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Master's thesis

Community-based evaluation of stakeholder analysis methods: Case study from Nepal

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Abstract

Stakeholder analysis (SA) is the technique of identifying, investigating and differentiating stakeholders to prioritize involvement. It has been identified as a key resource which yields lasting benefits for diverse stakeholders in natural resource management (NRM) projects. This thesis attempts to tackle three main challenges faced in SA, identified as; top-down approaches, integrating diversity and lack of reflection. The combination of systems thinking (SES) and transformative learning (TL) theory enables the understanding and analysis of these challenges in SA. A novel three-phased participatory SA methodology was designed and implemented utilizing four methods; mind-mapping, participatory network mapping, generative picturing and consensus mapping. The methodology involves a mix of ex-ante and ex-post approaches to characterize participants' perspectives to the designed SA in a NRM project implemented jointly by BOKU, Tribhuvan University and Gaurishankar Conservation Area Project. In our target villages, we find that respondents reported a 'positive' experience with the methods used, agreeing that the three challenges were tackled in a holistic way. Although individual methods performed differently according to the assessed challenges, the whole methodology addressed challenge 1, top-down approaches, to the highest degree. This indicates that participants felt comfortable expressing their ideas, that the group accepted their inputs, and that their perspectives influenced method outcomes. We found that all learning objectives were addressed, but the methodology could improve in addressing TL elements social learning, and critical reflection and SES elements improving awareness around the systems connections and complexities. Taken together, it can be concluded that the SA methodology outlined in this thesis performed well at addressing challenges and achieving learning objectives, however, should be revised and adapted according to its identified shortcomings.

Keywords: stakeholder analysis, transformative learning, sustainable natural resource management, participatory methods, community forest

Zusammenfassung

Die Stakeholder-Analyse (SA) ist eine Technik zur Identifizierung, Untersuchung und Differenzierung von Stakeholdern, um deren Einbeziehung zu priorisieren. Sie wurde als Schlüsselressource identifiziert, um dauerhaften Nutzen für verschiedene Interessengruppen in Projekten zur Bewirtschaftung natürlicher Ressourcen (NRM) zu bringen. Diese Arbeit versucht, drei Herausforderungen anzugehen, mit denen SA konfrontiert ist: Top-down-Ansätze, die Integration von diversen sozialen Gruppen und mangelnde Reflexion. Die Kombination von Systemdenken (SES) und transformativem Lernen (TL) ermöglicht das Verständnis und die Analyse dieser Herausforderungen in SA. Eine neuartige dreiphasige partizipative SA-Methodik wurde unter Verwendung von vier Methoden entworfen und implementiert: Mind-Mapping, partizipatives Netzwerk-Mapping, generatives Picturing und Consensus-Mapping. Die Methodik umfasst eine Mischung aus Ex-ante- und Ex-post-Ansätzen zur Charakterisierung der Sichtweisen der Teilnehmer auf die geplante SA in einem NRM-Projekt, das von der BOKU, der Tribhuvan University und dem Gaurishankar Conservation Area Project gemeinsam durchgeführt wird. In den untersuchten Dörfern gaben die Teilnehmer/innen an, dass sie mit den angewandten Methoden „positive" Erfahrungen gemacht haben, und stimmten darin überein, dass die drei Herausforderungen auf ganzheitliche Weise angegangen wurden. Obwohl die einzelnen Methoden unterschiedliche Ergebnisse erbrachten, zeigte sich insgesamt, dass Herausforderung 1 (Top-down-Ansätze) am besten angesprochen wurde. Dies impliziert, dass die Teilnehmer/innen sich wohl fühlten, ihre Ideen auszudrücken, dass die Gruppe ihre Beiträge akzeptierte und dass ihre persönlichen Sichtweisen die Ergebnisse der angewandten Methoden beeinflussten. Wir stellten fest, dass alle Lernziele angesprochen wurden, sich allerdings unsere Methodik verbessern könnte, indem TL-Elemente des sozialen Lernens und kritische Reflexion und SES-Elemente berücksichtigt werden, um mehr Bewusstsein für die Systemverbindungen und -komplexitäten zu schaffen. Zusammenfassend lässt sich sagen, dass sich die in dieser Arbeit beschriebene SA-Methodik bei der Bewältigung von Herausforderungen und beim Erreichen von Lernzielen bewährt hat, für zukünftige Anwendungen jedoch an die festgestellten Mängel angepasst werden sollte.

Schlüsselwörter: Stakeholder-Analyse, transformatives Lernen, nachhaltiges Management natürlicher Ressourcen, partizipative Methoden, Gemeindewald

Affidavit

I hereby declare that I am the sole author of this work. No assistance other than that which is permitted has been used. Ideas and quotes taken directly or indirectly from other sources are identified as such.

Lauren Dietemann

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Date

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Abbreviations

BOKU	University of Natural Resources and Life Sciences, Vienna
CAMC	Conservation area management committee
CF	Community forest
COS	Carbon off-setting
GCAP	Gaurishankar Conservation Area Project
GDP	Gross domestic production
GM	General method assessment
GP	Generative picturing
Ha	Hectares
HH	Household
ICS	Improved cook stoves
LDC	Least developed countries
NGO	Non-governmental organization
NRM	Natural resource management
NTFP	Non-timber forest products
NTNC	National Trust for Nature Conservation
SA	Stakeholder analysis
SES	Social-ecological system
TL	Transformative learning
WBI	Workshop-based intervention

1. Introduction

In the wake of global environmental crises, natural resource management (NRM) development projects aim to implement the most effective and efficient activities which cultivate a transition to sustainability in development trajectories and management regimes (Diduck et al. 2012). Participatory NRM development and research projects operate within complex and dynamic social-ecological systems (SES). Such complexity presents unique challenges for projects, spanning across spatial and temporal scales, making sustainable NRM development appear as an elusive goal (Grimble and Wellard 1997). In order for projects to reach their objectives of improving the governance of multi-purpose resources within multi-actor systems, a more systemic approach to environmental concerns is paramount (World Bank 2011).

Cooperating and engaging with diverse and relevant stakeholders throughout the project has been recognized as one important aspect to be integrated into project logic (Reed 2008; Reed et al. 2009; Grimble and Wellard 1997; Eva Schiffer et al.). The initial challenge in all participatory projects is to identify relevant stakeholders in a fair and unbiased way, while prioritizing and engaging stakeholders for involvement with the project, without jeopardizing their interests or overburdening stakeholders (Reed et al. 2009; Eva Schiffer et al.; Schiffer and Hauck 2010).

NRM projects and conservation would need to better engage with the root causes of the problems, and improve stakeholder analysis (SA) pathways to better achieve development goals (Bodin and Prell 2011; Abson et al. 2017; Prell et al. 2009). Lacking this important step in a project can create or reinforce unhealthy power dynamics, resulting in further marginalization of already powerless groups, "a problem that is especially acute in development projects" (Reed et al. 2009, p. 1935). Driven by the growing awareness of stakeholder influence over governance of NRM, sustainable development initiatives are increasingly interested in integrating participatory stakeholder identification, engagement and analysis approaches into project logic (Prell et al. 2009; Reed 2008; Reed et al. 2009).

Participatory SA approaches can assist in defining aspects of a SES affected by a decision (Reed 2008), identify individuals and stakeholder groups who hold interest and/or influence the system at hand and prioritize stakeholders to cooperate and engage in the decision-making process (Reed 2008). Furthermore, SA can highlight local actors perspectives regarding conflicts in interests and facilitate negotiations among stakeholders to develop alternative strategies (Chevalier 2001) while incorporating joint learning throughout the analysis and engagement process (Leventon et al. 2016; Reed et al. 2009; Ravnborg and Westermann 2002).

SA is often not a priority in planning and implementation and done on an *ad hoc* basis, causing a project-long bias and lacking in viability (Reed et al. 2009). Additionally, basic principles for stakeholder engagement are often absent from project logic (Talley et al. 2016). These shortfalls are associated with the many challenges and constraints projects are confronted with, but also the under-developed and under-researched concepts, typologies and practical approaches to application for SA within projects (Reed et al. 2009). Methods used in SA are poorly developed (Chevalier 2001) and little understood in terms of their processes and potential outcomes, furthermore very few projects reflect on methods used, and if done, rarely in collaboration with participants (Talley et al. 2016). Additionally, academic articles and project reports often lack explicit descriptions of methods used for stakeholder identification and analysis (Leventon et al.

2016). In aims of filling this research gap a community-based assessment of methods was undertaken with a case study in Nepal.

The case study development project is 'Carbon Nepal', a carbon offsetting project (COS) led by University of Natural Resources and Life Sciences (BOKU), in collaboration with international partners, aiming to enable sustainable development of rural communities by participative implementation of carbon offset activities. In hopes of mitigating global risks imposed by climate change the projects activities aim to improve and integrate forest management and agroforestry, while decreasing fuelwood demand and emissions by introducing improved cook stoves (BOKU- CDR 2015). Activities aim to cultivate a self-sustaining climate protection which not only fix carbon but promotes ecological biodiversity, gender equality, international collaboration, as well as, local participation and education throughout the projects design and implementation process (BOKU- CDR 2015). Within the context of the case study, SA has not yet been undertaken due to resource constraints, but Carbon Nepal project would benefit from an improved understanding of the stakeholder environment surrounding forest governance. This case study also provides an opportunity to assess SA methods to deepen understanding of methods capabilities.

2. Research problem & questions

The defined research problem for this thesis is: Participatory natural resource management development projects, like the Carbon Nepal project, face many challenges during participatory SA. These challenges constrain projects in reaching their objectives of cultivating a transition to more sustainable natural resource management. This problem implies the research questions:

1. What are the *main challenges* of participatory stakeholder analysis in natural resource management?
2. Which approaches can address the *main challenges* in participatory stakeholder analysis?
3. What results do such approaches yield for participants?

Trends are interpreted and conclusions are drawn regarding the challenges faced in SA through reviewing the state-of-the-art literature,

3. State of the art – participatory stakeholder analysis

Literature specific to participatory SA approaches was reviewed to identify the main challenges faced when implementing methods of SA. My interpretation of these challenges follows (I), and are then summarized (II) in hopes of answer research question 1: What are the *main challenges* of participatory stakeholder analysis?

3.1 Overview

SA has developed in parallel disciplines including business management, policy, development and NRM yielding various methods adapted and applied to each unique discipline (Reed et al. 2009). This complicated development of method application and approaches has led to a gap in our understanding of 'how, when and why' different approaches are effective (*ibid*). Methods used for SA are not inherently participatory, however this thesis focuses on participatory NRM

development projects, and further aims like inclusions of local perspective, engagement and empowerment of stakeholders, therefore I use imply 'SA' to indicate participatory SA.

Participatory approaches have claimed to improve agency, capacity-building, dialogue, develop group identities and points of negotiation, while transforming adversarial relationships and equalizing unbalances power dynamics (Howard et al. 2018; Reed 2008) Others claim their potential to fuel broader engagement and co-ownership over project activities (Goodier et al. 2018) resulting in higher quality SA and engagement (Reed 2008). Local participation is seen as crucial to empower communities for change, mobilize collective action and aid in compromise amongst diverse stakeholders (Paudyal et al. 2018).

The framing of this thesis is based on the assumption that stakeholder participation throughout SA methods yields positive results for both the communities and projects (Reed 2008; Talley et al. 2016). Additionally, it is acknowledged that the extent to which 'positive results' are accomplished is dependent on the quality of the SA during implementation and throughout the projects lifecycle (Reed 2008).

SA within development and NRM, is a tool "for better understanding environmental and development problems and interactions through comparative analysis of the different perspectives and sets of interest of stakeholders at various levels" (Grimble and Wellard 1997, p. 177). I uphold Reed 2008's definition of SA as a process which aims to:

i.   Interpret aspects of the social-ecological system affected by decisions or actions associated with the focal natural resource s
ii.   Identify stakeholders associated with those element of the system
iii. Differentiate between and categorize stakeholders
iv.   Investigate relationships between stakeholders to prioritize involvement in the decision-making process

3.2 Methodological challenges

Identifying relevant stakeholders, engaging them in the project and motivating them for learning and change presents many challenges to project planning and implementation (Colvin et al. 2016; Prell et al. 2009), these difficulties can translate into deficiencies which persist throughout a project. An overview of these challenges practitioners faces during SA methodology follows.

Improper timing of SA implementation

SA approaches should be used from the beginning stages in a project's lifecycle, as early engagement with stakeholders is commonly cited as crucial for inclusive and high quality decision-making processes (Reed 2008). Development projects durations are often referred to as the project life cycle, with generally 4 phases of the life cycle, 1. Initiation, 2. Planning, 3. Implementation and 4. Closing (Adrienne Watt 2014). Early SA with relevant and actively responsible stakeholders can improve the impact and efficiency of project activities (Colvin et al. 2016a; Leventon et al. 2016). Unfortunately, SA often come too late, or are non-existent in project implementation.

Intercultural communication

Working in intercultural settings presents particular challenges for all of those involved. An example of such a challenge is in defining roles, terms, and objectives. Throughout different fields of NRM projects and in differing cultures, diverse understandings of 'stakeholder' and 'community' persist. This can lead to misunderstandings of approaches and the scope of SA and engagement, particularly within intercultural and transdisciplinary teams. Simple misunderstandings can lead to a misalignment in expectations of project activities. Ensuring culturally appropriate communication during SA is essential to ensure project and stakeholder objectives are met.

Integrating diversity

In NRM, often many diverse individuals and organizations play varying roles within the management of the resource with each stakeholders unique perceptions regarding economic, social and environmental realities (Grimble and Wellard 1997). However, "many environmental management initiatives do not encompass the diversity of stakeholder perspectives, and this disconnect can threaten the success of these initiatives" (Virapongse et al. 2016, p. 86).

This is challenging to navigate within an intercultural setting, particularly when diverging opinions translate into conflicts resulting in stakeholders unwillingness to collaborate (Adams et al. 2018). Participation during SA can reinforce existing power dynamics and discourage minority perspective sharing (Abson et al. 2017; Reed 2008). However, it holds the potential to transcend boundaries pushing towards the development of more equitable power roles while uncovering needs and interests of marginalized and under-represented stakeholder (Grimble and Wellard 1997; Abson et al. 2017; Reed 2008). It is critical that practitioners in NRM development strive to understand the relationships existing in multi-stakeholder environments and integrate the diverse perspectives to develop equitable project activities (Chevalier 2001).

Often the long-term success of a project requires policy change and inclusion of diverse stakeholders, therefore perspectives and opinions must be recognized, discussed and represented during the design and implementation of SA (Leventon et al. 2016; Reed et al. 2009). Inclusion can help to build bridges, shared purpose and identity among stakeholder, as well as motivate and build capacities for collective action (Howard et al. 2018). Furthermore, inclusion of the most marginalized people is essential is achieving the SDGs (Howard et al. 2018; Reed et al. 2009).

Motivate stakeholders for participation and change

Transformative change starts with stakeholder engagement and empowerment. To enable such change, stakeholders must be motivated for participation in the projects activities usually including learning new skills, changing of lifestyle, among other fundamental changes. Empowering individuals through project activities, can take two forms: "(i) ensuring that participants have the power to really influence the decision (Fiorino, 1990; Laird, 1993; Chase et al., 2004; Tippett et al., 2007); and (ii) ensuring that participants have the technical capability to engage effectively with the decision (Richards et al., 2004)" (Reed 2008, p. 2420). Clearly, it is not merely the opportunity to participate, but their ability to do so, their active engagement and gained capabilities (*ibid*).

Sometime stakeholders lack the perception of the problem or their perception doesn't align with the projects, restricting the incentive to change (Bodin and Prell 2011). This presents a challenge for project facilitators to engage and empower inactive or marginalized stakeholders for involvement in decision-making processes and change (Reed 2008). It is crucial to enable disempowered stakeholder to feel they have influence over decision-making processes (Virapongse et al. 2016; Leventon et al. 2016). This is of particular importance during the SA.

Lacking context

There is no manual or 'best practice example' of approaches to identify, analyze, engage and empower stakeholders within a participatory NRM development project. That is because these approaches must be contextualized to the locality (Howard et al. 2018). NRM is embedded in a complex SES with many actors holding a stake in governance on varying scales of jurisdiction, this presents a challenge as a SA practitioner (Adams et al. 2018).

SA approaches often lacks contextualization to the local SES (Colvin et al. 2016a), with approaches focusing on geographic or ecological systems, while neglecting the social, institutional and political behavior, in which the stakeholder's function and interact (Abson et al. 2017). Traditionally, these systems have been viewed with analytical thinking, with complexities being deconstructed for better understanding of each distinct system, however, this approach can lead to unintentional lacking's and potentially detrimental effects (Wals 2007). Problems occurring within NRM are inherently complex involving many actors, such sustainability problems cannot be resolved without considering the roles of these structures, value and goals that create and sustain the problems (Abson et al. 2017).

SES are ever in flux, often changing in non-linear and unpredictable patterns due to the fact that complex processes, relationships and interactions of many actors are influencing system dynamics (Howard et al. 2018). Approaching such complexities, projects should use integrated, system-oriented approaches (Wals 2007; Abson et al. 2017), combining scientific with local knowledges, in hopes of producing well-rounded understanding of the complex SES and its functioning's (Reed 2008). This sort of approach to complex systems, considers social, ecological, economic, and political spheres, as well as the potential influences of gender, culture and power dynamics (Goodier et al. 2018). Methods used in project activities must be adapted to the local SE context (Reed 2008).

Goodier et al. 2018 report based on five participatory research projects from Africa to Asia, compiled recommendations on how to create inclusive relationships through stakeholder engagement on two levels; first, "building shared purpose and identity, and capacities for collective action" and second "building participatory inclusion" (p. 4). These can be reached through a heightened awareness of the SES and the power dynamics at play (*ibid*).

Top-down approaches

'Top down' approaches remain the most common approach to SA within NRM development projects, which may result in identification of 'usual suspects' (Leventon et al. 2016) among other biases and deficiencies. This instrumental approach, relies on expectations, views and experiences of development practitioner for analysis (Colvin et al. 2016a; Reed et al. 2009), and the urgency of needs, legitimacy, and the influence of potential stakeholders in relation to the

objectives of the project (Prell et al. 2009). The failures of such top-down approaches has led to the formalization of 'bottom-up' community-based approach to NRM projects, appreciating the need for local participation in development projects (Fraser et al. 2006).

Two opposing approaches for stakeholder identification are identified by Prell et al. 2009, *Creating* vs. *Seeking*. *Creating* is the 'top-down' approach, meaning practitioners have a large influence on the identification process, while the opposing *seeking* approach is classified as 'bottom-up', meaning stakeholders directly create and influence the process (Colvin et al. 2016b). Both of these approaches come with confounding challenges and pitfalls (Prell et al. 2009). Top-down, or *creating*, approaches are criticized as causing imbalance in representation for a given community (Prell et al. 2009), as differing perspectives and contextual inputs are missing from the process making it inherently biased (Colvin et al. 2016b). This could potentially lead to misunderstandings and misinformation. *Seeking* to identify stakeholders can, inadvertently, re-enforce pre-existing social structures, tensions and divides, undermining projects efforts to involve stakeholders that need the intervention most (*ibid*).

SA processes must be planned and implemented mindfully to avoid these pitfalls. In combining approaches, practitioners can account for the interests of the whole range of stakeholders who influence and/or effect processes while balancing the strengths and weaknesses of each method (Colvin et al. 2016a).

