes intended to increase local people's role in governing and managing forest resources (RECOFTC, 2013). It has been considered that all community forests as subsystems such as resource units and resource systems, governance systems and users interact to produce outcomes are not only affected by the outcomes and interactions but also are influenced by social, economic and political settings and related ecosystems of subsystems (Ostrom, 2009). The success of any CF management program requires the active participation of local communities, which depends on the extent it aligns with their needs and capacities in the management of their forests. The needs and capacities of a community regarding forest management depend on the context, which is a dynamic phenomenon. How people manage forests in relation to local-level governance institutions and forest conditions can largely be explained by political and economic forces that are directly or indirectly embedded in the local institutions (Sikor, 2006). These forces are often more important than local institutions for defining the future trajectory of forest management (Tucker and Southworth, 2005). The role of context, which affects the interactions between people and natural resources, is acknowledged in the framework for assessing the sustainability of the social-ecological system (Ostrom, 2009). The context for managing natural resources, including forests in any landscape, depends on social, economic, and political settings (Ostrom, 2009). In a social-ecological system, the following four factors are among the most influential factors that determine the context and shape the trajectory of CF, which we consider as a broader theoretical framework for our study (Fig. 1):

2.1.1. Economic development

Economic development in a landscape reworks relationships between stakeholders and provides economic opportunities to people. It does so by offering employment opportunities to people, better linking them with the market, and raising their incomes. It increases opportunity costs for people to participate in CF and changes their interests in forests (Lambin and Meyfroidt, 2010). The economic sub-system within

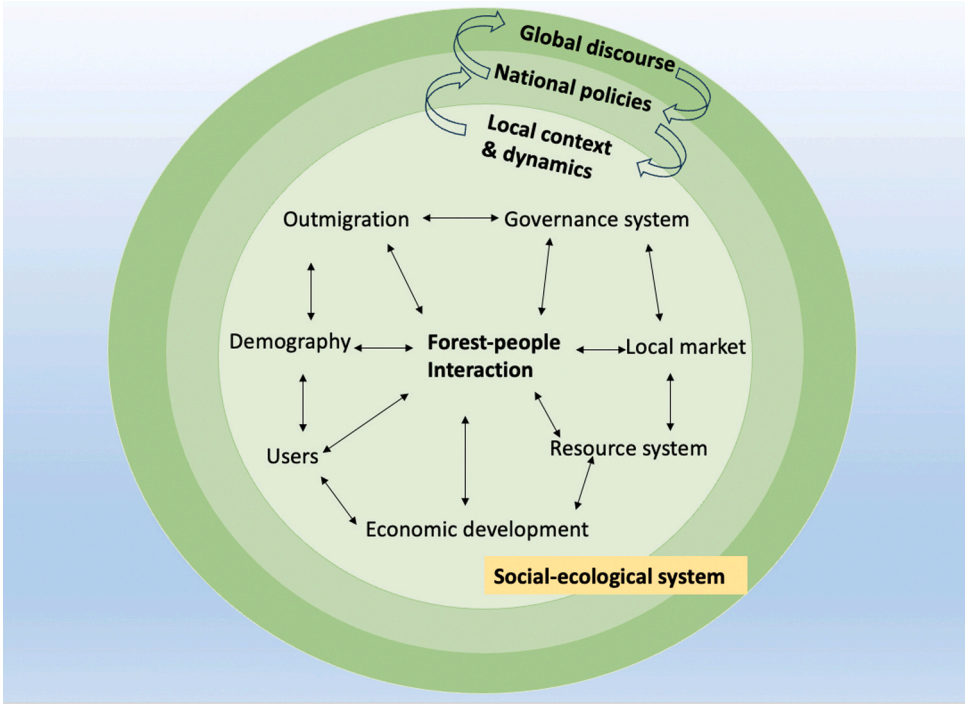


Fig. 1. Theoretical framework of the study.

SES interacts with the biophysical and social system, for example economic development may create enough non-farm jobs and pull farmers off the land and convert farmland into forests (Lambin and Meyfroidt, 2010; Young et al., 2006). Fig. 2.

2.1.2. Demographic composition

Demographic composition in a social-ecological system is affected by multiple factors such as population growth and mobility, including migration (Agrawal, 2003, 2002, 2001). It can directly impact how people participate in managing their forests. For example, reductions in population density, which ensue out-migration, meaning that fewer people participate in the management of forests thereby reducing care to forests or increasing expectations on remaining people (Bista et al., 2023). Similarly, a socio-ecological system comprising a smaller share of