Esoteric & rigid design

Although SA approaches should be well thought-out, that does not mean they should be rigid. Methodology should adapt to the context of the study areas as the analysis progresses (Reed 2008). Collaboration with diverse stakeholders, particularly during initiation of the project, allows for idea exchange and adaptations of project goals according to the needs and objectives of the stakeholders. This can help define projects roles. This co-creative approach can yield activities which improve stakeholders problem awareness, support, and active engagement, while fostering new connections and grounding them within the local context (Adrienne Watt 2014).

Identifying 'Usual suspects'

"Who is a stakeholder and who is not is a question of perspective" (Colvin et al. 2016b, p. 275)

Approaches to SA are inherently subjective and often lead to identification of the 'usual suspects', within communities, NGOs, government and private sector actors (Colvin et al. 2016a; Prell et al. 2009). Assessment are often based on a stakeholders relative power, influence and/or authority (Prell et al. 2009). Unconventional or historically marginalized stakeholders are often, unintentionally, excluded due to the subjectivity involved in the approach, institutional blind spots and a lacking in identification and engagement (Prell et al. 2009; Bodin and Prell 2011; Colvin et al. 2016a). This unintentional exclusion of important actors and subsequent lack of representativeness, can maintain or reinforce unsustainable power dynamics within the NRM system which can break down the space for meaningful discourse and engagement (Leventon et al. 2016; Prell et al. 2009). Participatory approaches to SA could be 'taken over' by the most powerful individuals or groups, which can further marginalize the least powerful (Howard et al. 2018).

Lack of reflection

In order to improve and push towards effective and efficient SA, it is essential for practitioners and stakeholders alike to reflect on the process and outcomes of methods used, why certain things went smoothly, while others failed. Methods used should be assessed in terms of understandability among stakeholders, verification, testability, justifiability, completeness, inclusiveness, feasibility, responsibility, embeddedness, usefulness and logic (Goodier et al. 2018). However, reflection on processes and outcomes in the literature is seldom and "even fewer did so in consultation with stakeholders" (Talley et al. 2016, p. 34). This deficiency can be ascribed to the underappreciation and lacking of analysis methods causing key characteristics for robust engagement to be overlooked (*ibid*). This can hinder methods evolution within the field. Self-reflection by participants and practitioner throughout the project lifecycle and upon completion allows "organizers to assess and redress challenges in the implementation" in hopes of improving the SA in the future (*ibid*, p. 6).

Yielding pragmatic benefits for stakeholders

NRM development literature highlights the need for meaningful participation of stakeholder in learning-based approaches, which enable knowledge sharing and production with a particular focus on 'learning' which can 'transform' unsustainable points of views and use patterns regarding NRM (Reed 2008; Diduck et al. 2012; Virapongse et al. 2016). Employing learning approaches while engaging with stakeholders is recognized as a useful guide to breaking "from unsustainable social-ecological interactions" (Diduck et al. 2012, p. 1312). Empowerment of individuals and communities through gained insights can guide this type of fundamental 'transformation' (Reed 2008). There are many learning theories and approaches which can be applied to SA, potentially yielding pragmatic benefits for all stakeholders (Reed 2008).

3.2 The three main challenges faced
Through reviewing the challenges outlined in the previous section, I provide and answer to my first research question by demarcating the three main challenges faced in participatory SA as:

1. Top-down approaches
2. Integrating diversity
3. Lack of reflection

4. Case study
The case study is set within a Carbon offsetting (COS) project headed by the Centre for Development Research at University of Natural Resources and Life Science (BOKU) in Vienna Austria. This section (I) details the project, (II) provides a synopsis of the social-ecological system for the case study region in Nepal.

4.1 BOKU-COS Carbon Nepal Project
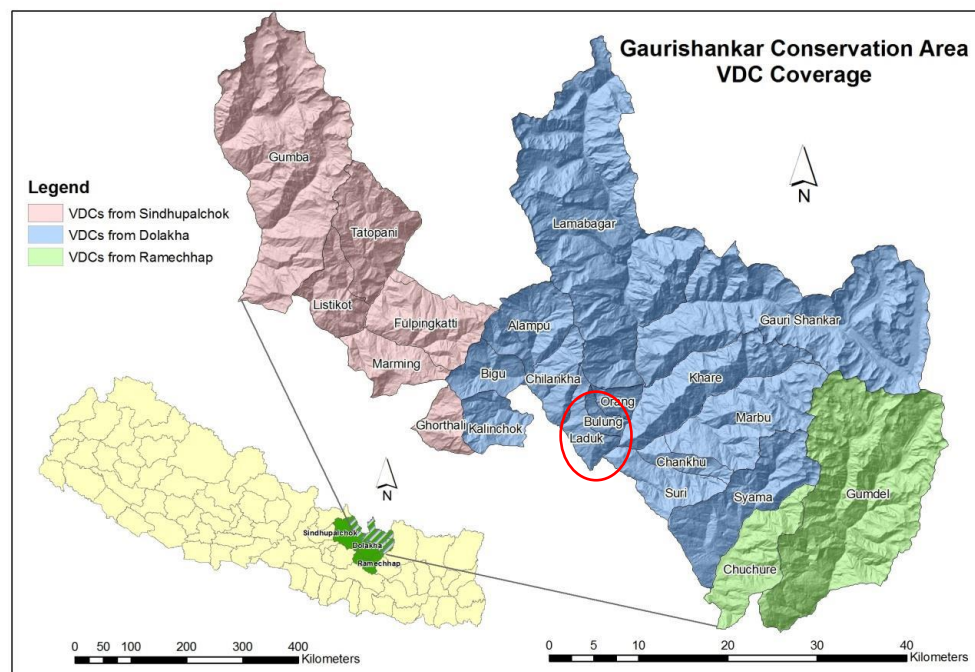
Figure 1. Gaurishankar Conservation Area Map, with the case study region circled in red (NTNC-GCAP 2017).

The BOKU-Carbon offsetting (BOKU-COS) projects allow individuals and companies to offset their greenhouse gas emissions by investing in sustainable rural development projects in LDCs. BOKU-COS projects aim to establish self-sustaining climate protection which protect ecological biodiversity and incorporate long-term social benefits like gender equality, participation and education, ultimately contributing to sustainable structural shifts (BOKU 2018). BOKU-COS hopes to international collaboration, through pilot project research and development, throughout design and implementation process (BOKU- CDR 2015). Pilot projects provide transparent International Panel for Climate Change quality standards in calculation methods (*ibid*).

This thesis focuses the BOKU-COS Carbon Nepal project, implemented within the recently established Gaurishankar Conservation Area Project (GCAP) in Nepal (Figure 1). Three Conservation Area management committee (CAMC) are the primary stakeholders and direct users of the forests which the project targets: the Timbu Mahadev Forest Conservation Management Sub-Committee, Fiste Dunga Forest Conservation Management Sub- Committee (Laduk village) and Thado Khola Forest Conservation Management Sub- Committee (Bulung village) (BOKU- CDR 2015). Carbon Nepal aims to promote and improve sustainable management of the three identified community forests, regarding forest management and agroforestry practices, as well as fuelwood demands by implementing improved cook stoves (ICS) (BOKU- CDR 2015). Improving management will improve the carbon sequestration in the forest, while use of ICS reduce future emissions (*ibid*). Carbon Nepal aims to improve stakeholders capacity for sustainable governance and utilization of forest resources and strengthen participatory NRM in the region (Bhandari 2017a).

4.1.1 Main activities

In cooperation with international and national representatives, reforestation projects and development plans were established using participatory methods with the CAMCs. (Bhandari, 2017a, Bhandari, 2017b). Since the project's implementation in 2015, the Kalinchock Utkrista Nursery was established at Patigaira, it is jointly managed by all the 3 forest conservation management sub-committee (Bhandari 2017a). There is a demand for not only timber species like pines, but also fodder and fruits species for use in agroforestry systems (Bhandari 2017a). On-site training workshops took place in April 2017. The workshops were based on a participatory process which identified needs of the three CAMC's involved in the project. The trainings were then adapted aimed at meeting some of the needs identified (Bhandari 2017b).

During the trainings, three PRA tools were adapted and implemented, including a historical timeline of forest management in the respective forests, an appraisal of the status of resources and services available from forest, and input for design measure for the project (Bhandari 2017a). From the information gained using these tools, ultimately training objectives were to:

    (1) promote sustainable utilization of forest resources,

    (2) strengthen participatory management of forests and pastures and

    (3) build capacity on sustainable management and utilization of forest resources

    (4) Promote energy saving devices such as ICS, back boiler etc. (Bhandari 2017a)

The participatory trainings aimed to create more sustainable forest management while also assisting the project in identifying potential sites for afforestation, improved forest management, as well as the nursery site. The total area of 131 ha were mapped with GIS software and yielded four degraded regions which need improved forest management, afforestation and/or grazing management (Bhandari 2017a).

The project is a combined research and development partnerships between BOKU and Tribhuvan University in Kathmandu, governmental offices as well as local NGO National Trust for Nature Conservation (NTNC), whom governs the GCAP. Though combining knowledges from all partners, valuable information has assisted in the understanding of the area and pathways for successful project implementation (BOKU 2018; BOKU- CDR 2015).

4.1.2 Challenges and deficiencies

Although, Participatory Research Approach (PRA) tools were performed during project planning and trainings, there remains a knowledge gap in regards to the social dynamics of stakeholders which interact, rely and govern the forests. During the workshop undertaken in April 2017, 2 of the 5 planned PRA tools were not used due to time and resource constraints, these were; 'social mapping' and 'assessing the access to resources and service' (Bhandari 2017a).

The social and cultural systems in Nepal are complex as communities abide by traditional practices dictated by the ethnic and caste groups. Additionally, multiple stakeholders influence how forest resources are utilized and "community rights are limited, guided by many rules and regulations" (Bhandari 2017a). These complexities present challenges to the project, as it aims for inclusive participatory planning and implementation, in terms of ethnic groups and gender. In order to successfully achieve the objectives of the Carbon Nepal project in building the

stakeholders capacity for sustainable management of forest resources and to ensure a participatory decision process as the project matures, it is essential to understand the social systems functioning's, how various stakeholders influence and transfer knowledge in the community as well as, their level of influence on others and decisions. Through implementation of a targeted participatory stakeholder analysis, insights into the social network could benefit all stakeholders allowing for more informed, locally-appropriate decision making.

4.1.3 Strategic needs

Feedbacks from participatory meetings allowed for stakeholders to communicate their needs. Many identified needs were common between the three Forest Conservation Management Sub-committee proposed activities and included

- Technical and financial support in permanent Nursery establishment, which provides:
  - Tree species
  - Grass and fodder species
- Technical and practical field-based trainings in
  - Block-wise forest management and conservation
  - Forest fire management and equipment support
- Financial support for poor households (HH) to obtain ICS
- Control of open grazing and establishing fodder species plantation for private land
- Information and display boards in periphery of forest (Bhandari 2017a).

4.2 Social-ecological system

In order to contextualize the Carbon Nepal project, a synopsis of the SES of the two villages where the project focuses are provided. NRM problems transcend forest, farm and village boundaries, especially in mountainous regions like Nepal were land is highly fragmented and jurisdiction is often complicated and heavily bureaucratic. This synopsis helps to establish the focus and delineates system boundaries for the SA (Reed et al. 2009).

I acknowledge that the deep history of this region has many implications for contextualizing the present situation and struggles which the villages face, however this historical perspective has been intentionally excluded [1]. Additionally, I have left out a general outline and perspective of community forest system of Nepal, as this long-established legislation, combined with centuries of tradition and practice has created a complex system around forest tenure in Nepal [2]. The summary provided in this chapter is informed via cited literature and my own participant observation during the two months spent in villages Laduk and Bulung. The chapter begins with a brief overview of the case study, then focuses on the social system influencing the community

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[1] For a deeper insight into the history of the region please refer to Dr. Gabrielle Tautscher's Anthropology study from 2016, unpublished study, Vienna, or DI Florian Peloschek's unpublished summary of the study, Vienna, from November 2016

[2] If the reader is interested in a more detailed explanation of the Nepali community forest system, I recommend the book, *Community Forestry in Nepal: Adapting to a changing world,* (2017) edited by Richard Thwaites, Robert Fisher, Mohan Poudel, Routledge,

forest stakeholder environment, and lastly briefly explains the forests governance within the GCAP.

4.2.1 Regional overview

The case study villages, Laduk and Bulung, lie within the Central Development Region in the Dolakha district of Nepal within the physiographical zone of the high mountain region (Forest Resource Assessment Nepal 2015). This region makes up about 20% of the total land in Nepal with an elevation range from 543 masl. to 4,951 masl. (Forest Resource Assessment Nepal 2015). Within the GCAP, Laduk and Bulung contain a comparatively higher number of community forest with 6 contained in each (NARMA consultancy pvt ltd 2013).

Table 1. Details of case study villages population and CFs – Laduk and Bulung (NARMA consultancy pvt ltd 2013).

Village	Total population (2011 census)	No. of HHs	No. of CFs	Area of CFs (Ha)	Area of CFs per HH (Ha)
Laduk	3663	928	6	1274	.91
Bulung	2043	510	6	724	.77

The average population density within the GCAP is 22.4 people per km^2, however within the case study ranges from 100-200 per km^2 exhibiting the highest population density with the GCAP (NARMA consultancy pvt ltd 2013).

Forests act as crucial natural capital in Laduk and Bulung, as they provide fuelwood, construction timber, grazing, tree lopping and use of forest litter on arable lands (The World Bank Group 2012; Giri and Katzensteiner 2013). In summarizing a socio-economic survey from 2011 in Table 1, it can be summarized that HHs within the GCAP

Livelihoods are based upon a traditional mixed farming system integrating crop and animal production. Landholdings remain small with the average of .99 Ha and marginal in quality (NARMA consultancy pvt ltd 2013). Subsistence agriculture persists in both villages, which provides for between 2 and 7 months of food security (Nico Eidenmüller 2017). In the 2011 survey, however, it was reported that food security in the case study from own production and permanent sources of income averaged to 6 months (NARMA consultancy pvt ltd 2013). 25% of HHs reported their main incomes source being from farming (*ibid*).

Animal husbandry remains integrated in farming systems and livelihood strategies. In fact the 2011 survey reports HHs keeping livestock amounted to 66% and 82.5% in Laduk and Bulung, respectively (NARMA consultancy pvt ltd 2013). About 32% of HHs reported their main income source being related to livestock (*ibid*). Livestock depredation within the case study was reported as a major conflict between the communities and the GCAP. In recent years these human-wildlife conflicts have increased within the GCAP (*ibid),* this can be correlated with an increased wildlife population due to the protection applied via the regulations of the NTNC. This fact has caused many tensions between communities and the GCAP, to be further discussed later.

The average income for Laduk and Bulung in 2011 was approximately 15,000 Nepali Rupees which classifies these communities in the 'non-poor' category, meaning on average the populations are living above national poverty line of Nepal (NARMA consultancy pvt ltd 2013).

However, when looking at poverty distribution, there is quite a disparity between the 'non-poor' HHs and 'very poor', with approximately 60% of HHs categorized as 'very poor', and about 31 % in 'non-poor' (*ibid*). Although the average classifies the population in 'non-poor' it can be concluded that a higher proportion of the population belongs to the 'very poor' category. In general, the poorer the HH the more resource dependent (Paudyal et al. 2018).

As of 2010 the number of tourists entering the GCAP at Singati began to be recorded and has increased from 141 in 2010 to 1740 in 2012 (NARMA consultancy pvt ltd 2013), showing promise for an increasing trend in tourism to the region. Although many tourism activities exist in the GCAP even the most popular tourism regions remain undeveloped and lack proper promotion

The devastating earthquakes of 2015 heavily impacted the Dolakha district, which increased local timber demand for reconstruction, further pressuring fragile forest resources (BOKU– CDR 2015). At the time of my research, reconstruction was still underway, as villagers indicated that nearly all of the structures in both Laduk and Bulung were destroyed in the earthquake.

4.2.2 Social system and village structure

The population can be characterized by multi-ethnicity and socially governed via the Hindu caste system (Tautscher, 2016). The caste system is characterized by "endogamy and hereditary transmission of occupation, status in hierarchy, customary social interactions, and exclusion" (Paudyal et al. 2018, p. 3). This traditional hierarchical social structure largely based on caste, ethnicity and gender, helps to shape local institutions in rural villages like Laduk and Bulung (Devkota, B., Thwaites, R., Race, D. 2017). Approximately 20 castes, each with their own identity, unique culture, traditions, and language, exist in the GCAP (NARMA consultancy pvt ltd 2013). These castes can be classified into 3 major categories listed from 'higher' to 'lower' castes: Brahmin/Chettri, Janajati and Dalit (NARMA consultancy pvt ltd 2013).

Table 2. Caste distribution of case study villages (NARMA consultancy pvt ltd 2013).

Village	Brahmin/Chettri	Janajati	Dalit	Other
Laduk	48%	44%	7%	1%
Bulung	40%	49%	11%	<1%

The caste-system directly influences the village structure. Both villages are further organized into tolls, according to their dominant ethnic or caste group. These tolls vary in size according to the population of that ethnic group and distances between tolls also vary. When comparing Bulung to Laduk, longer distances exist between tolls in Bulung, which means less interaction between castes.

4.2.3 Current status of forest governance of GCAP – NTNC

The land of both Laduk and Bulung were commissioned to the GCAP in 2010 under NTNC management on a 20 year agreement from the Government of Nepal (NTNC-GCAP 2017). GCAP is the third conservation area entrusted by the Government of Nepal to NTNC for management (*ibid*). The NTNC is an autonomous not-for-profit organization working to preserve natural sites in Nepal. The GCAP covers 2,179 km², encompassing 22 Village Development Committees in 3 districts (*ibid).*

The NTNC has general rules applied to the Conservation areas is governs, including;

- Private land timber is not allowed to be cut for five years after the declaration of a conservation area (from 2010 – 2015)
- No commercial trading of forest product is allowed from CF, except NTFP with compliance to NTFP Policy 2004 (Bhandari 2017a; NTNC-GCAP 2017).

Forest governance is now guided by the GCAP operation plan and district forest office, changing their governance from former 'Community Forest User Groups' 'to 'Forest Conservation Area Management Sub-committees', abbreviated as CAMC (Bhandari 2017a; NTNC-GCAP 2017). Under the NTNC operational plan, activities have been designed to improve forest management in hopes of increasing carbon stock in the forest and sustainable use of the resources but communities within the area remain largely unaware of sustainable management practices within forests (Bhandari 2017a).

In the past three decades, Nepal has focused on uniting participation, conservation and economic development, encouraging local involvement in conservation and NRM decision making with programs like community forests, sustainable tourism, and buffer zones to conservation areas (Paudyal et al. 2018). However, conservation projects produce costs, benefits and trade-offs for local communities and ecology (*ibid*).

Several interest groups have voiced their discontent with the decision making processes of the GCAPs establishment as being "undemocratic and non-deliberative" (Paudyal et al. 2018). The transfer of community forest user groups to CAMCs mean more bureaucracy involved in forest governance, lessening comprehension of governing processes among community forest members and users. The change in land governance has created conflicts among forest users and governors. Tautscher 2016 reported the GCAP office in Singati was demolished by villagers "ignited by the ban to transport the wood logs outside the GCAP" (p. 54). Conflicts persist between local communities and the GCAP, primarily regarding the local users access to forests and the change in community forest institutions (Paudyal et al. 2018). A central issue regarding local community's conservation participation is the lack of government's engagement with local communities after implementation (*ibid*).

The NTNC published a management plan for years 2013 to 2017, however there has been no update of this document for the recent year, 2018 or this year, 2019. Additionally, the GCAP has not yet issued a Conservation Area Management Regulation for its management and development, as other National Park and Conservation Areas under the NTNCs management have. These conflicts and lacking's have resulted in a knowledge gap amongst local stakeholder regarding land tenure, forest use regulations and GCAPs activities, ensuing a low level of local support and participation in conservation (Bhandari 2017a; Paudyal et al. 2018). Although the NTNC aims for inclusive local participation this has represented a challenge in the GCAP, with poor and socially disadvantaged groups receiving less direct benefits (Paudyal et al. 2018). Voluntary involvement of diverse stakeholders in conservation efforts represent another challenge, "as they were not properly identified and included during the planning stage" (Paudyal et al. 2018, p. 3).

3. Theoretical framework

To frame the research theoretically, social-ecological systems thinking (SES) and transformative learning (TL) theory are utilized. These theories address the main challenges in SA and guide the development of analytical framework, methodology, and data collection instruments. In the following chapter, I describe both theories, followed by their relevance for use in the context of SA in NRM.

3.1 Social-ecological systems thinking

Systemic thinking, or a 'systems approach', insists that components of a system interact with many others, creating numerous complex connections, feedbacks and synergies. A systems approach provides a holistic, integrative lens accounting for the interconnected nature of systems, which is seen as critical for understanding sustainability problems and creating solutions (Wals 2007).

In Berkes & Folkes 1998 book *Linking Social and Ecological Systems for Resilience and Sustainability*, the basis for approaching NRM problems using systems thinking is detailed. Authors assume that management of our environment is inevitable but argue that a fundamentally different approaches is needed to move on from 'conventional' resource management to a sustainability-oriented management approaches (Berkes et al. 1998). In re-framing our view of systems in a *wider range*, the approach emphasizes a 'people-oriented approach' to resource management, viewing society as integrated with their environment. SAS thinking was created as a scientific concept to assist in description and analysis of "human-in-nature systems" (*ibid*, p. 9) with a focus on the "ability of the management systems to respond to feedbacks from the environment" (*ibid*, p. 10).

Participatory NRM development project require cooperation between a variety of actors within complex and interconnected system components (van Bruggen et al. 2019). Systems thinking, and more specifically the concept of SES, provide a frame to understand the complexities of systems, which often constrict projects success. Participation in NRM development projects offer an opportunity for implementing non-formal educational approaches regarding social and ecological interconnections and synergies (Sinclair et al. 2011).

3.2 Transformative learning theory

TL, a framework for adult learning and development can be defined as, "a process by which previously uncritically assimilated assumptions, beliefs, values and perspectives are questioned and thereby become more open, permeable and better validated" (Cranton 2016, p. 27). TL has been applied in many contexts, from informal to formal learning environments, including application in NRM. The theory shows promise for application and further development in participatory NRM development as it provides processes of learning for guidance, concepts for investigation of learning outcomes, and constructs for understanding learning on varying scales of the social system (Diduck et al. 2012).

Mezirow's theory of TL uniquely addresses how our previous experiences and expectations directly influence how we attach meaning to various perspectives of our life. These *frames of reference*, act as our lens which we view the world and filter our experiences (Cranton 2016). Mezirow's seminal work in 1978 introduces the *perspective transformation* which he elaborated

throughout his career until 2009. The theory is based on constructivist learning, meaning humans construct meaning and knowledge according to their experiences (Cranton 2016).

TL theory is, uniquely, adult. Adult learning is considered voluntary, self-directed and often experiential and based on critical reflection and discourse (Cranton 2016). Adults are cognitively capable of self-determination, and this perception of self is required for self-reflection, something inherent to transformation within the theory, with subjects revising their view of self in relation to the world.

Kuhn's, Freire's and Habermas's works acts at the theoretical foundation of Mezirow's of TL theory (Kitchenham 2008). In 2000 Mezirow expanded on Habermas's differentiation of learning into three types: *instrumental, communicative* and *emancipatory* by adding one addition type, *perspective transformation*. Instrumental learning obtained through doing, or "the acquisition of technical knowledge" (Cranton 2016, p. 17). The second, communicative learning is through understanding or, the acquisition of practical knowledge and "derived from shared interpretation and consensus" (Cranton 2016, p. 22). These two knowledges comprise the majority of knowledge which is gained through adult education (Cranton 2016). The third knowledge, emancipatory, stems from the introspective critical questioning of the assumptions and origins which come out of first two knowledges, instrumental and communicative (Kitchenham 2008). *Emancipatory* learning is the transforming of *habits of mind* (Kitchenham 2008). The foundation of emancipatory learning lies in *critical theory*, both of which guided Mezirow's creation of *critical theory of adult learning and education* (Mezirow 1981 as cited in Cranton 2016). Emancipatory learning becomes transformative when the knowledges put into question are "found to be distorting, inauthentic, or otherwise invalid" leading to critical self-reflection and a *perspective transformation,* the fourth, and last learning type (Mezirow 1991; Cranton 2016, p. 55). Mezirow equated action through emancipatory learning to his *perspective transformation*.

We learn every single day as we encounter alternative perspectives which lead us to critically reflect our frames of reference, bringing into question our habitual expectations (Cranton 2016). The goal in creating TL theory is to help understand "how to negotiate and act upon our own purposes, values, feelings and meanings rather than those we have uncritically assimilated from others – to gain greater control over our lives as socially responsible, clear-thinking decision makers" (Mezirow 2003, p. 8; Cranton 2016)

Transformative change in coupled SES is required for sustainability transition of NRM (van Bruggen et al. 2019). This means changing our social realities, and the goals and paradigms on which it is founded, which in turn relies on our capacity to learn and adapt to changing circumstances (Sinclair et al. 2011; van Bruggen et al. 2019). TL is a promising theory with useful concepts to promote individual and social transformations (Sinclair et al. 2011). Additionally, TL provides a framework for designing and examining the nature and depth of the learning processes and outcomes while offering constructs for understanding the results of designed SA approach for participants (Diduck et al. 2012). TL can help facilitate individual and social changes needed for more effective participatory NRM development projects (Sinclair et al. 2011).

4. Analytical Framework

The following analytical framework aids in identifying and translating the theoretical framework for practical application to SA methodology, while also developing indicators for process and outcome analysis for each theory. I (I) identify elements from SES thinking theory, then (II) TL theory.

4.1 SES Elements

NRM development projects should aim to actively facilitate 'systems thinking' (Wals 2007). When systemic instruments are integrated into intervention design, reflection and learning are enabled and learners begin to notice and understand interrelations in the system structures (*ibid*).

Systems thinking and learning is "a critical component of learning based change for sustainability as it assists people to understand the systems they are attempting to change" (Wals 2007, p. 119). In cultivating social-ecological learning, our views of phenomena, and our relations to these phenomena can transform. In changing perceptions of society regarding the complexity of our systems lies potential for the cultivation of sustainable development (Petrosillo et al. 2015).

SES has become a wide-spread lens for framing natural resource management systems, particularly those which are built on common pool resources, or "local common property systems", like the community forest system in the case study (Colding and Barthel 2019). Within the context of SA and the case study, 3 SES analytical elements were identified (Figure 2), which informed SA methodology design, as well as, analysis instrument.
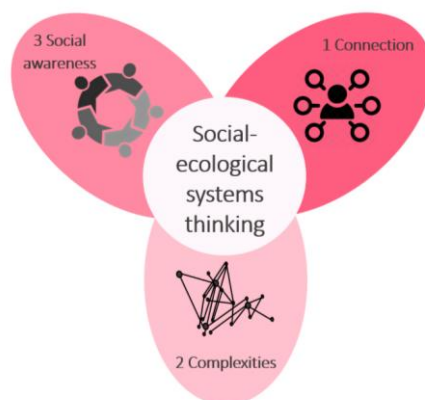
Figure 2. Social-ecological systems thinking elements – identified as the analytical framework.

4.1.1 Connection

The connection between ecological systems and management practices is the local ecological knowledge, which is considered critical to understand the many dynamics which inform sustainable use practices (Colding and Barthel 2019). SES contain ecological and social units which "interact interdependently and each may contain interactive subsystems as well" (Anderies et al, 2004 as cited in Colding and Barthel 2019, p. 6). Making these connections explicit could aid in gaining the knowledge needed for transitions to sustainability.

4.1.2 Complexities

The interconnected nature of social–ecological systems implies complexities, with many dynamic interactions across spatial and temporal scales (Petrosillo et al. 2015). The SES theory views these complex dynamics through a holistic lens, explaining how crucial mechanisms influence whole system dynamics (Petrosillo et al. 2015). However, the framework also recognizes that nothing is static within systems, that systems behavior is chaotic with many different stable states possible (*ibid).*

4.1.3 Social awareness

Within SES, social systems are viewed as an integrated part the whole system, with forces resulting in changes in ecosystems, both direct and indirect, with positive, neutral and negative effects (Petrosillo et al. 2015). Authors argue that it is "necessary to turn social actors' attention to a view where society and nature are coevolving in the biosphere" (*ibid,* p. 3).

4.2 Transformative learning elements

TL has been applied in many contexts, including application in NRM. It shows promise for application and further development in participatory NRM development as it provides processes of learning for guidance, concepts for investigation of learning outcomes, and constructs for understanding learning on varying scales of the social system (Diduck et al. 2012). Additionally, it has been shown that the transformative potential of participation in projects would increase, "with more opportunities for the public to participate in decision making at the normative and strategic phases of project planning" (Diduck and Mitchell 2003, p. 1320).

I uphold the belief that in hopes of cultivating a 'transition to sustainability', transformation must be cultivated on individual and collective levels, yielding a deep shift in perspective. For application and assessment of TL theory to SA methods, six main elements of the theory were identified. These elements depicted in Figure 3 were used to guide SA method design and assessment (Probst et al. 2018; Mezirow and Taylor 2009)
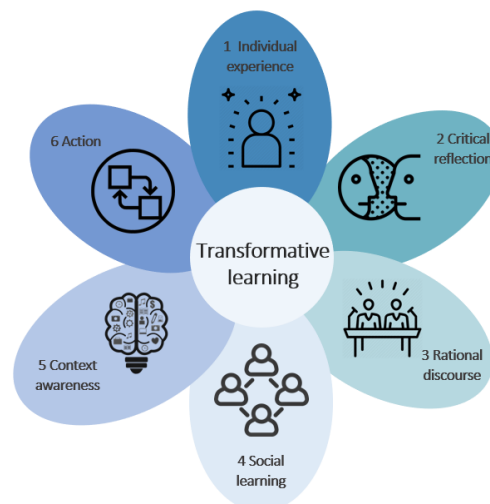
Figure 3. Transformative learning elements – identified as the analytical framework.

4.2.1 Individual experience

Individual transformation causes "a person calling into question her or his assumptions, beliefs, and values" (Cranton 2016). Mezirow highlights this individual experience as a personal

'dilemma' which allows for transformation. These dilemmas can be the first steps within a transformative learning process as they can catalyze self-reflection, shifting views of themselves, and their relation to society, environment and the world. Mezirow's TL theory emphasizes individual transformation as an essential prerequisite to social transformation (Cranton 2016).

4.2.2 Critical reflection

Reflection is defined as, a "process of reconsidering experience through reason, reinterpreting and generalizing the experience to form mental structures" (Fenwich, 1998; Mezirow, 2003b as cited in Cranton 2016, p. 26). Critical reflection is an examination of ourselves, our beliefs, the world, the many systems which they operate and how these things influence or are influenced by 'external' forces (Wals 2007). Critical reflection plays an essential role in transformative learning (Kitchenham 2008).

This critical view assists learners to "participate more fully and freely in rational discourse and action, [while] advancing developmentally by moving toward frame of references that are more: inclusive, discriminating, permeable, critically reflective, and integrative of experience" (Mezirow 1991, p. 247). This statement acts as the core of TL theory.

4.2.3 Rational discourse

Rational discourse acts as a red thread throughout the conceptualization of TL theory, and is defined as "dialogue involving the assessment of beliefs, feelings, and values" (Cranton 2016, p. 83). In discourse, we rationally and collaboratively explore ours and others perspectives, insights and information (Diduck et al. 2012). Certain conditions must be met to encourage such critical discourse and include: access to accurate information, openness to alternatives, freedom from coercion, objective assessment of arguments, the ability to critically reflect on one's own assumptions, equal chance for participation, and an accepting disposition towards discursive outcomes (Diduck et al. 2012)

4.2.4 Social learning

The basis of the theory is 'constructivism', which implies the construction of meaning through interaction with others. Social learning utilizes 'systems thinking', used in SES theory, to understand connections and synergies within a social setting. Individuals do not learn on their own, but are influenced by past experiences and the resulting frames. This validates learning as inherently social, emphasizing the importance of interactive knowledge sharing and creating, both important aspects of the TL process (Cranton 2016).

The social aspects of TL theory "involves calling into question social norms, social values, and issues related to oppression, abuse, brutality, violence and war" (*ibid,* p. 42). This kind of learning implies "not only structural change in the individuals way of seeing himself or herself and the world but also structural change in the social world that provides the context for the individuals life" (Cranton 2016, p. 51)

4.2.5 Context awareness

TL should guide learners to examine their content (or previous actions), process (or origins of meanings) and premise (the basis of the content) (Cranton 2016). Through enhancing awareness of an individual's understanding of their context, the other elements of TL can be actuated.

4.2.6 Action

TL theory is based on Habermas's theory of communicative action which emphasizes cooperation, deliberation and communication among actors in order to coordinate action (Habermas 1984). With this theoretical basis the ultimate goal of TL became "to gain greater control over our lives as socially responsible, clear-thinking decision makers" resulting in "beliefs and opinions that are more reliable guides for our choices and actions" (Mezirow 1997 as cited in Diduck et al. 2012, p. 1314). Therefore, the outcomes of TL is based on a new perspectives and are acted upon with action (Merriam et al. 2007 as cited in Diduck et al. 2012). Action is in this final applied stage of TL.

5. Methods

This chapter (I) provides an overview of the main methods used in the SA, and (II) describes the methods used for data collection and analysis. For a more explicit explanation and practical guide, including times and material requirements refer to Appendix A.

5.1 Participatory stakeholder analysis methodology

SA methods were chosen and strategically combined according to their ability to:

i) Provide required data needed to undertake a SA,
ii) Address the three main challenges faced in SA,
iii) Yield pragmatic results for participants according to chosen identified frameworks, TL and SES thinking,
iv) Be technological and intellectually accessible,
v) Comply with targeted case study communities geographical, cultural, economic and ecological realities.

These guidelines account for both the needs of the stakeholders and the project simultaneously, by enhancing communication between stakeholders of the community forests, creating space for TL and action, while also meeting strategic needs of Carbon Nepal by collecting data needed for SA. This resulted in a flexible multi-method approach which was adapted according to field conditions and experiences (Figure 4). Methods were implemented in three phases; the first a workshop-based intervention (WBI), the second individual interviews, and the third phase the second and last WBI. Methods highlighted in yellow in Figure 4 are those which were assessed by participants.
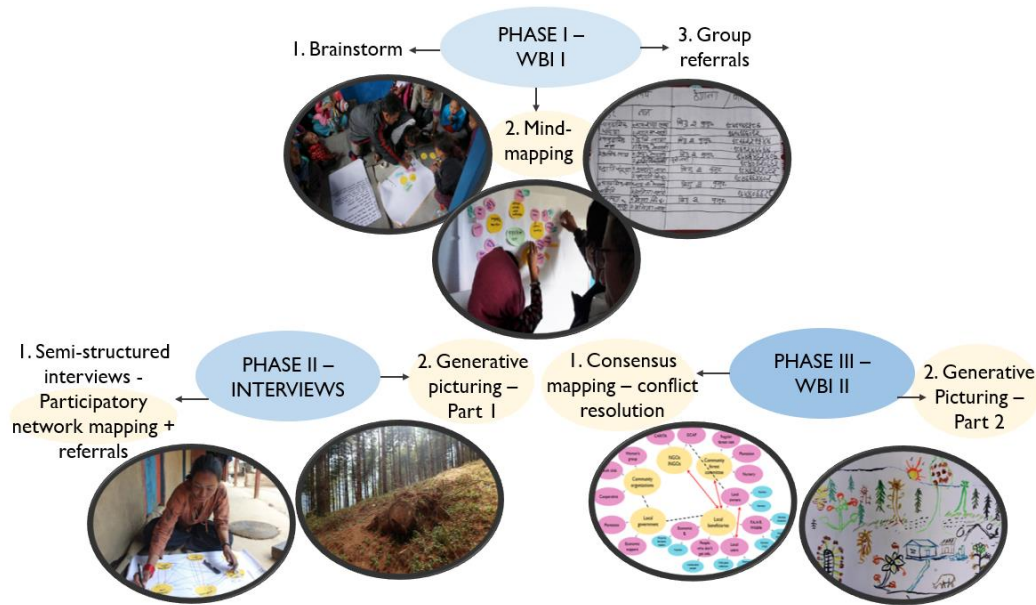
Figure 4. Three-phased participatory stakeholder analysis methodology progression – assessed methods highlight in yellow.

Workshops took place in municipal spaces, the school in Laduk and community center building in Bulung. We provided food and drink for the workshop participants, to acknowledge their time commitment. Demographic data collected via sign-in sheets provided data regarding representation of participants, these are summarized in Figure 5. When summing participants from phases I to III, a total of 121 participants was reached, however the sample size for representation measure differs due to uncompleted forms.
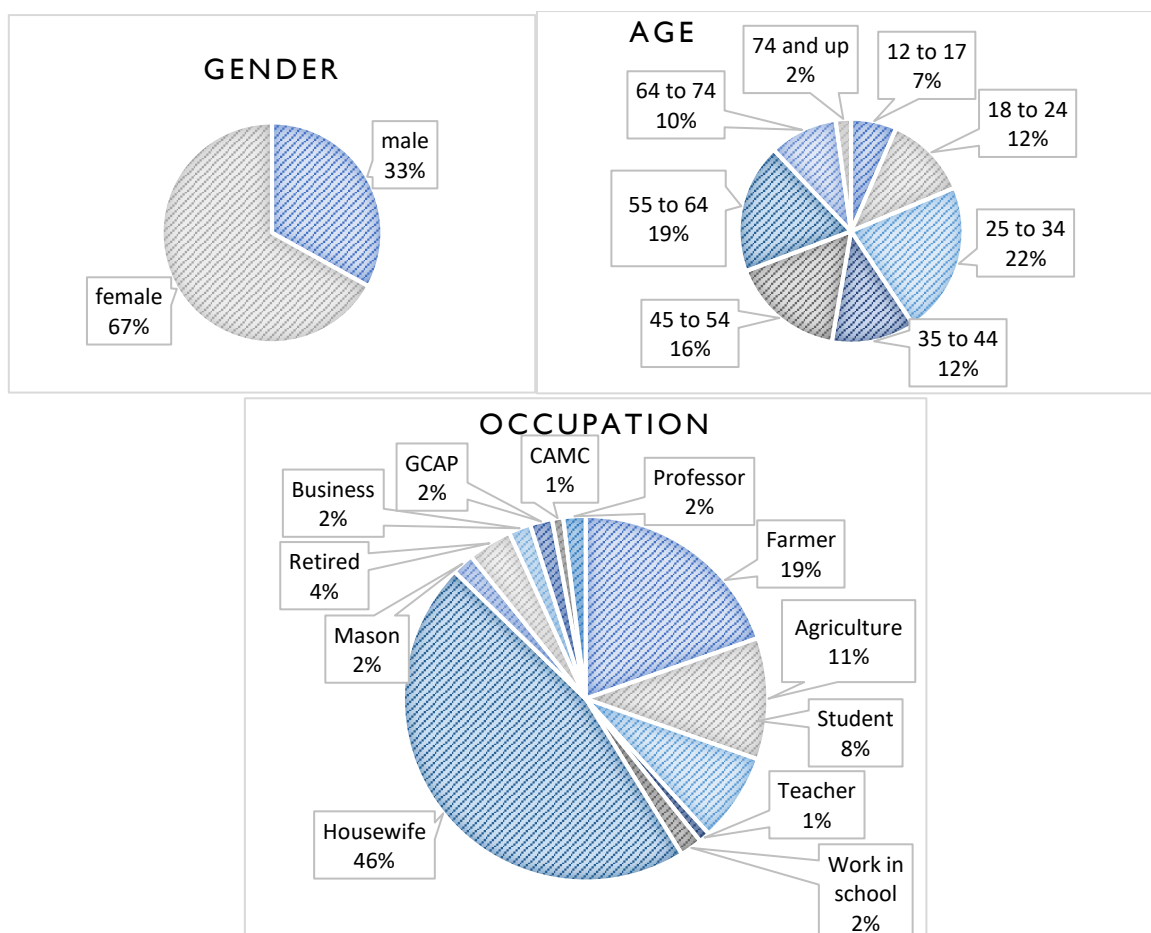
Figure 5. Representation through three-phased stakeholder analysis process according to gender n=121 (top left), Age n=91 (top-right) and occupation n=102 (bottom-middle)

5.1.1 Mind-mapping

5.1.1.1 Method description and rationale

Mind-mapping is a visual tool which allows participants to discuss, identify and map their stakeholder environment, quickly capturing and linking ideas among stakeholders (Durham E. et al.). Participants first brainstorm major groups of stakeholders as a list, next this list is organized into 'levels' of stakeholder categories with major groups closest to the center, with groups becoming more detailed as you move out a level (Durham E. et al.). Using the example provided in the BiodivERsA stakeholder engagement handbook, final mind-maps were created as seen in Figure 6.