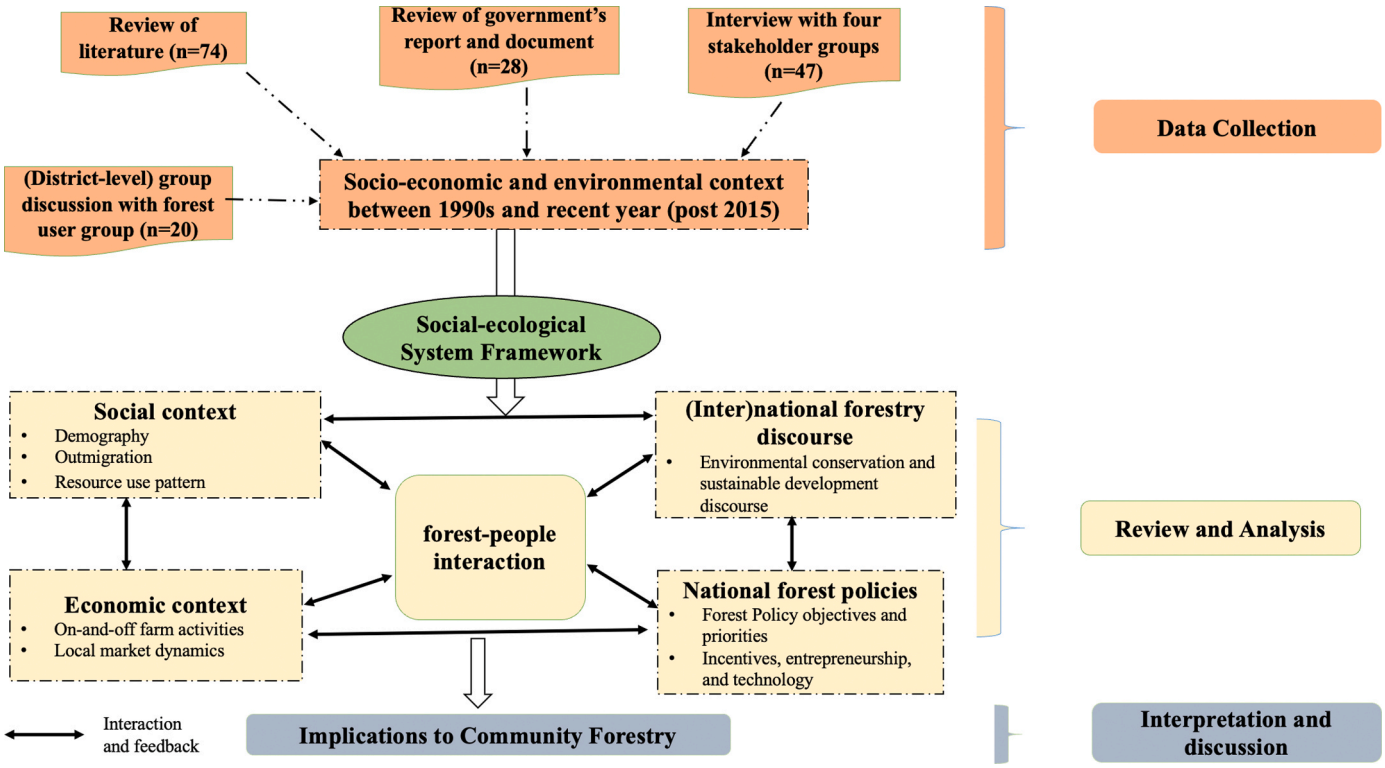


Fig. 2. Methodological approach adopted for the study.

the working-age population tends to contribute less to forest management because of its extreme nature of works (Robson and Berkes, 2011). Likewise, due to the close association between agriculture and forestry, a reduced share of farmers in a system also means fewer engagements in managing forests (Ojha et al., 2017).

2.1.3. Government resource policies

National and subnational policies directly and indirectly influence the institutions governing forestry and natural resources that are posited in a SES (Verma et al., 2021). In addition, the development of policies and programs encourages or discourages people from managing natural resources in multiple ways. For example, the policies related to forest resources management have a direct effect while those related to other sectors and the economy have indirect impacts (Grimble and Wellard, 1997). However, while the provision of incentives to local people for their participation in forest management has a direct positive impact, policies promoting migration or driving people away from farming reduce peoples' engagement in forest management (Aryal et al., 2023; Laudari et al., 2022; Sunderlin et al., 2005).

2.1.4. Global policy discourses

Global policy discourses often influence the institution of a social-ecological system (Bull et al., 2018; Ostrom, 2009). In particular, discourses relating to development and sustainability, such as sustainable development, climate change mitigation, and forest landscape restoration influence the collective management of forest resources (Lemos and Agrawal, 2006). They (in)directly affect the contexts of CF, for example, by influencing government policies and programs and changing countries' priorities (Milne et al., 2016). At the same time, the international discourses may also influence resources for CF, add complexity in CF management, and bring-in or cut off incentives for those involved in it (Hajjar et al., 2021a; Karky and Skutsch, 2010). Notable examples can be taken from REDD+ (reduced emissions from deforestation and forest degradation through sustainable forest management, forest conservation and enhancement of forest carbon stocks), which has not only changed the way of how decisions are made in CF, but it also has impacted benefit sharing mechanism and management practices community forestry resources (Chhatre and Agrawal, 2009; Ojha et al., 2019).

As multiple factors influence the sustainability of social-ecological institutions (Dessalegn, 2016), understanding the impact and outcome of a myriad of elements, including demography, socio-political and institutional factors and their linkage to CF institutions is important (Agrawal, 2003). This is not just to understand the shocks and uncertainties they create in the social-ecological system, but also to explore the opportunities they provide to existing forest management regimes, policies and goods and services of the forested landscape (Hajjar et al., 2021b; Oldekop et al., 2021; Shyamsundar et al., 2021).

2.2. Methodological approach

To map out the changes impacting forest-people interactions, we compared the context for two time periods: the 1990s and recent years. The 1990s is taken as a benchmark for CF in Nepal as the CF program was designed and formalized during the period as reflected in the 1988/89 Master Plan for Forestry Sector (MPFS) and 1993 Forest Act and 1995 Forest Regulation. For the current context, we focus on post-2015. The year was followed by substantial political and socio-economic changes and reflected in the promulgation of the 2015 Constitution of Nepal, federal restructuring, massive out-migration, and substantial significant expansions of rural areas' infrastructures and service sectors, affecting CF institutions and their deliberation. In addition, Nepal's commitment to achieve Sustainable Development Goals and the Paris Agreement climate target also started after 2015. Considering these perspectives and contexts, we divided our study into two parts: (a) before the 1990s and (b) recent years (post-2015) to reflect how the changed context has impacted the function and deliberation of CF, the mode of forest-people interaction, and socio-economic development of the country.

To ascertain the changing perspectives in the rural hills, we adopted a meta-synthesis approach to review existing Nepal-based literature and extracting contemporary information related to socio-economic and institutional change. Since meta-synthesis facilitates searching of knowledge pools related to a specific topic or research question and allows iteration of literature search and review of previous studies until constructing greater meaning and developing deeper understanding on particular phenomena or queries (Walsh and Downe, 2005) by weighing the results of each study (Lachal et al., 2017) and appraising and combining qualitative evidence to address research questions (Erwin et al., 2011). Before doing meta synthesis, we set the criteria that only the studies that describe the changing socio-economic and environmental context of Nepal and its implication to CF management were searched in a web-based scholarly database and selected for review. And then, we started comprehensive literature search, including book chapters, proceedings and peer-reviewed articles that were published between 1990s and recent year in the scholarly online database, particularly in 'google scholar'. The iterations of literature search, review of literature and synthesizing were continued until receiving adequate information and developing our understanding on evolving socio-economic perspective of Nepal's mid-hills and its feedback to forest-people interaction. In other words, the process of literature search and reviewing and synthesizing was interactive and deductive where the first three authors intensively engaged in the process. In the meantime, regular discussions and meetings were conducted amongst authors not just for resolving contradictory and debatable information but also for extracting evidence-based relevant information and improve understanding before describing and narrating evolving perspectives in a social-ecological system. For the final review and analysis, we screened 74 peer-reviewed literatures and 28 policies, survey/census reports and country profile (see, Annex A).

To get broader insights into the changing perspectives and dynamics of mid-hills of Nepal and triangulate and validate the gathered information, we conducted interviews with divisional forest officers ($n = 20$), forestry and environment-related policymakers ($n = 15$), and researchers and academia ($n = 12$) who participated in the seventh National Community Forestry Workshop held in Kathmandu, Nepal (June 12–14, 2022). To get more deeper insights on how socio-economic and institutional dynamics are evolving and impacting on forest-people interaction, we also conducted district-level group discussion ($n = 20$) with community forest user groups of mid-hills of Nepal. We purposively selected these research participants for the interviews because of their engagement in various aspects of CF process. Before doing interviews and group discussions with these stakeholders, we developed a questionnaire (see, Annex B). We then administered interviews (through phone call) and group discussions and requested the research participants to reflect on how socio-economic and environmental context of mid-hills of Nepal is altering and how it is impacting forest-people interaction and community forest management.