Figure 6. Community forest stakeholder mind-map created by participants during Phase I: WBI I. Top: Laduk 31.3.2019, Right: Bulung, 20.4.2019

Using the completed mind-maps, participants then self-identify according to the stakeholder categories by writing their names on a slip of paper and placing them on the map.

5.1.1.2 Sample design and selection criteria

For selection of participants for the WBI I, a quota, maximum variation purposive sampling was utilized. The quota of participants invited to the initial workshop was set to 35 persons, this limited quota was dictated by the size of the workshop room and the ratio of participants to facilitators. The initial sampling aimed to include a heterogenous and inclusive representation of the stakeholders surrounding the CF. Upon arrival to both villages a one-week period was allowed to acquaint ourselves with the local culture, the village structure and community perceptions. Following this week, we spent one day inviting participants to partake in the first workshop by walking through each toll of the village. Since tolls are organized according to caste groups, each toll was visited to invite participants. This sample design was influenced by Leventon et al. 2016 experiences in stakeholder identification, explaining that "by actively seeking to invite stakeholders with diverse perspectives, there is a higher likelihood of moving away from the researcher's perspectives, and thus a higher chance of removing their identification bias" (p. 773). The number and characteristics of participants is summarized in Table 3.

Table 3. Summary of participants from phase I: workshop-based intervention I– Mind-mapping method.

Location	Date	N. of participants	% Women	Age range	Caste attended
Laduk	31.3.2019	20	75	13 to 71	Thakuri, Kami, Tamang, Chhetri, Newar, Magar
Bulung	20.4.2019	20	60	14 to 70	Dalit, Chhetri, Tamang

5.1.2 Net-mapping

5.1.2.1 Method description and rationale

Multiple-stakeholder systems, like that of CFs in Nepal, are complex with many formal and informal linkages, hindering project practitioners, which exist outside of the system, understandings of governance issues particularly when under time pressure (Schiffer and Hauck 2010). It is often these complex social structures involved in NRM that determine the success or failure of NRM development projects. Therefore, participatory network mapping (net-mapping) was chosen to aid in investigations of these social complexities surrounding CFs within the case study (Schiffer and Hauck 2010; Schiffer, E., J. Hauck, J. Abukari 2007).

The net-mapping method is considered low-tech, low-cost, and adaptive and has been implemented in similar contexts as this case study (Hauck et al. 2015; Schiffer and Hauck 2010). Identification of stakeholders is refined and data is gathered regarding relationships between actors and the influence of each stakeholder categories to affect the natural resource. The mapping process can help to identify key stakeholders who could serve as catalysts of change while deepening the understanding of relationships between stakeholders, benefiting the interviewees, communities and project objectives (Durham E. et al.).

The net-mapping methods acts to facilitate learning, aligning with both theoretical frameworks (Schiffer and Hauck 2010). It allows participants to refine stakeholder categories while gathering data regarding:

- Links between actors, according to:
    - Flow of information
    - Lines of conflict
    - Flows of funding
    - Flows of regular communication
- Influence of each stakeholder categories to affect the natural resource in question
    - Positive, neutral, or negative
    - Level of influence (#)
- Interest of each in the community forest
    - Level of influence (#)
- Objective for each actor group regarding the forest, according to:
    - P (Protection),
    - SD (sustainable development),
    - ED (economic development)
    - U (use),
    - SU (sustainable use),
    - EU (economic use)

- Conflicts and resolutions (Schiffer and Hauck 2010).

Additionally, a semi-structured interview and intermittent mapping reflections questions were used throughout the net-mapping exercise according to questions:

- Here are the main stakeholder categories, created during the mind-mapping exercise in WBI I (List shown of categories) – Are there any categories missing from your understanding?
- How do you categorize yourself and your household?
  - Which category do you think you (and your family) belong?
  - Which other categories do you interact the most?
  - What level of influence do you (and your family) have over forest resource management (low, medium, high)?

Reflection on Step 2 – links:

- Flow of information – Who provides information to who?
- Lines of conflict – The actors which conflict, could you explain what it is about?
- Flows of funding – Who is providing funding to whom?
- Flows of regular communication
  - Which categories communicate the most?
  - Which the least?

Reflecting on Step 3 – influence:

- Which stakeholder groups seem to hold the most influence in the forest?
  - Is their influence positive?
  - Where does his/her influence come from?
- Which stakeholder groups hold the least influence in the forest?
  - In your onion, why do you think they have the least influence?
  - What would give this group more influence?

An impression from the experiences with the net-mapping method are shown in Figure 7.

Figure 7. Impressions from experiences with net-mapping, Photos from Laduk (top row), Bulung (bottom row).

5.1.2.2 Sample design and selection criteria

In selecting interview partners, a purposive sampling strategy was used. Following the implementation of the mind-mapping method, the group of participants used the first level stakeholder categories (closest to the center) to fill in the referral Table providing 2 stakeholder contacts the most 'influence' over community forest governance with name and contact information from each identified category. Using these referral table, an example shown in Table 4, one participant from each category was chosen randomly and according to availability for an individual interview.

Table 4. Stakeholder referral table example

Stakeholder referrals

Stakeholder category	Name	Contact information: Address / phone number
1. Community forest committee	1.	
	2.	
2. Community organization	1.	
	2.	
3. Economic beneficiaries	1.	
	2.	
4. INGOs/NGOs	1.	
	2.	
5. Local Users	1.	
	2.	

For the second round of interviews, snowball sampling was utilized by asking the interviewees to refer other stakeholders according to their understanding of the stakeholder categories. Interviewees filled out the same 'referral table', referring two influential stakeholders from each category as well as, one or two contacts with 'opposing views' to theirs. This mode of sampling can ensure heterogenous viewpoints are included (Ravnborg 2002). Stakeholder referred from the first round of interview acted as potential interviewees for round two. The tables were compiled and compared to choose round-two interviewees according to 'most referred', while also integrating diversity according to caste, gender, and stakeholder association. The 'opposing view' referrals were also considered and some of these referred stakeholders were also included in sampling.

All interviews were conducted individually and face-to-face at participants home or in the field. The interviews were arranged one or two days in advance, according to the availability of the interviewee. This was done by calling potential interviewees with the contact information provided from the referral table, but also by visiting the individuals and asking them for an interview. The number of interviews was not pre-defined, we rather aimed to capture two diverging opinions in each stakeholder category. A total number of 20 interviews were carried out (Table 5).

Table 5. Summary of participants from phase II: individual interviews – net-mapping method.

Location	Date range	No. of interviewees	% of Women	Age range	Castes interviewed
Laduk	4.4.2019 to 17.4.2019	12	58	26 to 56	Thakuri, Kami, Shresta, Thami
Bulung	20.4.2019 to 29.4.2019	8	63	29 to 62	Khatri, Nepali, Kami, Chhetri

5.1.3 Generative picturing

5.1.3.1 Overall method description and rationale

Generative Picturing Photographic Praxis (GP) is a participatory and process-oriented photo-visual method which uses photography and art as tools for learning, sparking dialogue and reflection, while cultivating mutual understanding and transformation within complex systems or confounding situations (Brandner 2017). The process of GP allows participants to mutually and creatively reveal and reflect upon personal and other's cultural and social boundaries, experiences and knowledges (*ibid*).

This method begins with the creation of an 'impulse' which animates the participants to "take photos within their everyday life in order to express their opinions, feelings and thoughts (triggered by the impulse) through their own pictures" (article in review, Brandner 2017). After photography has been completed, images are selected according to the central topic (or impulse) and are used as the basis for discussion and reflection within the group (*ibid*). These rational discourses aim to create a collective interpretation of images, topics and questions (*ibid*). This process of GP should ideally be recursive, where the steps outlined are repeated. Lastly, these images are used in a 'mapping' exercise which combine photographs which have obtained the greatest meaning, this step can be done using different visual methods, like painting. The results of the final step are termed as a *Generative Picture* (GP). These GP can be used for sparking dialogue and collective interpretations.

5.1.3.2 Part 1. Photography

5.1.3.2.1 Method description and rationale

The process of photography, and reflection upon photographs, are multidimensional processes which can act to spark transformation and dialogue across different cultures, caste, or viewpoints (article in review Brandner 2019). The author highlights the transformative power of this method as the process of photography within a familiar environment stimulates participants to interact and reflect on their subjects in a creative and different way than they do normally (*ibid*). This change in perspective can be compared with what Mezirow described in his TL theory as a 'perspective transformation'.

In part 1, participants are "invited to take photos within their everyday life in order to express their opinions, feelings and thoughts (triggered by the impulse) through their own pictures" (Brandner 2019). Photography is done individually. The impulse created and provided to participants was:

> Use the camera to capture positive and negative aspects of sharing the resources of the community forests

Figure 8 provides an impression of participants photographs taken using the method.

Figure 8. An impression from each participants photography from phase 1 of generative picturing. From top left to bottom right photographers: Sanja M. Thakuri, Radhika M. Thakuri, Bishnu K. Thakuri (Laduk), Jagat B. Khatri and Ajita Khatri (Bulung).

5.1.3.2.2 Sample design and selection criteria

For the first part of the GP method, each interviewee from the net-mapping method were invited to partake in photography. The date range of sampling is therefore the same for both methods. Of the total 20 people interviewed, 5 participants partook (Table 6). Although many interviewees expressed interest, most did not manage to finish the task due to time constraints.

Table 6. Summary of participants in part 1 of generative picturing method

Location	No. of participants	% women	Castes
Laduk	3	66	Thakuri
Bulung	2	50	Khatri

5.1.3.3 Part 2. *Photography dialogue + Generative picturing*

5.1.3.3.1. Method description and rationale

Open photography dialogue led into a reflective painting process which aids in uncovering "the central topical fields and questions [which] elicited from the visual material, allowing for deductions regarding positive and negative aspects of living together" and sharing the forests resources (article in review Brandner 2019, p. 12). Photography dialogue was facilitated in the group. During this process photographers presented their images and stakeholders questioned their photographs. This dialogue guided reflection on differing perceptions, while encouraging mutual learning (*ibid)*.

Following photography dialogue, a generative picturing painting exercise began using one of the positive images as a cue. To ensure dynamic interactions and the inclusion of different views in the workshop, the group was split in half using random numbers. Both groups were encouraged to paint in silence their ideal future scenario. The resulting generative pictures are shown in Figure 9. This process is termed envisioning and "is a process that engages people in conceiving and capturing a vision of their ideal future", linking "longer-term goals and their immediate actions" (Wals 2007, p. 25). It also contextualizes problems within the complexities SES and linking 'sustainability' for relevance in stakeholders' lives (*ibid)*.

Figure 9. Generative pictures. Top row from Laduk, bottom row from Bulung,

Upon completion, GPs were reflected upon in the large group and rational discourse facilitated. This collective interpretation of the GPs, helped negotiate through "questions, existing differences and common grounds, the development of possibilities for action, reflection and dialogue" of personal and others perspectives (Freire 1978: 88 as cited in article in review Brandner 2019, p. 15).

5.1.3.3.2 Sample design and selection criteria

The second part of the GP method took place in Phase III, WBI II. Sampling for the second workshop focused on re-inviting participants from the first via phone calls and home visits to inform persons of the workshop details. Additionally, persons interviewed and referred via the referral lists were informed. As a reminder, previous attendees were contacted the day before the workshop by mobile phone call. A total of 62 participants resulted (Table 7).

Table 7. Summary of participants from phase I: workshop-based intervention II: part 2 of generative picturing method and consensus mapping method.

Location	Date	No. of participants	% of Women	Age range	Castes / ethnic groups attended
Laduk	9.4.2019	31	71	13 to 71	Thakuri, Kami, Tamang, Chhetri, Newar, Magar, Shresta, Shahi
Bulung	21.4.2019	31	65	14 to 75	Khatri, Nepali, Khadka, Tamang, Lama, Kami, Thapa

5.1.4 Consensus mapping – conflict-resolution

5.1.4.2 Method description and rationale

Results from both the group mind-mapping and individual net-mapping methods were reflected and compared to create an 'our understanding' map which contained intentional 'gaps'. These gaps were to be completed during the final group mapping exercise, as seen below in Figure 10. All participants were encouraged to complete this map according to their understanding in hopes of creating a 'common understanding' of the social fabric which surrounds forest use and governance.

Figure 10. 'Our understanding' stakeholder maps, completed in workshop-based intervention II. Laduk on left, Bulung on right.

Following the completion of the 'consensus map', conflicts and resolutions identified via compiled results of the net-mapping method were each presented, seen as Figure 11. Participants were encouraged after each to clarify the conflict, or resolution, according to their understanding. This was used to elicit an engaged discussion about the possible engagement

and collaboration with actors on the map. For more detailed explanations regarding the conflict – resolution results, refer to Appendix B.
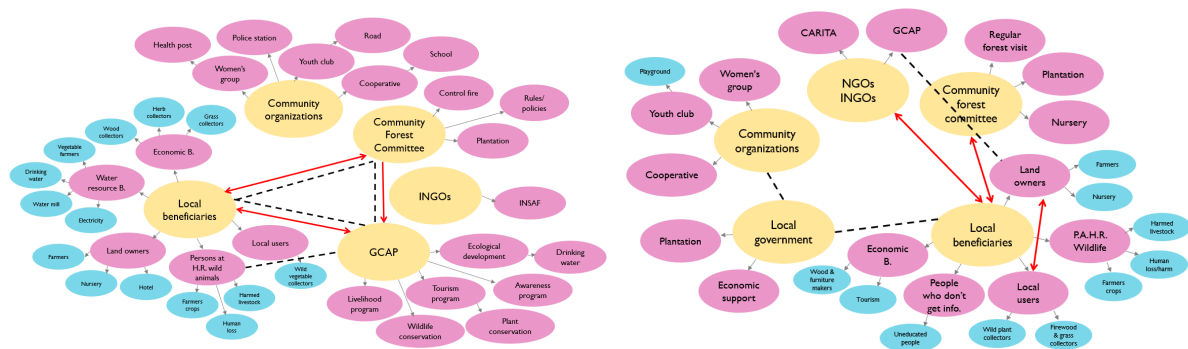
Figure 11. Final mind-maps for stakeholders + conflicts as red lines + resolutions in dashed black lines. Left is Laduk, right is Bulung.

5.1.4.2 Sample design and selection criteria

This method was undertaken during the second workshop and therefore followed the same sample design as described in 5.1.3 Generative picturing Part 2 sample design and selection criteria. Table 7 in the same section also shows the summary of participants in this method.

5.2 Data collection and analysis

This section describes the: (I) main research instrument, the methods assessment questionnaires and, (II) participatory observation and visual methods.

5.2.1 Community-based methods assessment

5.2.1.1 Data gathering instrument

Ex-post method assessment questionnaires acted as the dominant research instrument which has participants assess each methods ability to address the three main challenges. Additionally, a summative *ex-post* self-evaluation according to the analytical framework elements was undertaken to help understand the participants learning achievements while also engaging participants in self-reflection. The questions developed to assess the three main challenges followed similar wording across the methods, ensuring consistent data allowing for comparisons. Questions regarding the three challenges are outlined in Table 8.

Challenge Measure	Items
C1	The group members accepted my inputs to the X exercise
	It was difficult to voice my opinion during the X exercise
	I felt comfortable expressing my ideas during the X exercise
C2	During X , different people who were there listened to what I had to say
	Thinking back to X, some important persons were NOT there to contribute but should have been
	During X, it was possible for all participants to say what they really think
	Looking at the X we created, it is a good compromise of how the different participants see the community
	In X for some of the participants, it was DIFFICULT to influence what we did
	When we created X, I discussed with someone new for the very first time
C3	When we made X, I thought for the first time in detail about who 'holds a stake' in the forests
	During X, I quite often felt like the activity should be done differently
	After we finished our mind-map, the discussion we had as a group was different to what we usual discuss
GM	In summary my experiences with the X exercise was

Questionnaires were created and implemented with the assumption that by reflecting and assessing methods throughout the process would positively elicit element of TL and SES thinking for participants. Questions relating to the analytical framework elements were inspired by the Transformative Learning Survey (Stuckey and Taylor 2015; Stuckey et al. 2013; Diduck et al. 2012) and social-ecological systems thinking literature (Colding and Barthel 2019; Petrosillo et al. 2015; Berkes et al. 1998; Wals 2007; Diduck et al. 2012). Items and measures for all questionnaires were adapted in cooperation with my research partner, according to the context of the case study. Below in table 9 the items for all analytical framework measure are detailed.

Table 9. Summary of items for each measure regarding analytical framework, transformative learning (T) and social-ecological systems thinking (S), as well as general method (GM). items in grey indicate reverse-coding

Analytical framework measure	Item
T1	The exercises we did in both workshops made me ask questions how we manage and understand the forest
	When we met for the workshops, I thought about how I value the forest
	The photograph and painting exercises were new and challenging for me
T2	Our discussions after exercises made me think about my assumptions regarding my community
	Our activities in the workshop taught me different things about forest management than what I usually see and hear on television, radio and from neighbors
	I believe it is good to discuss the traditions we have in managing our forest, and new ways of managing the forest
	Although we can discuss the management of the forest, the decisions will be taken by those who are more powerful
T3	Because of my experience in the workshops, I have realized that people have different but reasonable interests regarding the forest
	The workshops showed me that my interests and ideas about the forest are legitimate and heard by other people
T4	Through discussion with the participants in the workshop, I learned how they view the community and the forest
	Mapping the different people involved was interesting, but I already knew the results before
	The group of participants and I developed a shared vision of how we would like to manage the forest
T5	As a result of the interactions, I learned something new about our community and forest

	The workshop activities made me discover new aspects of how our community is organized
T6	The workshop activities made me look for opportunities to improve forest management
	I have the skills to start improving forest management
S1	The activities showed how our actions affect the forest and the community
	Through the activities, the social, economic and environmental aspects of our life as forest users were exposed
S2	I agree with the message of the mind-map and net-maps, that forest management is complex and we cannot expect easy solutions
	For sustainable management of our forest, building communication among diverse stakeholders will be very important
S3	I expect that forest use will have to be discussed intensively by the multiple stakeholders we have identified
	I gained insights into how my social structures must change to enable sustainable use of the forests
	The time I spent at the workshops, was worth my time
	The phases and sessions were well timed and transparent
GM	The photography and painting exercise would have needed more time
	The workshops were too long
	The overall experience of the workshops was positive

For detailed questionnaire items used for all methods as well as a questionnaire example, refer to Appendix C.