The collected information was then categorized into different themes such as socio-economic context, demographic and income dynamics, national resource policies and (inter)national environmental discourse. We then discussed and analysed evolving perspectives of Nepal's mid-hills and their feedback/interaction by employing the social-ecological system (SES) framework suggested by Ostrom (2009). Moreover, by using the SES framework, we explained and discussed how the changing context is reworking and altering forest and people's interactions within the complex yet evolving social-ecological systems in which community forests are functioning.

We employed a range of attributes, including social, economic, and institutional (local and global) suggested by Ostrom (2009) to navigate their impact on the sustainability of the social-ecological system, the CF in our case. Particularly, we assessed how demography, socio-economic and institutional settings are being changed; how such changes have

altered the interaction of people with forestry and other land uses; how the changing pattern of interaction is impacting the overall functions and deliberation of the CF institutions; and how the changed context is affecting overall forestry regime of Nepal. We then explored the possible pathways that CF needs to embrace for its sustainability for meeting evolving needs of communities. Fig. 1 and Fig. 2 illustrate the theoretical and methodological approach adopted for this study.

3. Results

Our study shows that the age-old agrarian-based economy of Nepal has been shifted due to unprecedented changes in socio-political, economic, and demographic systems. The major domains of change and their impact on forest-people interactions are summarized in the following sub-chapters.

3.1. Changing socio-economic, institutional, and environmental context

3.1.1. Socio-economic context

During the 1990s, agriculture and animal husbandry was the primary livelihood activity for most households in Nepal (CBS, 1996; Springate-Baginski and Soussan, 2003). Particularly in mid-hill, the dependency on forest resources was so intense that more than 87% of households used to collect firewood for cooking while the percentage of households using Liquefied Petroleum Gas (LPG) and kerosene was very low, nearly 1% and 5% respectively. The access to electricity of households living in rural areas was nearly 10% while the national average access to electricity was 14% (CBS, 1996). Organic fertilizer was either unavailable or unaffordable during that period.[3] Nearly 20–30% of people needed to walk for more than three hours to get access to the nearest facilities, including bank, market centre, paved road, and bus stop (CBS, 1996). Deforestation and forest degradation have also been serious problems in mid-hills (Acharya, 2002).

However, after 2015, the socio-economic scenarios of Nepal's rural areas have drastically changed. For example, the per capita income of Nepali people has been increased to USD 1381 in 2022 from USD 192 in 1990.[4] An increasing number of rural households have access to the facilities, including banks, market centres, paved roads, and bus stops (CBS, 2021a; NPC, 2020). With improved access to transportation and the contribution of remittances, the traditional rural economy has been changed to a monetized and cash economy (Kanel et al., 2012). Rather than producing and using local products, local people are highly dependent on market products (Gentle and Thwaites, 2016). Many households in mid-hills have switched fuelwood with biogas, LPG, and electricity to meet their energy needs (Baral et al., 2017; Poudel et al., 2018; Puri et al., 2017), with only 51.88% household using firewood for cooking in 2021(NSO, 2023). A total of 94.0% of the population of the country, and 88.87% in the mid-hills have access to electricity (MoF, 2022) while more than 26.6% of the total households in the country and 47.1% in the mid-hills use LPG for cooking (CBS, 2021b). Just in a decade, the import of the LPG in the country has increased by three folds as an alternative cooking fuel to kerosene and firewood (Bhandari and Pandit, 2018).

3.1.2. Demographic and income dynamics

Both demographic and income dynamics of Nepal have been significantly shifted over the past few decades (Paudel et al., 2021). During 1990s, the household size of rural areas, including hills was dense, with an average size of 5.33 persons (CBS, 2004). However, the average household size has shrunk to 4.37 persons nationally and 3.99 persons in the mid-hills in 2021 (NSO, 2023). Although the population in the country has continuously grown from 1980s, with an annual rate of 0.92% between 2011 and 2021, which is 0.43% less than that in the earlier decade (NSO, 2023). However, the mid-hills experienced a mere 0.30% annual growth and many districts in the region saw a population decline during the same period (NSO, 2023).

During the 1990s, very few people (nearly 0.6 million) migrated to the international labour market (IOM, 2019) while people heavily relied on subsistence agriculture for their livelihood with limited economic opportunities and the role of remittance in the rural economy was nearly 23% (CBS, 2004, 1996). However, after 2010, the movement of people to the international labour market has been doubled (IOM, 2019; Pain et al., 2021) and the trend of outmigration has been increasing till date (Bhattarai and Conway, 2021). Nearly six million Nepalese (around one-fifth of the total population) live in foreign countries and on an average 696 people per day have left the country for foreign employment in the last five years (NRB, 2021). Similarly, a total of 9.34 million people in the country and 4.02 million people from the mid- hill have been migrated from their residence and 40. 71% of households in the hill have family members, particularly youths, away from their home, according to the 2021 CBS census.

The share of youth migration to cities and abroad for opportunities, particularly jobs and education is so pronounced and higher (DoFE, 2016). For example, the trend of absentee population has been increased to 2.1 million in 2022 from 0.7 million in 2000 while women's absentee population has increased by 71% in recent years compared to 2011. Similarly, incidence of depopulation is rapidly growing in rural areas since 2011 (CBS, 2022). Because of rampant outmigration, fewer working-age males and a large number of female-headed households have occupied the hills and mountains (MoFSC, 2017). Young male (30–40%) populations are being out-migrated to seek employment while the ageing population is guarding their homes (Adhikari and Hobley, 2015; Fox, 2018; KC et al., 2017). The increasing movement of women to road-heads, nearby towns, or big cities to make their children educated has been a common phenomenon in mid-hills (KC and Race, 2019; Maharjan, 2015).

The remittance has become the largest single source of the national economy, equivalent to 30.1% of the country's GDP in 2018 (World Bank, 2018). The volume of financial remittance has significantly increased in the recent past from 2.54 billion USD in 2010/11 to 8.79 billion USD in 2018/19 (MoLESS, 2020), contributing two-thirds of Nepal's gross foreign exchange earnings (NRB, 2021) and poverty reduction (NPC, 2020). The proportion of households receiving remittances has also been increased rapidly over the last 15 years, from 23.4% in 1993/94 to 55.8% in 2010/11 (CBS, 2011a).