Questionnaires were designed using a Likert scale (Figure 12). This method of appraisal was chosen because of the varying degree of literacy among participants, as most can read and understand but struggle with communicating via writing. Therefore, to avoid exclusion according to literacy and collect as many participants perceptions, the Likert scale was chosen. In addition, some questions were reverse coded, this is recommended throughout the literature to avoid 'yea-saying', to encourage meaningful responses and avoid response biases (Wong et al. 2003). Participants assessed statements targeted at one measure according to a 5-point scale (1 – 'disagree' to 5 - 'agree').

1	2	3	4	5
Disagree		Neutral		Agree

Figure 12. Likert scale used for all questions regarding the three main challenges, and analytical framework items.

The last questions of each questionnaire aimed to capture participants summary of their experience with the method, assessing statements according to a 5-point scale (1– 'negative' to 5 – 'positive'), refer to Figure 13. This acted at the general method assessment, you can see Table 8 and Table 9, as GM measures.

1	2	3	4	5
Negative		Neutral		Positive

Figure 13. Likert scale used for the general method assessment questions.

Method assessment measures contained various numbers of questionnaire items, the number of items used for each measure are outlined in Table 10.

Table 10. Overview of community-based method assessment measures, with numbers of questionnaire items per measure.

Measure		Items per measure
Three main challenges	1. Top-down approaches	15
	2. Integrating diversity	19
	3. Lacking reflection	17
Transformative learning	1. Individual experience	3
	2. Critical reflection	4
	3. Rational discourse	2
	4. Social learning	3
	5. Context awareness	2
	6. Action	2
Social-ecological systems thinking	1. Connection	2
	2. Complexities	1
	3. Social	3
General method assessment		13

5.2.1.2 Sample design and selection criteria

The sampling frame included all participants who completed any of the methods being assessed. Convenience sampling was used for the community-based method assessment questionnaire. Every participant whom partook in the method in question were invited to partake in the assessment questionnaire. Questionnaires were completed voluntarily, anonymously, and individually to enhance truthful responses and therefore collect representative data. General directions were given, for easy comprehension, while questionnaires were being filled out assistance was given to confused individuals.

5.2.1.3 Data analysis

Likert scales yield ordinal data, which does not follow the classical normal distribution and is therefore unsuitable for parametric tests. Because of these facts, medians should be used to measure central tendency of datasets (Sullivan and Artino 2013). Descriptive statistics helped analyze the questionnaire results. Using excel for data storage and processing, from the raw data of both villages' medians, minimum and maximum values as well as standard deviation, were identified for each measure.

Statistics appropriate for ordinal data were utilized. First, a Barlett test of homogeneity of variances was ran on raw data sets. This tests if we can accept or reject the null hypothesis of: variance is homogenous between data sets. This was done with all raw data sets to determine if they are normally distributed. All were not, this information was used to choose an appropriate statistical operation, the Mann-Whitney U test. This test can detect differences of variable values between two samples through ranking. It is similar to an ANOVA, but is suitable for use in nonparametric data (Yau 2019). The Mann-Whitney U-test was used to test if the difference between two or more measures were statistically significant, with the significance level set at .05. The statistical program, R was used to run all operations.

5.2.2 Participant observation and visual methods

Participant observation is not considered to be a specific research technique, but rather a "mode of being-in-the-world characteristics of researchers" (Silverman 2006). Aims of this 'mode of being' can be summarized as;

i. Viewing the world through local eyes
ii. Description: of mundane details
iii. Contextualization: Situating local realities in a wider context
iv. Viewing social life as an every-changing process
v. Flexible research designs
vi. Avoid early conceptualization and conclusions which may not fit to participants perspectives (Silverman 2006).

With these aims in mind, my research partner and I engaged in participant observation to complement the quantitative research methods (Newing 2011). Through living in the local communities with two families, this deepened our understanding of the SES for better method implementation. We had many opportunities for involvement in daily lives within our research setting. We attended various local events, shared meals with locals and attended the GCAP 5-year policy and planning meeting where a diverse set of stakeholders discussed the decisions made in the past, and how they might be improved in the future. These opportunities allowed us to cultivate rapport with forest stakeholders easing all aspects of our research.

After both WBIs and every interview, we discussed how we perceived their experiences with the method. This helped to determine relevant adaptations of methods for better implementation within the local context, while allowing us to develop a common understanding of potential pitfalls regarding method implementation, facilitation, etc. Brief field notes were taken to record our observations.

Other methods for observational research included the collection of visual images – in the form of photography by both myself and my research partner, as well as participatory photography (part 1 of the GP method). Additionally, the stakeholder maps created through mind-mapping as a group, net-mapping as individuals and finally the consensus mapping, act as additional visual data.

Data captured by photographs and other visual images are "qualitatively different from those recorded through other kinds of research methods" (Emmison and Smith 2000, p. 3)and therefore "have the potential to be, social constructions, consciously or unconsciously manipulated images which can serve ideological ends" (p. 4). To these points, visual images are utilized as supplementary data, which aim to provide a glimpse of how photographers viewed the world at that moment through the lens of their camera (Silverman 2006).

6. Results

Results according to the community-based method assessment and participant observation are structured following my research questions. I (I) summarize results according to each methods ability to address the three main challenges, then (II) self-assessments according to learning objectives, SES systems and TL are summarized. Lastly, (III) a summary of all measures is provided.

The response key described in Table 11 aid in interpreting values according to corresponding response.

Range	Corresponding response
0 – 1.4	'disagree'
1.5 – 2.4	'disagree/neutral'
2.5 – 3.4	'neutral'
3.5 – 4.4	'agree/neutral'
4.5–5	'agree'

P-values are provided for statistical test results according to: >0.05 referring to not-significant (ns), with significant scores grouped into three significant levels <0.05*, <0.01**, <0.001***.

6.1 Success of methods in addressing the main challenges

Through utilizing descriptive and inferential statistics results regarding each methods ability to address the three main challenges in SA are provided in the following sections.

6.1.1 Mind-mapping

20 workshop participants in both case study villages partook in the mind-mapping method, from this total 19 participants in Laduk and 14 in Bulung successfully completed the assessment questionnaire. Results are summarized in Table 12.

Table 12. Observed range, standard deviation and medians of studied variables regarding mind-mapping method, n=33.

Measure		No. of Items	Min	Max	SD	m	Response
Three main challenges	C1. Top-down approaches	3	1	5	.8	4	'Agree/neutral'
	C2. Integrating diversity	6	1	5	1.2	4	'Agree/neutral'
	C3. Lacking reflection	3	1	5	1.3	4	'Agree/neutral'
	Mean method assessment					4	'Agree/neutral'

Responses from the community-based assessment indicate the same median score, 4, between the three challenges. Additionally, a mean method assessment score of 4 resulted, meaning participants agreed with slight neutrality that the method addressed the three main challenges of SA. The general method assessment which appraised participants perceptions of the method using just one questionnaire item, had a median of 4, indicating that participants had a positive/neutral experience with mind-mapping.

Table 13. Differences between challenges for mind-mapping according to Mann-Whitney U test

Comparison	P-value
C1 vs. C2	<0.05*
C1 vs. C3	<0.05*
C2 vs. C3	ns

Table 13 shows us that when comparing the mind-mappings methods ability to address the identified challenges, C1 is significantly different from both C2 and C3, while the difference between C2 and C3 are not significant.

6.1.2 Net-mapping

A total of 12 individuals partook in the individual interview in Laduk, and 8 in Bulung. All participants successfully completed the questionnaire upon completion of method implementation. This yields a total sample size of 20.

Table 14. Observed range, standard deviation and medians of studied variables regarding net-mapping method. n=20

Measure		No. of items	Min	Max	SD	m	Response
Three main challenges	C1. Top-down approaches	4	1	5	.8	4	'Agree/neutral'
	C2. Integrating diversity	x	x	x	x	x	x
	C3. Lacking reflection	3	1	5	1.3	4	'Agree/neutral'
	Mean method assessment					4	'Agree/neutral'

Challenge two, integrating diversity, was not assessed for net-mapping method because this method was undertaken individually and therefore there was no opportunity to integrate diverse perspectives. Responses from the community-based assessment (Table 14) resulted in a mean of 4, indicating participants agreed with slight neutrality that the net-mapping method addressed the three main challenges. The general method assessment using just one item, yielded a median of 5, indicating that participants had a positive experience with the net-mapping method.

Table 15. Differences between challenges for Net-mapping according to Mann-Whitney U test

Comparison	P-value (adj.)
C1 vs. C3	<0.001***

Table 15 indicates that when comparing the net-mapping methods ability to address C1 and C3, there is a highly significant difference between the two challenges.

6.1.3 Generative picturing

The generative picturing method, implemented in two parts, was assessed accordingly. First results from each part are summarized separately, then results are combined to understand the method as a whole.

6.1.3.1 Part 1: Photography

In Laduk a total of 3, and in Bulung 2, interviewees partook in part 1: photography of the GP method. All 5 participants successfully completed the questionnaire upon completion.

Table 16. Observed range, standard deviation and medians of studied variables regarding generative picturing part 1. n=5.

Measure		No. of items	Min	Max	SD	m	Response
Three main challenges	C1. Top-down approaches	2	4	5	.5	5	'Agree/neutral'
	C2. Integrating diversity	x	x	x	x	x	x
	C3. Lacking reflection	3	1	5	1.1	4	'Agree/neutral'
	Mean method assessment					4	'Agree/neutral'

Descriptive statistics (Table 16) show that C1, top-down approaches, has a higher median value than C3. Responses from the community-based assessment resulted in a median assessment score of 4, hence participants agreed with slight neutrality that the photography exercise addressed the three main challenges of stakeholder analysis. The general method assessment,

using two questionnaire items, resulted in a median of 4.5, indicating that participants had a positive experience with this method. Additionally, there exists no significant difference between the medians of C1 and C3.

6.1.3.2 Part 2: Photography dialogue + generative picturing

In Phase III: WBI II there were a total of 31 attendees in both villages. Of 31 attendees, in Laduk 23 and in Bulung 18 completed the assessment questionnaire, yielding a sample size of 41.

Table 17. Observed range, standard deviation and medians of studied variables regarding part 2 of generative picturing method. n=41

Measure		No. of items	Min	Max	SD	M	Response
Three main challenges	C1. Top-down approaches	3	1	5	1.4	5	'Agree/neutral'
	C2. Integrating diversity	7	1	5	1.4	4	'Agree/neutral'
	C3. Lacking reflection	4	1	5	1.3	4	'Agree/neutral'
					Mean method assessment	4.3	'Agree/neutral'

Responses from the community-based assessment show that C1, top-down approaches, has the highest median value of the three challenges for the mind-mapping method (Table 17). The method received a median assessment score of 4.3, hence participants agreed with slight neutrality that the photography exercise addressed the three main challenges of stakeholder analysis. The general method assessment, using two items, resulted in a median of 5, indicating that participants had a positive experience with this method.

Table 18. Differences between challenges for GP part 2 according to Mann-Whitney U test

Comparison	P-value (adj.)
C1 vs. C2	<.01**
C1 vs. C3	ns
C2 vs. C3	ns

Table 18 demonstrates that when comparing the GP part 2 methods ability to address the challenges a significant difference exists between C1 and C2 but not the others.

6.1.3.3 Combined generative picturing results

Table 19 shows descriptive statistics all responses corresponding to the entire generative picturing method.

Table 19. Observed range, standard deviation and medians of studied variables regarding both phases of the generative picturing method. n=46

Measure		No. of items	Min	Max	SD	m	Response
Three main challenges	1. Top-down approaches	5	1	5	1.4	5	'Agree/neutral'
	2. Integrating diversity	7	1	5	1.4	4	'Agree/neutral'
	3. Lacking reflection	7	1	5	1.3	4	'Agree/neutral'
					Mean method assessment	4.3	'Agree/neutral'

Responses from the community-based assessment resulted in the highest median belonging to challenge number one, top-down approaches, with a value of 5. The median assessment score

of 4.3, indicated that participants agreed with slight neutrality that the generative picturing method addressed the three main challenges of stakeholder analysis. The general method assessment, using four items, resulted in a median of 5, indicating that participants had a positive experience.

6.1.4 Consensus mapping – conflict-resolution

Of the 31 participants in the second workshop in Laduk and Bulung, 26 and 19 particiapants, respectively, partook in the method assessment questionnaires. This resulted in a sample size of 45.

Table 20. Observed range, standard deviation and medians of studied variables consensus mapping. n=45.

Measure		No. of items	Min	Max	SD	m	Response
Three main challenges	C1. Top-down approaches	3	1	5	1.1	4	'Agree/neutral'
	C2. Integrating diversity	6	1	5	1.5	4	'Agree/neutral'
	C3. Lacking reflection	4	1	5	1.2	4	'Agree/neutral'
	Mean method assessment					4	'Agree/neutral'

Median responses from the community-based assessment (Table 20) indicate that the three challenges have the same medians. The mean assessment score of 4 indicates participants agreed with neutrality that the entire consensus mapping method addressed the three main challenges of stakeholder analysis. The general method assessment, using two items, resulted in a median of 4.5, which indicated that participants had a positive/neutral experience with consensus mapping.

Table 21. Statistic results between challenges for consensus mapping according to Mann-Whitney U test

Comparison	P-value (adj.)
C1 vs. C2	<.01**
C1 vs. C3	ns
C2 vs. C3	<.01**

Table 21 reveals that when comparing the consensus mapping methods ability to address the challenges a significant difference exists between C1 and C2, and between C2 and C3.

6.1.5 Comparison of challenges across methods

To gain insights into how methods compare in addressing each challenge, Table 22 helps summarize each method median according to the three main challenges.

Table 22. Medians for assessed methods according to the challenges.

Method	C1	C2	C3
	median	median	median
Mind-mapping	4	4	4
Net-mapping	4	X	4
Generative picturing part 1	5	x	4
Generative picturing part 2	5	4	4
Consensus mapping	4	4	4

To determine if any of individual method addressed certain challenges better than others, a comparison of all methods according to each challenge was undertaken. The Mann-Whitney U test compared challenge scores between methods. This resulted in no significant differences between methods assessed for both C1 and C2. However, results from C3 resulted in 3 significant differences, between mind-mapping and consensus-mapping (p-value <0.05*), net-mapping and consensus-mapping (p-value <0.01**) and net-mapping and generative picturing part 2 (p-values <0.05*).

To help understand these significant differences between methods observed, and determine which method yielded higher scores, a box plot was created to better understand the distribution of the data. When comparing the inter-quartile range, or 50% of scores, we see that on average consensus mapping has higher scores than both net-mapping and mind-mapping. Additionally, one notices that generative picturing part 2's inter-quartile range is also higher than net-mapping. It can also be observed that responses were quite homogenous for the generative picturing part 1 and mind-mapping methods.
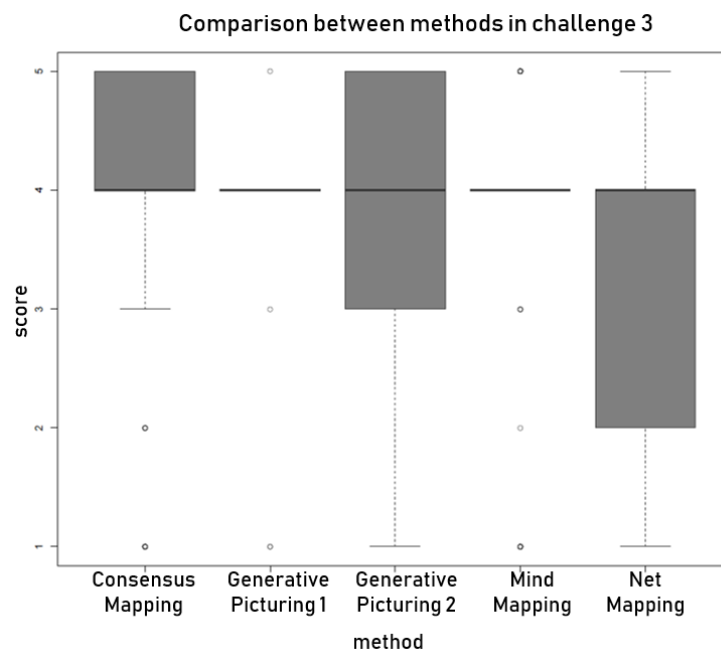
Figure 14. Box-plot of the methods assessed according to challenge 3 scores

6.2 Self-assessment of learning outcomes

Elements identified for both analytical frameworks, SES thinking and TL, were assessed using one questionnaire, following the completion with all methods post-phase III. Of the 31 participants, 21 in Laduk and 18 in Bulung completed the questionnaire, therefore resulting in a total sample of 39.

Additionally, various forms of qualitative data resulted from the SA methods, these included photographs taken by myself and my research partner, participant photography and generative pictures from the GP method, semi-structured interview answers, and stakeholder maps from multiple perspectives, first developed through the mind-mapping method, then revised

individually using the net-mapping method and finalized through consensus mapping. These results were interpreted and analyzed according to SES thinking and TL.

6.2.1 Social-ecological systems thinking self-assessment results

Table 23 summarized workshop participants self-assessment of all methods according to the three SES thinking elements. When considering all the identified elements of SES thinking, 4.3 was the resulting mean, translating into the response 'agree/neutral'. This implies that participants, on average, 'agree' and/or are 'neutral' that SES thinking was addressed throughout the designed SA process.

Table 23. Observed range, standard deviation and means of studied variables regarding social-ecological systems thinking analytical elements. n=39.

Measure		No. of Items	Min	Max	SD	M	Response
Social-ecological systems thinking	S1. Connection	2	1	5	.8	4	'Agree/neutral'
	S2. Complexities	1	1	5	1.5	4	'Agree/neutral'
	S3. Social awareness	3	2	5	.7	5	'Agree'
				Mean assessment		4.3	'Agree/neutral'

Results from inferential statistics indicate one significant difference between the 3 SES elements, between S2. complexities and S3. social awareness with a p-value of <0.05*. When looking to the medians observed in table 23, we see S3 with a higher median score than S1 and S2. We can conclude that participants found that S3 was addressed to a significantly higher level than was S2.

6.2.2 Transformative learning self-assessment results

Table 24 summarizes participants assessment of all methods according to the six TL elements. Using the quantitative data yielded from the community-based assessment, medians of all the identified elements of TL provide an impression of participants experiences. A mean assessment score of 4.7 resulted, translating into the response 'agree'. This implies that participants, on average, 'agree' that TL was addressed throughout the designed SA process.

Table 24. Observed range, standard deviation and medias of studied variables regarding transformative learning analytical elements. n=39

Measure		No. of Items	Min	Max	SD	m	Response
Transformative learning	T1. Individual experience	3	1	5	1	5	'Agree'
	T2. Critical reflection	4	1	5	1.2	4	'Agree/neutral'
	T3. Rational discourse	2	1	5	.7	5	'Agree
	T4. Social learning	3	1	5	1.3	4	'Agree/neutral'
	T5. Context awareness	2	1	5	.8	5	'Agree'
	T6. Action	2	1	5	.7	5	'Agree'
				Mean assessment		4.7	'Agree'

Results yield two significant relationships between TL elements, first between T4. social learning and T3. rational discourse with a p-value of <0.05*, the second between T4. and T6. action with a p-value of <0.01**.

6.2.3 Participant observation and visual methods

To provide an impression into participants experiences according to the analytical frameworks, SES thinking, and TL, a summary according to mine and Sushma's participant observations, as well as interpretation of visual qualitative data, are provided in this section.

The first workshop engaged individuals in four identified elements of TL; critical reflection, rational discourse, social learning and context awareness. The brainstorming and mind-mapping method began by sparking rational discourse between participants with differing opinions to negotiate mapping decisions, as there was only one map which was to encompass the diversity of understandings and viewpoints represented in the group. This discourse supported social learning, as people interacted and shared their knowledge and perspectives regarding the stakeholder map. The methods utilized all required participants to examine the context of the community forest stakeholder environment in which they exist, particularly stakeholders' roles, interests and relation to on another. This examination of the stakeholder environment sparked SES thinking elements, with participants considering the connections, complexities and the social roles of different stakeholder in their community forest. The stakeholder self-categorization on the first-round stakeholder map, individuals questioned their roles within their community, providing an individual experience while engaging then in SES thinking, increasing social awareness.

Participants which partook in the individual interview and net-mapping method, and GP part 1: photography, were engaged in an individual experience, allowing them to question their beliefs and assumptions regarding the community forest governance as well as, their relationship to that system. We observed this methods ability to engage participants in SES thinking, by questioning stakeholder groups relationship to the forests, in terms of their influence, objectives among other measures detailed in the methods chapter. Most individuals were at first overwhelmed by the demand required of this type of communication and engagement, however all eased into it aided by appropriate facilitation techniques. This deep investigation of the complex system of community forest governance, engaged interviewees in all the SES thinking elements delineated. To conclude the interview, individuals reflected on the problems and potential solutions, initiating TL elements critical reflection while also considering potential action.

Part 1 of GP method, provided a deep individual experience, as photographers took their cues and completed the exercise in complete autonomy. Subsequently, there was little possibility for observation of participants with this part of the method, however, when participants returned their cameras, they often expressed their excitement with the experience, and when we asked if they could show us their photography, they were happy to. Photographers explained some of their experiences in the field and rationale behind particular images, they expressed how going into the forest for a different goal and mindset, forced them to view their surroundings differently. The photography cues implied a binary opposition between images of 'good' and 'bad' aspects of sharing the forest resources, of which provoked critical reflection between what is 'good' and 'bad' in the context of the CFs.

In the last workshop, photographers *read* their photographs, to the large group, providing insights into their perspectives and experiences, while forcing them to critically reflect on their images. "People may read the same image in divergent ways, often depending on their identity, their life experiences and the subject positions they adopt" (Emmison and Smith 2000, p. 68). Because of this, it was important for photographers to share their views with the large group. This provoked rational discourse among participants, social learning and often discussion about necessary change and/or action needed to make that change. Two examples of these binary oppositions discussed in the last workshop are now explained.

Figure 15. of Laduk's Bishnu Thakuris binary photographs

The first example (Figure 15) is Laduks, Bishnu Thakuri's, chosen photographs with the negative photograph on the left and positive on the right. Bishnu began by describing the negative image, he explained that he wants to show that the community mines a lot of stone for reconstruction of their homes after the earthquake. This mining increases the risk of landslides, of which could potentially damage local structures, lives and the forest alike. This imagine sparked passionate rational discourse in the group, with individuals presenting their rationale for or against the mining of stones. Ultimately, the large group created an understanding; mining must be done responsibly in order to protect the natural resources, with people only taking what they need and not more. We can infer that Bishnu was engaged in SES thinking, drawing connections of local natural resource use patterns impacts on forest health. Next, Bishnu presented his positive image, describing the lush greenery of the forest as something we all must appreciate more. There was little discussion which followed.

The second example (Figure 16) is from Bulungs, Ajita Khatri. This participant was very engaged in the photography exercise, yielding a total of 215 photographs. She expressed her enjoyment with the experience when she returned the camera. Her negative photograph is on the left and positive on the right in Figure 16. Ajita read her photographs to the large group and explained, that the negative image is about the current situation of forest resource overuse. She argues that local users are cutting too many plants and often people cut down more trees than they need, leaving the remaining (which are still useful) in the forest. She presented a potential solution: to re-plant in the area of the forest where she took the photograph but also commented that, in general, the community needs to focus on replantation of highly used forests and open spaces. The large group generally agreed with her points, and discussed this plot of land that she photographed.

Figure 16. Bulungs, Ajita Khatri's binary photographs

Ajitas 'positive' image is about positive forest use. She argued that if the community selects some areas for animal grazing, and uses those areas responsibly, taking care of the forest resources, then they can feed the animals and also earn good money from their local resources. Similar to Bishnu's positive image, there was little discussion which followed the positive image reading.

To summarize experiences from these two examples, this *reading* of photographs not only presented an opportunity for photographer to share their experiences with photography while critically reflecting and communicating their viewpoints, but also engaging the large group in rational discourse, creating an opportunity for social learning. Photographers were engaged in SES thinking throughout the photography and *reading* exercise, this was apparent via the images and interpretations which were presented.

Using these images for the second part of the GP method, one photograph was used as inspiration to 'envision' their ideal futures. While silently painting, participants experienced personal reflection while being challenged to cooperate as a group to communicate their visions for future of their forests and communities. This presented an opportunity for individuals to express their opinions without having to directly confront an opposition. Once painting was finalized, and generative pictures created (refer to Figure 9 in section 5.1.3), the two small groups discussed their painting. This encouraged individual painters to present their additions to the group. Paintings were critically reflected upon by viewers and discussed according to the different elements identified. Throughout the exercise we observed individuals engaging as a group and learning from each other, suggesting stimulation of TL element, social learning.

The last stakeholder mapping exercise, consensus mapping, engaged participants in critical reflection regarding the conflicts which they observe in their community forests. This naturally, engaged participants in SES thinking, as these conflicts are encased within the complexities of the multi-stakeholder environment of community forest governance. Next, TL element 'action' was activated while potential resolutions were identified and discussed. This exercise provided vivid rational discourse as participants negotiated between their differing viewpoints, regarding identified conflicts and potential solutions.

Through the method progression, participants added layers and revised the existing stakeholder maps, this activated critical reflection with participants reconsidering their perspectives and assumptions about the community forest stakeholder environment. Additionally, the primary

data collection instrument, the community-based method assessment questionnaires, created an individual experience for participants to critically reflect upon their experiences with activities. The last questionnaire engaged participants further in self-assessment according to transformative learning, deepening into critical reflection.

6.3 Summarizing outcomes

Descriptive statistics for all studied variable for all methods assessed are summarized in Table 25. When looking at the final mean assessment of 4.4, participants agree with slight neutrality that the designed SA methodology addressed the studied variables.

Table 25. Observed standard deviation and means of all methods (mind-mapping, net-mapping, generative picturing and consensus mapping) combined and studied variables.

Measure		SD	M
Three main challenges	C1. Top-down approaches	1.1	4.4
	C2. Integrating diversity	1.4	4
	C3. Lacking reflection	1.3	4
Transformative learning	T1. Individual experience	1	5
	T2. Critical reflection	1.2	4
	T3. Rational discourse	.7	5
	T4. Social learning	1.3	4
	T5. Context awareness	.8	5
	T6. Action	.7	5
Social-ecological systems thinking	S1. Connection	.8	4
	S2. Complexities	1.5	4
	S3. Social	.7	5
General method assessments		1.3	4.5
Mean assessment			4.4

7. Discussion

This section (I) discusses the main findings of this case study and (II) critically reflects upon the chosen research design.

7.1 Discussing the results

This section is structured according to the main findings related to my second and third research questions. Table 26 provides a summary of the main conclusions which are discussed throughout this section.

Table 26. Summary of conclusions drawn from results

Research question	Conclusions
What are the *main challenges* of participatory stakeholder analysis in natural resource management?	Top-down approaches Integrating diversity Lack of reflection
Which approaches can address the *main challenges* in participatory stakeholder analysis?	All methods had varying ratings – however all resulted in participants agreeing, often with slight neutrality, that the main challenges were addressed
	The methodology as a whole addressed challenge 1 best
	All four methods addressed challenge 1 and 2 similarly, however methods consensus mapping and generative picturing addressed challenge 3 better than others
What results do such approaches yield for participants?	Learning objectives according to SES thinking and TL were achieved
	Participants reported experiences with the methodology as 'positive'
	Methodology performed best for learning objectives: Individual experience, rational discourse, context awareness and action, and SES thinking element social awareness
	Methodology could improve in addressing TL elements; social learning, and critical reflection and SES thinking elements; connection and complexities

Although particular methods addressed the measures to varying degrees, it is interesting to note most methods had significantly higher scores in addressing C1, top-down approaches. This implies that although participants agreed with slight neutrality that methods addressed all challenges, comparisons show that overall C1 was the most addressed challenge. This implies that for the entire designed SA process most participants felt particularly comfortable expressing their ideas in the group, that the group accepted and listened to their inputs, and that they felt they had power to influence the methods outcome.

When interpreting results from challenge comparison between methods, to determine which method addressed each challenge best, participants found all of the methods abilities to address C1 top-down approaches and C2 integrating diversity, to be similar. However, in C3, lack of reflection, participants saw significant differences between some of the methods, with consensus mapping and generative picturing part 2 yielding the highest median scores. These results are unsurprising, as these two methods intentionally provoke participants to reflect on the processes and outcomes of other methods. GP part 2 allows participants to question the photos of individuals and in a group synchronizes self and external perception, this can spark reflection regarding photographers and other participants role in relation to the photos and paintings created (Brandner 2019). Consensus mapping method is based upon compiled results, forcing participants to reflect on previous understandings, while establishing new, according to what they and others have learned. It can be concluded that these two methods help to spark participants critical reflection, and could therefore be utilized by other practitioners to do so.

Through addressing the identified main challenges of SA, benefits were yielded for participants and the project. Identifying approaches which address C1 top down approaches, allow

participants to influence the SA approach used in research and development projects, by sharing knowledges and cocreating agendas (Jahn et al. 2012 as cited in Leventon et al. 2016). Methods using a more 'bottom-up' approach can bridge the gap between science and society, integrating and sharing knowledges regarding the natural resource in question, producing more robust outcomes (Fraser et al. 2006). By involving participants throughout the process and giving them power to influence the outcomes of methods, one can expect broader engagement, the empowerment of participants and increasing the community capacity to address future problems (Reed 2008; Fraser et al. 2006).

Designing SA based on a multi-stakeholder approach while integrating the diverse actors, is important to include in project logic, as SA identifies who is involved in research or project activities and is often the first contact project have with stakeholders. Participants found the designed methodological approach implemented in this thesis to have successfully considered the importance of divergent perspectives. Benefits of addressing this challenge found in the literature include, transcending unhealthy power dynamics, uncovering the needs and interests of marginalized stakeholders, while cultivating understanding and deepening collaboration between stakeholder groups (Grimble and Wellard 1997; Abson et al. 2017; Reed 2008). Authors highlight the benefits of including diverse stakeholders' perspectives, as this acts to 'widen the discourse' creating space for multi-stakeholder discussions, balancing influence stakeholders have over the decision-making process (Stirling 2008 as cited in Leventon et al. 2016). These benefits could ultimately yield more equitable project results.

Integrating reflection throughout the SA methodology is essential to improving approaches. Few projects reflect on method processes and outcomes, and if done, rarely in collaboration with participants (Talley et al. 2016). Enabling participants to reflect on and assess their experiences, can provide direct benefits for them and project. Collecting participants assessments on processes and outcomes of the designed SA provides a wealth of knowledge to other practitioners, helping to improve SA science. Furthermore, method assessment results are useful in adapting methodologies and can allow for comparison studies further guiding robust future SA (*ibid*).

The designed SA process provided participants the opportunity to encounter all learning elements to varying degrees. Participation provoked SES thinking and TL according to identified elements, like appreciating the connected nature and complexities of community forest governance, learning to question personally made assumptions and local cultural norms, learning the value diverse opinions while building communication among stakeholders, and developing a shared vision for future forest management. Others have found that such learning outcomes can enhance participants capacity to understand and handle complexities which are inherent to multi-stakeholder natural resource governance (Cundil and Rodela 2012 as cited in Cliffe et al. 2016). These learning objectives can facilitate the individual and social change needed for more effective forest management. Results from this research support findings of others inquiries into the role of adult learning through participation in natural resource management (Sinclair et al. 2011; Diduck et al. 2012; Sims and Sinclair 2008; Diduck and Mitchell 2003).

While this study demonstrated that the designed SA process contributed to a number of TL outcomes among participants, the data also revealed a number of opportunities for improvement. Learning elements, social learning and critical reflection were rated with lower average scores than individual experience, rational discourse, context awareness and action. A larger spread of assessment scores is also observed for these two elements. These results indicate that respondents found they were less engaged in these elements of learning than others. Regarding SES thinking, S3. social awareness resulted in higher median scores, than the other two elements, connection and complexities. Therefore, TL objectives, social learning and critical reflection, as well as SES thinking elements, connections and complexities, should be emphasized when revising the SA methodology for use in another context.

Conclusions regarding transformative outcomes are not clear cut, while empirical evidence indicates participants found themselves engage in SES thinking and TL, further investigations would be needed to document the impacts of these learning outcomes (Diduck and Mitchell 2003; Fraser et al. 2006). Additionally, processes and outcomes of learning are influenced by the setting and methodological design used in participatory NRM (e.g. Diduck 1999, McDonald 1999, Sinclair and Diduck 2001, Diduck and Mitchell 2003, Fitzpatrick 2006a, Sims and Sinclair 2008 as cited in Diduck and Mitchell 2003) therefore, it is important to consider the context of this case study when applying methods in other settings.

7.2 Critical reflection on research design

The main limitations of this research relate to the data collection instrument used. Practical application of the instrument was the main constraint within the case study, as participants struggled to grasp the concept of the Likert scale. I suspect many participants ultimately did not fully understand the concept of the Likert scale. This may have resulted in two problems or inconsistencies in the data; first, 'serial circling' or rating every question with the same number due to confusion, and second, the exclusion of less educated, lower caste participants. Those whom struggled to understand instructions were most often older, uneducated, lower caste women. Although questions were read aloud for those illiterate participants, because questionnaires had a range of 6 to 27 questions, it proved to be a timely process. Unfortunately, many participants did not have the patience for this high demand of attention. In order to mitigate these challenges in future research, facilitators should first test the designed survey before data collection commences.

The second constraint of this data collection tool related to inadequacies of research design, therefore resulting in less reliable data. *Ex-post* questionnaires addressing TL and SES thinking, lack reliability as the research design did not include a control group, or baseline to compare achievements (Fraser et al. 2006). This diminishes the reliability of data by causing an over- or under- estimation of measured objectives (Laepple, Hennessy and Newman 2013 as cited in Fraser et al. 2006). Additionally, authors (Cliffe et al. 2016) highlight that scores related to self-assessment of knowledges and skills could reflect their impressions related to the workshop methods and facilitation techniques, as opposed to self-assessment of learning, while authors Probst et al. 2018 state that, "self-reported perceptions of participants" could result in "strong social desirability effects" of responses (p. 15). These phenomena likely influenced SES thinking and TL self-assessment results. Understanding the constraints of relying on quantitative data, this research would have benefited from complimenting quantitative data with qualitative

(Fraser et al. 2006). By doing so, the researcher could gain additional insights into perceptions and outcomes for participants while avoiding biases (Fraser et al. 2006).

The *ex-post* learning self-assessment questionnaire followed directly after the finalization of the SA methodology, not allowing participants appropriate time to reflect on their experiential and learning outcomes. This could have been better implemented, allowing appropriate time before collecting self-assessments. However, due to time constraints this was not possible. Additionally, the study would have benefited from an *ex-post* study of outcome variables related to practical changes and sustainability outcomes (Fraser et al. 2006). By using indicators which measure outcome, this research could've observed the practical application of the SA methodology.

Other concerns regarding questionnaire design, include; the number of items contained in each questionnaire were too many, and the number of items per measure differed, with C2 'integrating diversity' with comparatively lower items. If measures are to be compared the number of items should be similar.

Items developed for questionnaires used two types of questions, normal coding (a positive statement), and reverse coding (a negative statement). When normalizing the answers, and comparing them using the Mann Whitney U test, we observe a highly significant difference between the two coding methods with a p-value <0.0001***. We know that the medians differ significantly between normal and reverse coded items, with reverse yielding the lower median. It is also interesting to note the interquartile range observed in Figure 17, it is that which is contained in the grey box where 50% of responses lie, we can observe this range to be much larger for the reverse coded item verses the normal. This is confirmed when comparing the standard deviations, which were calculated as 1.4 for reverse coded items and 0.5 for normal. Using this information, I can infer that participants were confused with this approach. Authors have argued that reverse coded items may disrupt the established pattern of responses, or alternatively respondents may fail to notice the difference in normal-reverse coded items (Wong et al. 2003; Schmitt and Stults 1986). This implies reduced reliability of participants answers, which acted as the core source of data.
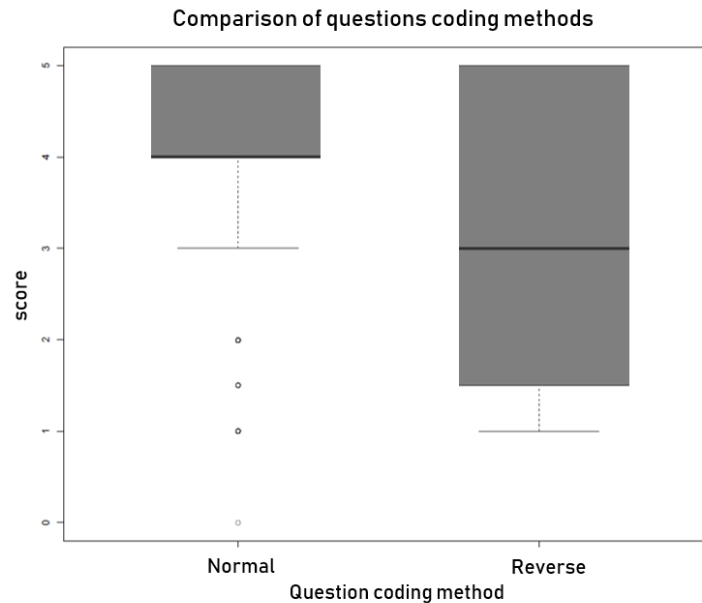
Figure 17. Box-plot comparing the question type, normal (n=2252) and reverse coded (n=494)

Critical reflections relating to facilitation follow. Coordinating and facilitating roles are an important aspect in proper method implementation and these person(s) must be adept with community engagement (Leventon et al. 2016), familiar with methods and the local cultural context. Although these needs were filled with my research partner, constraints remained in relation to facilitation. When in a large group the key challenges faced were the powerful stakeholder overtaking the process. This challenge was outlined as one of the three main challenges to SA, C2. integrating diversity. We mitigated this by intervening when culturally appropriate, aiming for a sensitivity for all perspectives. However, if SA approach is applied in another context, practitioners must be attentive to this challenge. Additionally, 1 facilitator (whom speaks the local language) and 1 assistant (whom does not), is not enough to handle 20–30 people in a workshop. Although we did our best, there were simply too many participants who needed direct assistance, and not enough facilitators. This should also be considered when adapting and planning workshops.