The young generations have little interest in on-farm activities, including agriculture, forestry, and animal husbandry because of low return and job availability in off-farm sectors (Gentle and Thwaites, 2016; KC and Race, 2019). It is estimated that households in Nepal derive 72% of their income from non-farm enterprises and remittances while farm income constituted only about 28% of total household income, a huge fall from 61% in 1995–1996 (CBS, 2011b). The share of income from agriculture and forestry is further decreased to nearly 12% in recent years (Khatri et al., 2021). Similarly, the share of agricultural employment decreased from 82.33% in 1991 to 65% in 2019 while the share of the non-agricultural sector employment increased from 18% in 1991 to 35% in 2019 (Bastola, 2020). In the mid-hills in 2021, only 57.92% of working age and economically active people were reportedly involved in agriculture, forestry and fishing while only 53.24% considered it as their major occupation (NSO, 2023).

3.1.3. National resource management policies

Nepal forwarded the policy idea of participatory forestry in a response to the rampant deforestation during the 1970s. The policy and institutional frameworks, including the Master Plan for Forestry Sector 1988/89, Forest Act 1993, Forest Regulation 1995, and Department of Forests (particularly the Community Forestry Division) and its local level units developed after the 1990s were instrumental in

[3] Discussion with forest user groups

[4] https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=NP

institutionalizing participatory forestry discourse in the country (Aryal et al., 2021, 2023; Laudari et al., 2020, 2021a, 2022). During this period, multilateral agencies such as the World Bank and bilateral agencies, including the United Kingdom, Switzerland, Australia and Denmark governments provided significant support to intensify community forestry (Laudari et al., 2020). Forestry staff used to frequently visit the CF and conduct several capacity development and awareness programs.[5]

The governance structure in which CF was primarily developed has now been changed because of the adoption of the federal system. The Constitution of 2015 has explicitly defined and delegated a range of legislative powers to federal, provincial, and local governments. For example, at the federal level, the Ministry of Forest and Environment, and the Department of Forests and Soil Conservation have been restructured to provide policy guidance to the provincial government. At the provincial level, the provincial ministry related to the forestry, Forest Directorate, Division, and Sub-division Forest Offices has been revamped to implement forest development activities, including those related to CF. However, most sub-division forest offices, from where the community forest user groups get the necessary legal and technical support for CF development, are facing understaffing problems.[6] At the same time, the engagement of donors in the CF development programs in recent years is substantially reduced compared to its earlier years. Instead, the government's budget is being mobilized for CF development. However, the allocated budget is inadequate to undertake CF management activities.[7] Due to these constraints and limitations, there are backlogs to renew Community Forest Operational Plans and has delayed implementing forest management practices (MoFE, 2018a; MoFE, 2018b). As the same time, community forest users' group in the mid-hills are becoming inactive and passive as those compared to the 1990s (Poudyal et al., 2023).

3.1.4. *(Inter)national policy discourses*

During the 1970s, Eric Eckholm postulated the *Theory of Himalayan Degradation* (Eckholm, 1976), and projected that the upland deforestation and soil erosion induced by population growth would induce downstream flooding and silting (Guthman, 1997). Because of such an environmental crisis narrative, many development sectors of Nepal started responding to the crisis through developing conservation-oriented policies and programs. The forestry sector was not an exception for adopting such an endeavour (Hobley, 1996). Particularly the CF program in its earlier years focused on addressing deforestation, livelihood, governance, and sustainable forest management issues (Ojha and Kanel, 2005).

It was only after the 2010s that Nepal's forestry sector started integrating broad-based global normative discourse into forestry sector planning and development (Chaudhary and McGregor, 2018; Laudari et al., 2020). The global discourses, particularly inclusive governance, sustainable development, reducing emission from forest-related activities (REDD+), and conservation and management of ecosystem goods and services have largely influenced the country's forest sector policies and plans (Banjade and Paudel, 2020; Bastakoti and Davidsen, 2017; Laudari et al., 2022, 2020). For example, the recent policy instruments, including Forestry Sector Strategy 2016–2025, National REDD+ Strategy 2018, Forest Act 2019, Forest Policy 2019, Climate Change Policy 2019, Environment Conservation Act 2019, and Environment Conservation Regulation 2019 have emphasized on inclusive approach for forest management by recognizing role of payments for ecosystem services, gender and social inclusion; private sector and entrepreneurship for increasing production and productivity of forests (MoFE, 2019; MoFE, 2018a).

[5] Discussion with forest users' group
[6] Interview with divisional forest officers
[7] Interview with divisional forest officers and policy makers

3.2. *Mode of forest-people interaction and its implications*

Nepal's mid-hills socio-economic context is being rapidly transformed in recent years due to unprecedented changes in social-economic, environmental, and demographic systems. Such changes have not only impacted the mode and pattern of forest-people interaction (Satyal et al., 2017) but also influenced the forest-livelihood nexus (Bhattarai and Conway, 2021). The major realms and modes of interactions and their implications are highlighted in the following sub-sections.

3.2.1. *Change in land use practices and resource use patterns*

The increased migration (national and international) led remittance has not only reduced the role of agriculture in rural livelihood (Blaikie et al., 2002; Fox, 2018), but also have shifted the demand for and the use of forest products (Poudel et al., 2018; Tiwari and Bhattarai, 2011). Land abandonment has been sharply increasing in Nepal since 2002 because of the outmigration of youth for foreign employment, rural-urban mobility, and labour shortages (NSO, 2023; Paudel et al., 2014; Paudel et al., 2014). Out-migration-led labour shortages and increased labour costs have further changed the cropping patterns and land cover of the mid-hills (KC et al., 2017; KC and Race, 2019). Nearly 1.03 million ha of agricultural land of Nepal is uncultivated while one-third of agricultural land across the mid-hills is near to abandonment (MoAD, 2014).

Increased instances of wildlife damage resulting from forest recovery have also led to more marginal land being abandoned for annual crop cultivation or converted to the management of trees and fodder (Pain et al., 2021). Because of the increasing land abandonment, tree regeneration on private land is increasing (Paudel et al., 2014; Tiwari and Bhattarai, 2011). Trees on private land have now emerged as one of the critical sources of fuelwood and timber supply in Nepal (Puri et al., 2017). The share of private forest for supplying fuelwood is increasing, nearly 37% to 72% (Puri et al., 2017) as compared to 20% in 1988 (HMG, 1988). In addition, the share of timber supply from private forests is very high, nearly 83% while the contribution from CF is only 10% (Amatya and Lamsal, 2017).

3.2.2. *Diminishing farm-forestry-livelihood nexus*

The significant shift in land-use practices and social systems has reduced dependency on subsistence agriculture and animal husbandry practices in Nepal (Fox, 2018; MoFSC, 2017). The global labour market has exclusively reduced the role of agriculture in rural livelihoods in the mid-hills but has led to higher living standards for many (Pain et al., 2021). Particularly in the mid-hills, where the farm, forests, and livestock used to be well-connected with the livelihood of locals have now disconnected and isolated (Fox, 2018; Paudel et al., 2014). Because of out-migration, infrastructure development and labour shortages, very few people are engaged in agriculture (Adhikari and Hobley, 2015; KC and Race, 2019; Khanal, 2002; Satyal et al., 2017). Similarly, the farm sizes have been shrunk to half over one generation (Pain et al., 2021) and agricultural productivity has been reduced due to increasing instances of underutilization and land abandoned (Dhakal and Khanal, 2018; Ojha et al., 2017). While on the other hand, livestock numbers have declined sharply in recent years (Pain et al., 2021). For example, the number of cattle or livestock units kept per household has decreased by almost five-fold from 2.38 in 1980 to 0.35 per household in 2017 (MoLD, 2017).

The remittance, on the one hand, increased the trend of land buying and kept it uncultivated. The return of migrants has induced the process of 'deactivation' meaning that migrant households are becoming less reliant on agrarian livelihood (Chettri et al., 2021). Moreover, very few shares of remittance are invested in agriculture and livestock enterprises (R.P. Acharya et al., 2019; Y. Acharya et al., 2019; Bhattarai and Conway, 2021; Sunam and McCarthy, 2016). While the improved road networks and better educational services have contributed to a gradual

shift from subsistence to a market-based economy (MoFSC, 2017). Because of the socio-economic and demographic change, there are diminishing activities on land, forests, and livestock (Pain et al., 2021; Poudel et al., 2018). The contribution of agriculture sector to the country's gross domestic product (GDP) has sharply declined from 49% in 1990 to 23% in 2020[8] while also reducing interest in the forestry.

3.2.3. Decreasing participation in CF management

The changes in the rural economy are impacting long standing forest-people nexus (Khatri et al., 2021; Shahi et al., 2022). As a result, people's participation in CF has been decreasing in recent years compared to the 1990s and the early 2000s (Pandey and Pokhrel, 2021). For example, many of the executive committees of CF user groups of mid-hills, where the major decision for forest management is taken, are devoid of young and energetic people (Shahi et al., 2022). Instead, vital positions of the CF users' committee are being occupied by ageing people where nearly 50–70% of positions of the committee are being occupied by 40–60 years old people. Even women are underrepresented in the executive committee despite the space created by the out-migration of young people (Lama et al., 2017) and the mandatory legal provisions (of at least 50% of the leadership positions).[9] CF is losing the attraction from local people as a form of collective action platform and the core institutional functions such as general assemblies have been just a ritual or completely non-existent (Paudel et al., 2021; Poudyal et al., 2023). On the other hand, there is a declining interest of youth to involve in CF activities and assuming leadership role in CF institutions (Khatri et al., 2021).

3.2.4. Decreasing voluntary contribution to forest management

Forest areas in the past used to be handed over to the local people based on their willingness and ability to manage it.[10] Many user groups of community forests at that time voluntarily arranged watchers to protect forests.[11] If watchers were not available, the forest users would assume self-protection of CF on a rotational basis. Forest management activities, including plantation, weeding, thinning, pruning, harvesting, fire line development, were done by forest user group by mobilizing their members voluntarily (NPC, 1998). The forest user group (as labour) used to share nearly 64% of the total cost of CF in the early 1990s (Pokharel and Nurse, 2004). As there is a growing trend of using paid labours for forest protection and undertaking silvicultural and tending operations (Rai et al., 2016), the voluntary contribution from forest user has been dropped to about 20% of the total cost (Basnyat, 2020). People are less actively undertaking forest management activities and utilizing forest products of CF than they used to do five years ago (Cedamon et al., 2021). A significant loss of labour from the rural economy through out-migration is occurring and impacting CF management activities (Marquardt et al., 2020).

3.2.5. Under-utilization of community forestry

Nearly 2.58 million ha of forestland of Nepal have been handed over as CF (MoFE, 2020). However, the CF of Nepal has not been able to produce anticipated outcomes in terms of forest productivity (Sapkota et al., 2020), income generation and job creation (Paudel et al., 2014d; Uprety et al., 2012), and biodiversity conservation (Paudel et al., 2021). The reason is that: (a) forest management activities under CF are mostly limited to removing dead, dying and diseased (3D) trees and leaf litter (Acharya, 2002; Poudyal et al., 2020) (Acharya, 2002; Poudyal et al., 2020); (b) forest products from CF are being seriously under-harvested (Acharya et al., 2022); (c) greater emphasis has been given on protection-oriented management to ensure forest conservation (Poudel et al., 2018; Shrestha and McManus, 2008); and d) CF is still adopting conventional harvesting (Pahari and Bhattarai, 2020) and seasoning practices practice.[12] Gradual alienation of CF from the local political and development discourse has substantially reduced investments in forest management, allowing forests to turn into dense thickets (Paudel et al., 2021). Under-utilization of community forestry resources have brought in several implications: (a) increased gap (~ 51%) in the supply of and demand for forest products in Nepal (MoFSC, 2015; Paudel et al., 2014); (b) reduced the income of community forest user groups[13]; (c) increased incidence of forest fire (Bhujel et al., 2022; Pandey et al., 2022); and (d) augmented human wildlife conflict (Acharya et al., 2016; Bista and Song, 2022).

Other notable implication and consequence is increasing demand for and price of timber in the country.[14] For instance, the country is compelled to import nearly five million cubic feet of timber annually (Nuberg et al., 2019) and squandering opportunity to generate revenue of 3.85 billion USD and creating 1.3 million full-time jobs annually from the forestry sector (MSFP, 2014) because of the adoption of protectionist forest management approach (Cedamon et al., 2021). Moreover, people residing in major cities of Nepal are compelled to buy local timber of Sal (*Shores robusta*) at a very high price of around 55–60 USD per cubic foot.[15] On the other hand, the quality and lifespan of the furniture products are being degraded and downgraded,[16] undermining the potential of CF to support local livelihoods and the national economy (Paudel et al., 2014). The potential of CF has not been realized because of several reasons, including but not limited to, the dominant conservation ethos at all levels of society (Nuberg et al., 2019), the higher start-up cost of forest management (Poudyal et al., 2019), and inadequate human resources caused by out-migration.[17] Inadequate investment from private sectors and cooperatives for entrepreneurship and enterprise development and poor access to the markets are further limiting forest user groups to reap maximum benefits from CF (FAO, 2016; Paudel et al., 2018).