Now to consider constraints within particular methods; the individual interviews, and the net-mapping method, were conducted in the home of the interviewees. This often resulted in neighbors and family members to become involved in the exercise. Since the method is aimed at capturing the individual's understandings of the stakeholder environment, the mere presence of certain individuals, could alter the respondent's behavior, leading to held back opinions, and/or introducing skew to the results. Additionally, often young children were present during interviews, particularly in female interviews, this may have led to less focus on the interview tasks for these participants. These obstacles could be avoided by conducting the interviews in a private and quiet setting away from the distraction of the home, however, this also presents difficulties, as people are busy and also feel most comfortable in their homes. Therefore, I suggest researchers to carefully consider the best location for interviews in the context of the case study.

Regarding the generative picturing method, during the first phase of participatory photography, there was a low number of participants, a total between both villages of 5. This shortfall could be attributed to 3 things; first, the lacking of cameras (total 2) relative to the time allotted to conducting interviews, second, the lack of technological 'know-how' or willingness to take on the responsibility the camera implies, and lastly, the lack of 'free time' of individuals. Participatory photography requires interviewees to take time to engage in photography in the community forest, this by nature excluded persons which had more HH, on-farm and/or community responsibilities. Unfortunately, the individuals which refused to participate were often lower castes individuals, this resulted in the lack of caste representation in our 5 participants (Table 6).

More generally, challenges related to practicalities of implementation in this case study include, constraints due to the village structure, the long distances between tolls made it difficult to locate a central place for the workshops which was convenient for all forest stakeholders. Laduk and Bulung, although close to Singati (the larger town, with the GCAP office), remain quite remote. Therefore, it was difficult to facilitate a true multi-stakeholder workshop, as distances to travel for non-local stakeholders was a major constraint. Next, the lack of access to technology, this constrained implementation of the method to GP part 2. The time of year this case study was conducted was not optimal, as it was peak farming season and therefore many community forest stakeholders (whom are also farmers) had far too many responsibilities and could not attend the workshops. Gaining rapport with communities presents its challenges in all research, particularly when living and conducting research in communities. Lastly, undoubtedly the fact that we were two young females (me being foreign, and my research partner being Nepali from a higher caste) influenced data collection. All of these aspects of conducting research should be carefully considered when designing and implementing research methodology.

8. Conclusions

SA in projects relating to NRM, hold the potential to engage and empower potential beneficiaries, ultimately improving the quality of project activities which follow. Unfortunately, often this potential is not realized due to the many challenges faced in identifying, engaging, differentiating, categorizing and investigating the stakeholder environment which prevail in complex multi-stakeholder management systems. In order to confront the challenges inherent to SA, practitioners require a better understanding of which SA methods properly navigate them.

In this thesis, I identified the three main challenges faced in SA as: top-down approaches, integrating diversity and lack of reflection. Methods were combined and adapted to address these main challenges, while aiming to realize learning objectives for the participants. The approach was applied in the case study villages of Laduk and Bulung, in Nepal, in cooperation with a carbon-offsetting development project aiming to improve community forest management. Participants assessed each method according to its effectiveness at addressing the main challenges with an *ex-post* questionnaire using a Likert scale. Data was used to assess each methods effectiveness and the entire SA methodology effectiveness according to the main challenges. Additionally, a final *ex-post* self-assessment according to defined learning

measures, based upon SES thinking and TL theory, was implemented upon completion of the designed SA methodology. This data was used to interpret the role such an approach has for its participants. The objective of this community-based evaluation of methods and learning achievements, was to clarify the capabilities of SA methods through the eyes of the participants.

Positive evaluation results from the questionnaires, reflected in high median scores, indicated that the four chosen SA methods addressed the three main challenges in SA, while also achieving learning objectives.

In the context of community forest resource management, this means the designed methodology led participants to question their attitudes towards the forest, learn from other actors whom also hold a stake, engage in rational discourse and critical reflection, recognize the connections and complexities which exist in their SES as well as the importance of social engagement for change. Ultimately, change in natural resource management requires social engagement of stakeholders which facilitates learners to question their assumptions, only then can we hope for transitions towards more sustainable common resource use. This is the sort of engagement participatory sustainable development projects, like Carbon Nepal, aim for. The SA methodology could advance project goals in promoting sustainable community forest use and improving carbon sequestration. Additionally, the data collected during field work, provides the data needed to analyze and investigate the relationships using more sophisticated SA methods, like social network analysis. These further analyses could help identify and investigate the social relations aiding project planning to better navigate the complex an interdependent relationships of community forest stakeholders.

Theoretical implications resulting from this community-based examination of SA methods, show how transformative learning and social-ecological systems thinking theories can be applied and assessed in SA. The methodology provides a framework for efficient and purposeful SA, which may be applied in other development projects. However, in order to affirm the findings of this research, it would be necessary that the approach be repeated and assessed in different case studies. Application of the approach in a contrasting cultural setting presents an opportunity for a comparative case study. Additionally, it appears to be an open question how best to apply and assess SES thinking and TL theory in the context of NRM projects. Further research applying and adapting the analytical framework of this thesis could contribute to the answers. This research design is novel, as methods are not often assessed, and rarely is assessment done by the participants themselves. Therefore, the SA science would benefit from further researching the effectiveness of methods used in this thesis, as well as others which hold promise to address the needs of SA and sustainable development objectives. I suggest that the results from community-based method evaluation be used as a guide for practitioners in choosing appropriate SA methods. Additionally, the designed SA methodology, or components, could be adapted and utilized for targeted application in other participatory NRM projects.

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Appendix A. Stakeholder analysis methods guide

Phase I: Work-shop based intervention 1

To ensure an inclusive first sampling of stakeholders, design this initial outreach carefully and in close cooperation with your local partners, or those familiar with the context of your targeted communities. The attendees of the first workshop helped in the first round of stakeholder's identification, therefore it is important to get into contact with diverse forest stakeholders.

Table A1. Schedule for WBI I

Step	Method	Time
0	Introduction	15 minutes
1	Brainstorm - Mind-map – self categorization	2 hours
B	Break	15 min.
2	Group referrals	1 hour
3	Reflection - Wrap-up + questionnaire	45 min.
B	Break	45 min.
	Approximate time required:	5 hours

Step 0: Plenary- Introduction

As participants arrive, fill in the attendance sheet, and provide assistance to illiterate participants. Once many have arrived, give a brief introduction, according to:

> *This work-shop will take place in 3 steps. First, we will think about the different stakeholders in the forests and create a map to organize our thoughts. We will then have a short break for snacks and tea. Following we will discuss our findings. Lastly, we ask for referrals of people belonging to stakeholder categories for stakeholder sampling used in our individual interviews. Lastly, an optional anonymous short survey can be filled in, reflecting on what we have done during the workshop. We will then share a meal together. This should take a total of about 5 hours. Does anyone have any questions?*

The points of the prior informed consent form can be either/or; (1) written on the flip-chart and read aloud to participants to ensure their understanding and agreement (2) printed and provided individually. Inform participants that upon completion of the sign-in sheet, they will provide their signature agreeing to the terms of consent outlined.

Step 1: Brainstorm - Mind-map – self categorization

Brain storming stakeholder categories – 30 minutes

First provide a definition of the term 'stakeholder', to ensure understanding, we used:

> *Any person or groups of people who has a significant stake or interest in community forest resources and can affect or be affected by management problems or interventions (Chevalier 2001).*

Facilitator first must ensure that participants understand what a stakeholder is within their context, therefore local examples are given and questions and discussion encouraged. Participants are then instructed to start discussing 'who holds a stake in the community forest' by listing their ideas on the provided blank flip-chart. This can be done by participants or by the facilitator depending on the context which you are working.

BREAK!

Mind-mapping – 1 hour

Facilitators then present an 'example mind-map', adapted for understanding, and relate the categories participants created to the example.
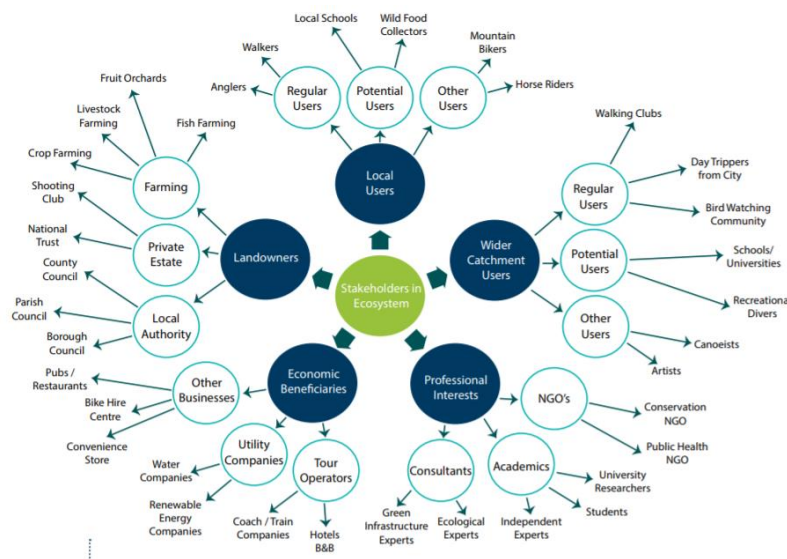
Figure A1. Stakeholder mind map adapted from Forest Commission as cited in (Durham E. et al.)

Figure A1 stakeholder mind-map helped to guide our example map provided to participants for ease of understanding the mind-mapping method.

Once a common understanding of the mind-map is created, participants are instructed to use the brainstormed list to create a 'mind-map' which reflects their understanding of the stakeholders of their community forest, or other natural resource. Participants were provided a flipchart with 'Community Forest' written on a circle in the middle, markers, tape, and various colors circles, corresponding to the 'example mind map'. This example map is then removed from sight to ensure participants map reflects their understanding, not the examples. This is done in one large group.

Upon the group completion of mind-map it is hung in front and facilitator interprets the map with the help of the mappers, to harbor reflection and discussion over stakeholder categories.

Self-categorization – 20 minutes

Little slips of papers and pens are given to each participant, they are instructed to write their names on the slips and place their names in or near the stakeholder category in which they belong.

Step 2: Group referrals

Now as a group, participants are asked to use the first level stakeholder categories (closest to center 'community forest') created in the mind-mapping exercise, to refer 2 stakeholders with the most 'influence' over community forest governance with name and contact information from each identified category. Facilitator must encourage participants to fill it in as a group and as complete as possible (particularly contact information as this helps immensely in phase II). The attendance list and referrals are then used to identify interviewees for phase II.

Step 3: Wrap up & questionnaire

Distribute the individual anonymous questionnaire assessing participants experience with the mind-map exercise. First explain the scale used, and what the questionnaire is assessing, then assist participants who have trouble understanding, and illiterate participants.

Once finished, inform participants the date & time of the second workshop and that some of them will be contacted for individual interviews. Thank everyone and break for the meal together.

Phase II: Individual interviews and network mapping

Table A2. Overview of Phase II, individual interviews

Step	Method	Time
1	Semi-structured interviews	15 minutes
2	Net-mapping	1 hour
3	Investigating interest-influence	15 minutes
4	Referrals	5 minutes
5	Optional homework – photography + Net-map questionnaire	10 minutes
	Approximate time required:	1 hour 45 minutes

The group stakeholder referrals from Phase I, identified the two individuals whom participants perceived to hold the most 'influence' from each category (Prell et al. 2009). Of the two referred persons, randomly select one from each stakeholder category.

The interview process was designed according to two methods, participatory influence network mapping (Net-Map) and interest-influence matrix. These methods can help to deepen the researchers and participants awareness regarding current needs, aspirations and influence of those who work, live, and play in the community forests. Net-mapping, allows the interviewee to create maps according to their perceptions.

The first round of interviews included one 'key informant' from each category, these interviewees referrals were used to guide the maximum variation snowball sampling (Ravnborg

& Westermann 2002), by asking the interviewees to refer someone with opposing views to theirs. This mode of sampling is chosen in hopes of getting a representative and inclusive sample.

Step 1: Semi-structured interview

With inspiration from (Renard, 2004 and Ravnborg, 2002) a semi-structured interview assists the interviewee to reflect on previously established stakeholder categories, self-categorize while also sparking transformative learning elements. Interviews were done individually in the participants home. The guiding questions were:

2. *Here are the main stakeholder categories, created during the mind-mapping exercise in WBI I (List shown of categories) – Are there any categories missing from your understanding?*
3. *How do you categorize yourself and your household?*
   a. *Which category do you think you (and your family) belong?*
   b. *Which other categories do you interact the most?*
   c. *What level of influence do you (and your family) have over forest resource management (low, medium, high)?*

Step 2: Net-mapping

To begin the mapping exercise first, the basic idea of 'stakeholder influence network mapping' was explained. Then each step was followed in succession, guided by (Schiffer and Hauck 2010):

Your task now is to map the stakeholder's categories, regarding connections (or linkages), influence and goal of each. You are welcome to add, take-away, or combine stakeholder categories as you see fit throughout the mapping process. These categories established in the previous exercise simply act as a guide in creating your network map.

1. *Define actors: Write the names of different stakeholder actor groups on colored paper circles (or 'actor cards') and assemble them on the empty sheet of paper*
2. *Define links: Next, how are these stakeholder groups linked?*
   a. *Define links and use different colored arrows to depict them according to:*
      i. *Flow of information*
      ii. *Lines of conflict*
      iii. *Flows of funding*
      iv. *Flows of regular communication*
   b. *If links or exchanges are mutual then arrows flow both directions*
   c. *A 'key' was provided which defined these different links*
3. *Define influence: of each stakeholder or actor category.*
   a. *Who has influence on forest governance?*
   b. *Is the influence positive, neutral, or negative regarding sustainable development of the community forests? Please draw +, 0, – on the map.*

c. The level of influence is visualized with an 'influence tower', these are constructed with the stackable items (game pieces). Guidelines for construction of towers are:
  i. The more influence an actor has, the higher the tower
  ii. Towers can be as high as the interviewee sees appropriate
  iii. Two actors can have towers of the same size – then they have similar level of influence
  iv. Actor with no influence have no tower
  v. Each interviewee given the same number of pieces (20 in our case)
  Practical notes
  ▪ note the height of the influence towers for actors on the network map, for data collection and later analysis
  ▪ each group gets the same amount of stackable items
  ▪ +, 0, – included on the key

REFLECTION ON Steps 2 & 3:

Reflection on Step 2 – links:

  i. Flow of information
    i) Who provides information to who?
  ii. Lines of conflict
    i) The actors which conflict, could you explain what it is about?
  iii. Flows of funding
    i) Who is providing funding to whom?
  iv. Flows of regular communication
    i) Which categories communicate the most?
    ii) Which the least?

Reflecting on Step 3 – influence:

  v. Which stakeholder groups seem to hold the most influence in the forest?
    i) Is their influence positive?
    ii) Where does his/her influence come from?
  vi. Which stakeholder groups hold the least influence in the forest?
    i) In your onion, why do you think they have the least influence?
    ii) What would give this group more influence?

RESUME MAPPING EXERCISE

4. Define objectives: What is the perceived goal or objective for each actor group regarding the forest? Predefined goals included: P (Protection), SD (sustainable development), ED (economic development) U (use), SU (sustainable use), EU (economic use) – these were also included on the key.

  a. Depict goals as first letter of the objective, next to the stakeholder card
    practical notes
    • Stakeholders can have more than one objective

- *Can make one letter bold to communicate one objective having more influence over actors decisions than the other.*

Step 3: Investigating interest-influence, reflection

During Step 2, the influence towers indicate the level which each stakeholder group has over the governance of forest resources, while also defining perceived objectives, however this net-mapping exercise is missing an assessment for the level of 'interest' stakeholder groups exhibit. This is an interesting variable to assess within stakeholder analysis, particularly when compared with the influence of categories. Although all stakeholders have an interest in the forest (Colfer and Prabhu 1999) these interests are diverse, and variable relative to levels of influence (Durham E. et al.). Gaining insight into interest and influence levels can guide a projects strategic stakeholder involvement, consultation, and collaboration (Durham E. et al.).

Since the net-mapping provided information regarding the influence of each stakeholder group, their interest, is then assessed. 'Interest' is first explained, then interviewees are guided by:

> *On the map please identify interest level for established categories by rating the level of interest from 1-5 (1 being the lowest level of interest, 5 being the highest), and writing the rating next to the stakeholder category in circling it.*

A short refection on potential problems depicted through the finished maps is guided by the questions:

> *a. Are there any potential problems you see occurring between stakeholders in the future?*
>
> *b. Would connecting some stakeholder groups help to alleviate these problems?*
>
> > *vii.   Which connection would help the problems?*
> >
> > **Practical note* if connecting some stakeholders would help to alleviate the problems, interviewees can draw this 'Problem alleviation' with a wavy or zig-zag line.*

Step 4: Referrals

Following the interviews, a referral table is filled out according to their final stakeholder categories according to:

1. *Influential stakeholders: From each stakeholder category please provide 2 contacts with highest perceived influence*
2. *Opposing views: Other people who hold a stake in the forest resource use most likely have different opinions to yours. Will you give us the names of one or two people who you think might have a different viewpoint? (Ravnborg 2002).*

The referrals from the first round of interviews were used to guide the second round, but also collected more stakeholders contacts for each category.

Step 5: Optional 'homework' – photography + questionnaire

The impulses are used to inspire and guide the individual's photography homework over a period of 2-3 days. Photographers are given autonomy on how they used the impulses to inspire their photography (Brandner 2019).

Instructions are given as:

> *Use the camera provided to take images which represent positive aspects of sharing the resources of the community forests & negative aspects for you – these images will be shared and used for WBI II. You can take as many photos as you like, just focus on taking separate images for the positive and negative*

If the interviewee does not have a personal camera then one is lent to them.

Following instructions on the camera functions, the Net-map questionnaire is completed anonymously by the interviewee.

After the agreed amount of days (range from 2-4 days) the camera is picked up for use in the following interview, and interviewee turned photographer is given the photography questionnaire to fill in anonymously.

Post Phase II processing to be done before Phase III:

1. Create a 'consensus net-map'
2. Brainstorm discussion points from results – perhaps compare two contrasting maps
3. Compile photographs and choose some for step 3 –projection?

Phase III: Work-shop based intervention II:

Discussion, consensus net-mapping, generative picturing, reflection & discussion

Table A3. Overview of Phase III

Step	Method	Time
0	Sign-in, introduction	15 minutes
1	Reflect on 'our understanding' of mind-maps – Consensus map – Conflict & resolution discussion + questionnaire	2 hours 30 minutes
B	Break – tea & cookies	15 minutes
2	Generative picturing – presentations	1 hour
3	Reflections – appraisal	30 minutes
4	Questionnaires	30 minutes
B	*Break – meal*	30 minutes
	Approximate time required:	5 hours 30 min.

In the second and last WBI, the results of the WBI I, and of individual interviews, including both the mind and net-maps, conflicts and potential resolutions identified through net-mapping, as well as individuals photographs are reflected upon. The hope is to elicit an engaged discussion about the possible engagement and collaboration with actors on the map, while creating a

'common understanding' of the social fabric which surrounds forest use and governance. Additionally, actors from a diversity of stakeholder categories from the referral lists collected during Phase II are invited to the work-shop, in hopes of triggering meaningful exchange between people of different beliefs, level of power and interest, addressing challenge number 2, integrating diversity.