3.2.6. Growing recognition of ecosystem services

During the 1990s, ecosystem services, except timber and fuelwood, accrued from CF were rarely traded in the market. However, the commodification of ecosystem services has increased in recent years (R. P. Acharya et al., 2019; Y. Acharya et al., 2019; Paudyal et al., 2017). The new discourses, for example, payment for ecosystem services and REDD+ have further increased the scope and enlarged the market of ecosystem services that flow from CF (Bhatta et al., 2014; Khanal and Devkota, 2020). Increasing number of hydropower projects, indicated by license issued to 113 projects above 1 MW with a capacity of 2004 MW by the Department of Electricity Development,[18] which relies on natural river flow in the mountains and are highly affected by land use upstream, has been contributing to the increased attention to community forests as means to sustain or increase water supply and secure future of Nepal in energy. Likewise, the increasing access to the market and changing priorities of forest user groups towards timber, carbon forestry, and eco-tourism have contributed to the commodification of ecosystem services in recent years.[19]

[8] https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?locations=NP
[9] Interview with divisional forest officers
[10] Interview with academia and policy makers
[11] Discussion with forest user group
[12] Interview with divisional forest officers and academia
[13] Discussion with forest user groups
[14] Interview with policy makers
[15] Interview with academia
[16] Interview with academia and policy makers
[17] Interview with policy makers
[18] the record is until 08 June 2022 available on the web page of Department of Electricity Development: https://www.doed.gov.np/license/54
[19] Interview with academia

4. Discussion

Our study shows that the context in which CF was evolved and developed in the mid-hills of Nepal is being rapidly altered due to substantial changes in socio-economic, environmental, and institutional settings. Because of the change, the CF, which had outperformed in its earlier years in terms of achieving its goals and objectives, is now facing several issues, including lower participation, poor deliberation, underutilization of its resources, and so forth. The summary of change in the forces of social-ecological system within which CF is functioning and their feedback to the (community) forestry regime of the country has been summarized in Table 1 and thoroughly discussed in the following sub-sections.

4.1. Evolving dynamics of social-ecological system and their feedback

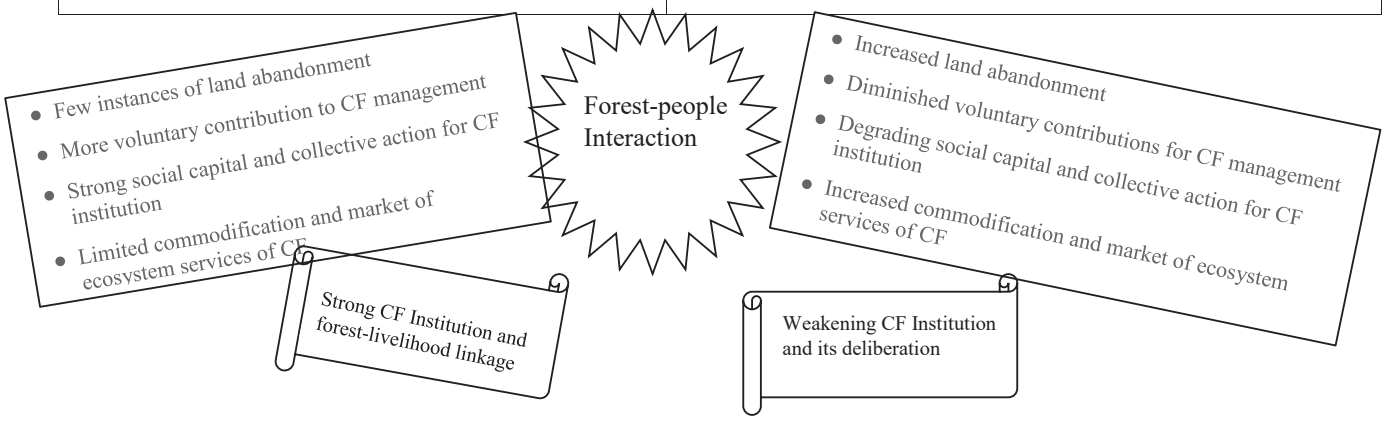
The CF was introduced in Nepal in such a socio-economic, political, and environmental background that out-migration was minimal, and agriculture and livestock husbandry practices were intensive. Furthermore, the country's economy remained well-connected with subsistence-based agriculture, forestry, and livestock, and local people used to make collective efforts to manage the forest resources during earlier years of the CF during the 1990s and early 2000s (Table 1). Increased participation in CF at that time was partly attributed to the pervasive poverty, subsistence forest and agriculture based economy, and limited livelihood options. Increasing participation in CF during the 1990s can be linked with the views of common resource pool theorists that a low number of migration and higher dependency of forest users on resources in a subsistence-oriented economy are the strong predictor of the sustainability of socio-ecological system, particularly community-based natural resource management institutions (Agrawal, 2001; Ostrom, 2009). High dependence on common resources and low migration possibilities might have encouraged forest users to devise strong institutions, including effective law enforcement mechanism for CF management of Nepal (Agrawal, 2001) during earlier phase of CF. Sizable village population of mid-hills during the 1990s could have magnified collective actions for community forest management (Heltberg, 2001).

However, in recent years, the participation of people in CF is decreasing because of change in socio-economic fronts: (a) increasing outmigration for the labour market; (b) increased income from off-farm activities, including remittance; (c) decreased poverty; and (d) increased supply of forest products from fallow land and private forest. The decreasing participation in CF could be linked to the notion of various scholars that: (a) collective actions amongst the users for managing the commons erode if the resource is abundant(Agrawal, 2002; Bardhan, 1993; Uphoff et al., 1990); and (b) increasing migration disrupts the social bonds of reciprocity and trust that are required for sustainable resource management (Curran and Agardy, 2002).

Our findings are consistent with previous studies that migration and remittance have multiple negative implications on social-ecological systems: (a) change in land-use practices, including a reduction in agricultural and livestock farming(Hecht and Saatchi, 2007; Schmook and Radel, 2008); (b) increase in land abandonment (Robson and

Table 1
Attributes of social-ecological system (SES), their evolving perspectives across different timescale, and its feedbacks to CF regime of Nepal's mid-hill.

Attributes of Social-ecological System and their evolving perspectives	
1990s	**Recent scenario (post-2015)**
Socio-economic factors:	
• Agrarian livelihood (nearly 90% of the population practicing farming and forestry) • Poor access to roads and market	• Mixed economy (contribution of agriculture sector on national GDP is decreasing) • Increased access to roads and market
Demographic dynamics:	
• Low mobility (internal and external migration) • Low number of absentee populations • Domination of working-age population at rural areas	• High mobility (internal and outmigration) • Increasing number of absentee populations • Domination of old aged population at rural areas
Governance and policy systems:	
• Centralized governance • Increasing donors' support for CF development • Low cost for CF management • Higher number of forestry staffs and budgets for CF	• Federal governance (three-tiers of government) • Very few donors' support CF development and extension • Increasing cost for CF management • Lower number of forestry staffs and budgets for CF
(Inter)national policy discourses:	
• Forest protection and environmental conservation	• REDD+, climate change mitigation and adaptation, disaster risk reduction



Berkes, 2011); and (c) impact on the forest product use pattern (Hecht et al., 2015), including reduction of firewood consumption (Xiujun et al., 2012). Some scholars, however, provide contrasting view that migration and remittance do not always threaten sustainability of socio-ecological system, rather it may even lead to agriculture and forest expansion(Davis and Lopez-Carr, 2014; Hecht, 2012; Hecht and Saatchi, 2007; Parry et al., 2010), and increase livestock production (Hovorka, 2012; Katongole et al., 2012; Wouterse and Taylor, 2008) if a large chunk of remittance is invested in on-farm activities as observed in various part of the world, including Latin America and Africa. But in our case, we found that little investment from remittance has been channelled back to the agriculture, livestock, and forestry sector, which is reflected as reducing farm and forestry linkage; increasing land abandonment; and decreasing forest-people interaction. Nevertheless, we agree that effects of outmigration are higher in more agriculturally suitable areas, which suggests that migration-driven forest transitions are influenced by agricultural production systems and likely to bring several implications for global efforts towards sustainable development, biodiversity conservation and climate change mitigation (Oldekop et al., 2018). In the context of Nepal too, if the trend of decreasing farm-forestry-livelihood linkage, increasing land abandonment and underutilization of the products of CF continue due to outmigration and remittance, it may increase the risk of food insecurity, amplify forest fire, augment human-wildlife conflict, impact biodiversity conservation, and increase the price of the timber. Such a likely impact would limit the prospect of CF in fulfilling forest product demands of local people and erode the long-standing legacy of strengthening forest-food security linkage, biodiversity conservation, and rural development. As Nepal is already experiencing a food and timber trade deficit, the additional challenges that are evolved from changing contexts would impede the country's efforts in achieving global climate and development related goals, particularly goal 2 (zero hunger), goal 8 (economic growth), goal 13 (climate action), goal 15 (life on land), and goal 16 (strong institution).

Our study further reveals that the change in population dynamics of mid-hills has also altered the gender division of labour in recent years compared to 1990s because of the increasing absentee (young and male) population accompanied by out-migration. Young people are showing no interest in continuing age-old subsistence practice and disconnecting from the agriculture-forestry and livestock domain due to high labour cost and low return (Table 1). Even the remaining population of the rural areas and mid-hills, primarily women and ageing people, have not been able to invest full time in CF because of time poverty and lack of leadership skills and expertise. Such a change has (in)directly contributed to a long-term leadership gap for advancing CF and has added risks and challenges to the CF program. The results of our study agree with those of previous assessments undertaken in different parts of the world that outmigration is limiting abilities of local communities in managing their forest resources (Poudel, 2019; J. Robson and Berkes, 2011; Robson et al., 2020; Robson and Berkes, 2011; Robson and Nayak, 2010; Shahi et al., 2022) and producing (negative) environmental consequences (Robson and Berkes, 2011). As the massive out-migration is unlikely to stop in the country in the near future (MoLESS, 2020) and youths show no interest in forestry affairs (Shahi et al., 2022), the function, deliberation and institutional process of CF and its future viability could be at significant risk, as also documented in other several countries, including India (Prateek et al., 2019) and Uganda (Ssekajja, 2021). The increasing education level of youth and the growing availability of fora for leadership development (in the committee of irrigation, road, tourism, and development, and political parties) in the country could further magnify leadership gap in CF management. Although some scholars articulate divergent views that intense outmigration reduces local people's commitment to forest resource management, and the locals become less rooted with agriculture, and forests create emergent opportunities (Robson and Klooster, 2019), our findings disagree with the notion that outmigration does not necessarily increase participation in CF management, rather it gradually keeps people away from forestry affairs and erode collective action required for managing the commons (Table 1).

Our study also found that the governance of CF in recent years has increasingly been influenced by new market forces. The instances of the commodification of goods and services of CF have been increased in the country in recent years compared to the 1990s and early 2000s (Table 1). The growing recognition of ecosystem services of CF is attributed to increasing (inter)national markets of ecosystem services for addressing global climate and development goals (Aryal et al., 2020; Chaudhary and McGregor, 2018; Laudari et al., 2020). These new developments could bring both opportunities and challenges (Chettri et al., 2021; Khanal and Devkota, 2020). For example, it could promote the unsustainable appropriation of goods and services of CF if a proper management model is not explored in the light of decreasing participation and leadership gaps in CF management. On the opposite site, it could increase the scope of CF in addressing local's needs and mitigating the global environmental problem considering the increasing commodification of ecosystem services of CF and their growing recognition by national policies.

We acknowledge that our study has some limitations. First, although our study shows that outmigration, remittance, demography, economic development, off-farm employment opportunities and (inter)national forest and environmental policies are producing feedback in social-ecological system (SES) and impacting (community) forest and people interaction, we were not able to quantitatively relative contribution of each and/or combination of these factors to the change in a SES and its sub-system. For example, only improved access to roads and rural centres does not necessarily dictate to reduce forest dependency of people. Instead, several other factors, including income from remittance, access to electricity, and incentive from governments could have an interplay for limiting forest-people interactions. Second, this study has limitation of how and to what extent and scale each factor establishes different relationships among themselves as a driver, mediator and moderator, and act as a casual pathway for producing different outcomes in SES and influences CF system. Because social, economic, and institutional (policies and discourse) factors not only act as drivers, mediators, moderators, or outcomes at times, but they also play a specific role within a casual chain. In addition, they can co-occur over space and time, interact multiple and complex ways, and influence the dynamics of SES (Oldekop et al., 2021), which our study has poorly navigated and thus warrants further research in future. Third, we also note that topographic and climatic conditions, increased instances of human-wildlife conflict and elite capture on accrued benefits as such determine and define the trajectory of CF but we have not assessed how these ecological and political factors are playing a role in the feedback loop, interacting social-ecological system of forested landscape, and impacting forest-people interaction. Lastly, we note that our study has analytical constraint due to lack of comprehensive and standardized datasets and limited availability of longitudinal data, which limit us to portray complete picture of how socio-economic and institutional contexts and other forces or factors over the time and space have shaped and impacted forest-people interaction in a complex SES of Nepal's mid-hill. However, we contend that this study has opened an avenue for undertaking further empirical research on these fronts.

4.2. Future trajectory of community forestry

Our study shows that the socio-economic and environmental context of Nepal's mid-hills is rapidly transforming. Changes in the forces (or factors) of social-ecological system (SES), including demography, socio-economic development, government policies and environmental discourse are pronounced and their feedback to the SES is notable. For example, the evolving dynamics have not just changed land use practices, resource use patterns and pools of human resource required to sustainably manage CF but also have modified forest and people

interaction and relationship. Being a part of SES, CF of Nepal is being impacted by these changes, which is reflected in diminishing participation, social capital, and collective action for CF management. If the policies and practices of CF continue to stick to the business-as-usual scenario (Cedamon et al., 2021) without considering evolving social-ecological process and changing context of Nepal's mid-hill, it will pose risks to the sustainability of CF and limit its prospects in addressing both local needs and global environmental problems.

To revitalize CF and better align its policy objective with the changing socio-economic context, it demands policy revision. Specifically, new form of CF modality that links its ecosystem goods and services to the market; provides income to local community and (sub) national government; and addresses changing needs and priorities of (inter)national governments is necessary and urgent. Because community forests, be it of the developed or developing world, provide provisioning as well as regulating services of global, regional, and local importance (Aryal et al., 2020; Gentle and Maraseni, 2012; Laudari et al., 2020; Paudyal et al., 2017) and increasing recognition and commodification its goods and services has further broadened its scope beyond forest and local administrative boundaries. We suggest managing CF into three different models: (a) urban CF, (b) protected CF, and (c) production CF by covering larger landscapes and putting the Payment of Ecosystem Services (PES) mechanism in place. CF around urban areas can be managed as urban parks to supply forest products and services that urban residents require, and management responsibilities of CFs can be given to forest user groups and local governments. Similarly, in rural hills, which can be seen declining population, forests can be managed for carbon, biodiversity, and soil and watershed conservation as protected CF. In this type of CF, the role forest user group would be undertaking conservation activities that demand less labour input, including plantation, fencing, and fire line construction and patrolling. While CF located in parts of lower mid-hill regions having higher growth rates can be managed as a timber focused CF so that youths could be engaged in forest management and receive income and employment, so that youths are retained in their villages.

Both provincial and federal ministries could play crucial roles in expediting and operationalizing PES in all three models of CF on the ground, as implemented in Vietnam (Pham et al., 2013). The provincial ministry could play a facilitating role in the process by assisting forest user groups in developing their institutional capacities to optimize and manage provisioning and regulating ecosystem services. While the federal ministries could provide strategic guidance in this regard by developing policies and institutional frameworks based on the principle of equity and respecting the rights of indigenous people and local communities. We suggest piloting these models at a small scale initially and upscaling them into a larger area based on the experience with adequate policy and institutional arrangements (Aryal et al., 2021; Laudari et al., 2020, 2021a). Issues such as conditionality in payments regarding the sustained delivery of the services, rights, and entitlements, and benefit-sharing may impede the PES process (Bhatta et al., 2014); but it should be resolved before it gets a larger shape.

To resolve other issues generated by socio-economic and environmental change, including tendencies of underutilizing least prioritized ecosystem goods and services and risk of forest fire and invasion of unwanted species and pests, we suggest improving the value chain of least prioritized forest products, including fuelwoods and small-sized woods. Value chain-specific measures, for example, sustainable harvesting and value addition through processing and product development and diversification of markets need to be employed to bring transformational change in the domestic furniture industry (Laudari et al., 2021b; Maraseni et al., 2022). Fiscal incentives and improving timber governance are equally important in this front. Such initiatives will have broader implications for minimizing increasing timber trade-deficit, reducing wood waste, and addressing demand-supply gap of furniture products, including engineered wood products.

Our findings and recommendations from Nepal's case study could have broader implications. The lessons drawn from Nepal could be relevant for other countries such as Cambodia, Indonesia, Lao PDR, Mexico, and Myanmar, which are at a relatively early stage (in terms of legal backup and coverage of CF) in the implementation of CF but are facing similar changes in socio-economic contexts (RECOFTC, 2021). While reforming policies and widening and strengthening CF programs to achieve their targets such as two million ha in Cambodia, 12.7 million ha in Indonesia, and 0.918 million ha in Myanmar, they can also consider how to adapt the CF programs to the changing contexts by better aligning them to the need and capacity of local communities (RECOFTC, 2020). Such considerations would not only help to speed up the implementation of the programs and achieve the CF targets but also timely identify evolving dynamics in social-ecological systems and adjust CF programs considering the changed context. Furthermore, recalibration of CF program considering the evolving perspective accompanied by changing socio-economic settings and environmental discourse is also proportionately important to translate various global and national commitments into action, including climate mitigation and adaptation targets, as mentioned by many governments such as Nepal and Indonesia in Nationally Determined Contributions (RECOFTC, 2021, 2020).

5. Conclusion

In this paper, we have used a Ostrom's social-ecological system (SES) framework to assess how change in socio-economic and institutional factors is impacting forest and people interaction by taking case of CF located in Nepal's mid-hill. We found that changes in the attributes of socio-economic and environmental factors are sufficiently pervasive to produce several negative consequences, including reducing participation, weakening social capital and collective actions for CF management. The evolving social, ecological and economic process and their interactions with SES have implications for land use practices. For example, it may disconnect local people from agriculture, forestry, and livestock enterprise; reduce collective action; increase the risk of forest fire and invasive species; and erode forest and food security linkages. More importantly, Nepal's CF may face the stark problem of the 'tragedy of commons' because of the change in the attributes of socio-economic and institutional fronts. These new and additional challenges that are induced from the changed context would eventually impede the country's efforts in achieving global (sustainable development and climate) goals. As the changed context has already altered the overall dynamics of SES in Nepal's mid-hill, we suggest readjustment in policy objectives of Nepal's CF.

Our findings could provide some lessons to land use practitioners, researchers, and policy makers working in different parts of the world. The first lesson is that change in income sources, population dynamics, economic development, and provisions (or mechanisms) in (inter)national policies could drive people away from farm and forestry enterprise. As a response to the changes in the elements of socio-ecological system, people may change their land use practices, which in the long run could impact the management of common pool resources. Second, interaction and feedback of socio-economic and ecological factors in SES could bring implications for institutions, resource units, and policies governing natural resources, which needs to be timely and rigorously navigated by researchers and practitioners. Third, if the evolving dynamics of SES remains unexplored and unaddressed on time, it could result in land use transitions, which may severely impact countries' efforts in addressing their development and environmental goals. Lastly, new challenges that may stem from shifting local and global (forestry) dynamics could be resolved by recalibrating policy objectives of national land use policies in line with evolving (inter)national environmental and development discourse and the need and priority of local communities.

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All (co)authors have no any conflict of interest on this paper.

Data availability

No data was used for the research described in the article.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.landusepol.2023.107018.

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