Step 1: Consensus mapping – conflict-resolution

In preparation for this final work-shop, the information collected throughout phase I & II aids in the creation of an 'our understanding' (as researchers) mind-map. This map was intentionally left incomplete, as it was based on the first level stakeholder categories (yellow color) used during the net-mapping activity in phase II. This map is put onto a flip chart and presented to the participants. All participants are encouraged to change, and complete the map according to their understanding.
Following their additions, red lines indicating conflicts are added to the maps.

After each conflict was presented, participants are asked:
- *Is this understanding correct?*
- *Is there anything which we misunderstood, or which is missing?*

Rational discourse is therefore facilitated and encouraged. This was an important role as, naturally, discussion over conflict can become very passionate. After discussion of every conflict identified, participants are given the opportunity to add any important conflict they perceived and explain them.

Next, potential resolutions to each conflict are presented. Following the presentation of each potential resolution, participants are asked:
- *Is this a possible resolution?*
- *How would this look in reality?*
- *How else could this conflict be mitigated?*

Notes are taken on a flip-chart in order to outline potential pathways to mitigate identified conflicts. Following this exercise, the method assessment questionnaire regarding the mind/net-map reflection is given, followed by a break.

Step 2. Generative picturing – presentations

Using picture taken by participants whom participated in generative picture part 1: photography, selected images from each are presented, discussed, and reflected upon. Following the conflict and resolution exercise in the previous step, an 'envisioning' session is utilized. Due to time constraints, only one topic (envisioning) for the generative picturing session could was used.

Picture dialogue

The photographs taken by photography participants in Phase II are used in this phase. Before the start of the workshop, some photos from all photographers are chosen for presentation, at

least two photos (one positive and one negative). Each photographer is invited to present each of their photographs according to:

- *Please explain each photograph: what, where, who, etc.*
- *Now tell us about your experience with photography*

After the presentation, one positive photo is provided from the selected photos, and used as tools for reflection, learning, discussion and envisioning. The large group was divided into two smaller groups by counting off "1,2,1,2…". Each small group contained at least one interviewee, turned photographer, from Phase II.

Part 2: Creation of generative pictures

Depending on the local situation regarding the workshop room setup, and access to electricity, the researcher has a couple of options to implement this method, (1) using a projector to project selected images on the wall to paint underneath (2) using a projector, but painting in two groups separate from the photograph, (3) Showing the photograph on your computer, or printed, to inspire the painting exercise. The last option was what we utilized, due to the lack of electricity and access to technology.

The two small groups are given their painting materials and the que:

> *Please as a group silently paint your ideal future scenario with inspiration from the image provided.*

After paintings has finished, each group elects one or two representatives who presents their groups interpretation of the painting. Each group is given 5-10 minutes to present their 'vision' image. Discussion of the GP is then facilitated according to points (Wals 2007):

- *[choosing one feature on the painting] what does this feature represent?*
- *What commonalities do you see between the two paintings?*
- *What has influenced or informed your vision?*
- *What are the results of this vision for life, work, everyday choices and actions?*
- *How can these additions become reality?*
- *What are the most important elements which would allow this 'vision' to become reality?*

Paintings are given to participants which are interested, from each group.

Step 3. Reflections – appraisal

Lastly, the large group joins back together to discuss and reflect upon their experiences and what was learned throughout the workshops and individual interviews. Reflective discussion points included:

- *What have you learned in the past weeks?*
- *Is this important for cultivating change?*
- *What activities were most interesting for you? Why?*
- *What could've been done differently? Why? How?*

Following the reflection and discussion session, the generative picturing questionairres and overall experiential appraisal questionnaire (according to transformative learning and social-ecological systems thinking) are completed by willing participants.

Appendix B. Results from Consensus mapping – conflict-resolution
LADUK

Figure B1. 'Our understanding' mind-map of stakeholder categories in Laduk, Nepal

After participants completed the map, according to their perceptions of the stakeholders involved in community forest, Figure B1 was created. The final stakeholder map created during phase III can be seen as Figure B2.

Figure B2. Final stakeholder map from Phase III, Laduk, Nepal 12.4.2019

Upon completion of the map, the most-common conflicts were presented one at a time by adding the red lines with arrows seen in Figure B3.

Figure B3. Final mind-map of stakeholder categories + conflicts + resolutions in Laduk, Nepal

From insights gained during the semi-structured interviews of Phase II, reasonings behind these conflicts were presented as,

1. Local beneficiaries ←→ GCAP
   - Conflict: Local beneficiaries are negatively affected by the increase number of wildlife in the community forest. From our understanding these human-wildlife conflicts include destroyed crops, livestock fatalities, and attacks to local users. Those local users negatively affected expect compensation for their losses but GCAP is not providing any.
   - Resolution: GCAP could provide trainings to save and protect crops and livestock.
2. Local beneficiaries ←→ C.F.C.
   - Conflict 1: Some local beneficiaries want less rules regarding forest use and therefore do not agree with the C.F.C. activities and decisions.
   - Conflict 2: Local beneficiaries pay a tax for the use of the community forest to the C.F.C. and therefore want more transparent communication regarding how this money is spent.
   - Resolution: C.F.C. could be more transparent about their activities and rules.
3. C.F.C. ←→ GCAP
   - Conflict: Although many interviewees identified a conflict between these stakeholder categories, no reasoning was provided. Is this indeed a conflict? If so, what is it about?
   - Resolution: No potential resolution noted. How could this conflict be mitigated?

Participants were engaged throughout the presentation of our understanding and yielded these results:

1. Local beneficiaries ←→ GCAP
Conflict:

Every participant from the workshop agreed with this conflict. The officer from GCAP (Rabin Shrestha) argued that the main cause of this conflict is the gap of information, he accepts that GCAP is still trying to give all the information regarding rules and processes when local beneficiaries are affected by the wild animals. He further stated that villagers only get compensation when they are affected from those animals which GCAP wants to protect, not every animal found in jungle, for example no compensation is provided with animals like leopards and the achhame bander monkeys. GCAP has provided compensation to 22 peoples for conflict with such wild animals. Most of people from the affected areas do not know the process and rules compensation through GCAP.

People who are attacked by animals they will gets maximum 200,000 Nepali Rupee immediate compensation from the GCAP on the basis of affected people's situation for their treatment. When they need more money for the treatment then they have to submit doctors bill and they will get money according the bill.

Identified resolutions:
1) Making fence around the jungle with iron nails
2) Training to protect the crops from wild animals.
3) Training to build local fence by using local materials for crops and animals.
4) Arrange meeting and give the information about the rules of GCAP and those animals which are protected.
5) Easy and direct communication between GCAP and local users.

2. Local beneficiaries ←→ C.F.C.

Conflict: Local users want to use forest like their own property without accepting the rules, but community forest committee has certain rules regarding forest use.

For this problem Rabin Shresta from GCAP provided a different perspective, he argued that when GCAP and C.F.C. make strong rule then villagers are not happy but, now you are saying that we have to make strong rule then its good for everyone.

Resolutions:
1) Focus on tree plantation.
2) Strong rules
3) Direct or regular communication among the C.F.C., GCAP and local users.
4) Create easy and understandable rules and policies for the villagers.
5) Chose better community forest committee member in the presence of GCAP and villagers.

3. C.F.C. ←→ GCAP
Conflict:

Most of people said there is problem but no one specifically said that 'this' is the problem. So first we tried to find out some of the problems, which are as follows:

1) Economic transparency.
2) Weak rules and policy.

3) Lack monitoring and no direct monitoring
4) Dependency.
5) Jungle is in risk because of no security from CFC.

Resolutions:

1) Regular awareness program about the forest conservation by the leadership of GCAP.
2) Regular meetings taking place in different villages in order to reach different groups of people.
3) Regular communication and participation.
4) Annual economic report must be presented in front of villagers and/or access of local b. to the economic activities of the C.F.C.
5) 10 min donation program (every single person of the village should separate 10 minutes every day for the forest, which they can provide weekly or monthly.)

BULUNG

Figure B4. 'Our understanding' mind-map of stakeholder categories, Bulung, Nepal
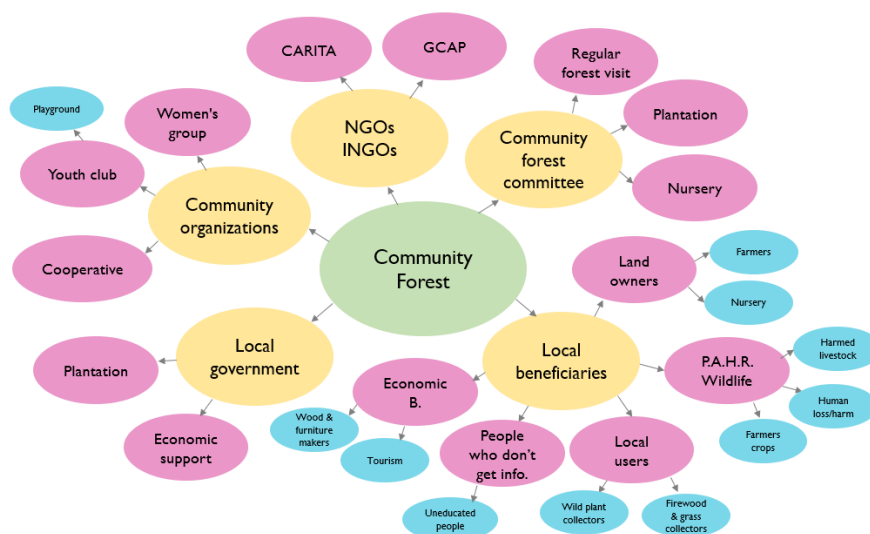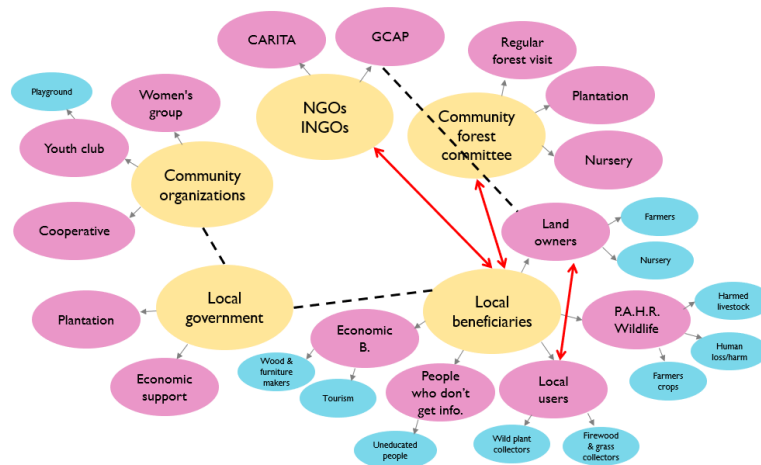
Figure B6. Final mind-map of stakeholder categories + conflicts + resolutions in Bulung, Nepal

From insights gained during the semi-structured interviews of Phase II, reasonings behind these conflicts were presented as:

1. C.F.C. ←→ Local beneficiaries

- Conflict: C.F.C. members misusing their power while unfairly, and unequally distributing forest resources.
- Resolution: No potential resolution noted. How could this conflict be mitigated?

2. Local users ←→ Land owners

- Conflict 1: those people who own land near the community forest suffer from the local users, because local users use their forest as community forest.
- Conflict 2: Additionally, land owners have a conflict with community forest committee about the territory.
- Resolution: Don't use these areas of land which you don't fully understand

3. Local beneficiaries ←→ NGOs/INGOs

- Conflict: C.F.C. committee members are misusing their power and unequally distribution of forest resources.
- Resolution: GCAP could provide trainings to save and protect crops and livestock.

Participants were engaged throughout the presentation of our understanding of the conflicts and resolutions and their feedbacks and discussions can be summarized as:

1. C.F.C. ←→ Local beneficiaries

Conflict: Everyone who was present in the workshop agreed on our understanding, after discussion began most of the people said that we cannot do anything to the community

forest committee members. But in the workshop one of the members from community forest committee, Jagat B. Khatri argued that whenever you find the committee members are misusing their powers and doing illegal things then you must inform the other committee members. At the same time one of the female participants, Devi Tamang, argued that if we form a complaint then they will not provide us with our needs from jungle.

Resolutions:

i)   Local users should be united and submit their complaint as a group.
ii)   Face to face discussions must be facilitated between the community forest committee and local users.
iii)   Regular meetings.
iv)   Information and discussion.

2. Local users ←→ land owners

Conflict: Whilst discussion began, many of the local users claimed that a lot of the land under conflict is not private jungle, but rather land owners claim it as theirs because their land borders the forest. Some of the land owners like Ganesh Bahadur BK, Devi Tamang and Kabita Khadka argued to separate private lands and community lands, in the presence of C.F.C. members. Jagat Bahadur also supported their argument and said he was there when they separated their lands in the past, but still local users remain unaware of the boundaries.

Resolutions:

i)   Fencing around the community forest.
ii)   Do not use forest area which are privately owned.
iii)   Owners of private forests should make some indication on their land.

3. Local beneficiaries ←→ NGOs/INGOs

Conflict: Participants indicated that the conflict is directly between local beneficiaries and GCAP. They were frustrated about the losses caused by the wildlife to crops, domestic animals and humans. They indicated that these destructions are caused by protected and non-protected wild animals alike. However, people are not getting compensation from GCAP due to the lack of awareness regarding compensation protocol as most affected beneficiaries are still not clear about GCAPs rules and regulations.

Resolutions:

i)   Trainings to protect domestic animals from wild animals
ii)   Discuss the policies and rules imposed by GCAP with community forest committee and local beneficiaries.
iii)   GCAP should disseminate knowledge regarding the protected and non-protected wild animals.
iv)   Provide information about potential new crops for cultivation, which are safe from wild animals.

Appendix C. Questionnaire items – detailed

Provided here are detailed items for all questionnaires used in the community-based assessments. Grey items were reverse-coded items.

Questionnaire code	Items per measure
Challenges	
C1. Top-down	15
C2. Integrating Diversity	19
C3. Lacking reflection	17
C4. General	13
Transformative learning elements	
T1. Individual experience	3
T2. Critical reflection	4
T3. Rational discourse	2
T4. Social learning	3
T5. Context awareness	2
T6. Action	2
Social-ecological systems thinking elements	
S1. Connection	2
S2. Complexities	1
S3. Social	3
General method assessment	
GM	13

Phase I

Mind-mapping, n=33

Challenge code	Question
C1	1. The group members accepted my inputs to the mind-mapping exercise
	2. It was difficult to voice my opinion during the mind-map exercise
	3. I felt comfortable expressing my ideas during the first exercise
C2	4. During the mind-map activity, different people who were there listened to what I had to say
	5. Thinking back to the activity, some important persons were NOT there to contribute but should have been
	6. During mind-map activity, it was possible for all participants to say what they really think
	7. Looking at the map that we created, it is a good compromise of how the different participants see the community
	8. In this exercise for some of the participants, it was DIFFICULT to influence what we did
	9. When we created the mind-map, I discussed with someone new for the very first time
C3	10. When we made the mind-map, I thought for the first time in detail about who 'holds a stake' in the forests
	11. During this activity, I quite often felt like the activity should be done differently
	12. After we finished our mind-map, the discussion we had as a group was different to what we usual discuss
GM	13. In summary my experiences with the mind-mapping exercise was:

Network-mapping, n= 20

Challenge code	Question
C1	1. I felt I could be honest with the information I gave during the network-mapping exercise
	2. It was difficult to give my true opinion during the net-map exercise
	3. I felt comfortable expressing my ideas during the first exercise
	4. During the net-map activity, the interviewers listened to what I had to say
C3	5. When I made the net-map, I thought for the first time in detail about the social networks that exist in my community
	6. During this activity, I quite often felt like the activity should be done differently
	7. After I finished the net-map, the discussion we had was different to usual discussions
GM	8. In summary my experiences with the net-mapping exercise was:

Generative picturing part 1, n= 5

Challenge code	Question
C1	1. I felt the directions given to me (of positive and negative aspects of sharing resources) helped to guide my photography
	2. I felt comfortable expressing my ideas through taking photographs
C3	3. When I took photographs, I thought for the first time in detail about positive and negative aspects of sharing forest resources
	4. While taking photographs, I quite often felt like the activity should be done differently
	5. By taking photos, I reflected on aspects of my community in a different way to what I usually do
GM	6. I felt comfortable with the task given to me
	7. In summary my experiences with the photography exercise was:

Phase III

Consensus mapping n= 45

Challenge code	Question
C1	1. The group members accepted my inputs to the discussion
	2. It was difficult to voice my opinion during the discussion of the maps
	3. I felt comfortable expressing my ideas during the discussion session
C2	4. During the discussion, different people who were there listened to what I had to say
	5. Thinking back, some important persons were NOT there to contribute but should have been
	6. During the discussion, it was possible for all participants to say what they really think
	7. Looking at the maps and reflecting on our discussion, we made good compromises of how the different participants see the community
	8. In this exercise for some of the participants, it was difficult to influence the discussion
	9. I heard an opposing opinion for the very first time during our discussion
C3	10. I thought for the first time in detail about our community as a network
	11. I thought for the first time about how the structure of the network affects our forests
	12. During the discussions, I quite often felt like the activity should be done differently
	13. The topics discussed were different to what we usually discuss
GM	14. I felt confused about the meaning of the net-maps
	15. In summary my experiences with reflecting on the net-map exercise was:

Generative picturing part 2, n= 41

Challenge code	Question
C1	The group members accepted my inputs while we painted
	It was difficult to express my opinions when we discussed what I painted on the photos
	I felt comfortable explaining what I had painted when we discussed
C2	During the discussion of our paintings, different people who were there listened to what I had to say
	Thinking back, some important persons were NOT there to contribute but should have been
	While we painted, it was possible for all groups members to participate equally
	During the discussion, it was possible for all participants to say what they really think
	Looking at the maps and reflecting on our discussion, we made good compromises of how the different participants see the community
	In this exercise for some of the participants, it was difficult to influence the painting
	I heard an opposing opinion for the very first time during our discussion of the paintings
C3	I thought for the first time in detail about how I feel about sharing the resources of the forest
	I thought for the first time about how I see the future of my community and forests
	During the discussions, I quite often felt like the activity should be done differently
	The topics discussed were different to what we usually discuss
GM	I felt confused about what I was supposed to be painting
	In summary, my experiences during the painting and following discussion was:

Analytical framework code	Item
T1	The exercises we did in both workshops made me ask questions how we manage and understand the forest
	2. When we met for the workshops, I thought about how I value the forest
	3. The photograph and painting exercises were new and challenging for me
T2	Our discussions after exercises made me think about my assumptions regarding my community
	Our activities in the workshop taught me different things about forest management than what I usually see and hear on television, radio and from neighbors
	I believe it is good to discuss the traditions we have in managing our forest, and new ways of managing the forest
	Although we can discuss the management of the forest, the decisions will be taken by those who are more powerful
T3	Because of my experience in the workshops, I have realized that people have different but reasonable interests regarding the forest
	The workshops showed me that my interests and ideas about the forest are legitimate and heard by other people
T4	Through discussion with the participants in the workshop, I learned how they view the community and the forest
	Mapping the different people involved was interesting, but I already knew the results before
	The group of participants and I developed a shared vision of how we would like to manage the forest
T5	As a result of the interactions, I learned something new about our community and forest
	The workshop activities made me discover new aspects of how our community is organized
T6	The workshop activities made me look for opportunities to improve forest management
	I have the skills to start improving forest management
S1	The activities showed how our actions affect the forest and the community
	Through the activities, the social, economic and environmental aspects of our life as forest users were exposed
S2	I agree with the message of the mind-map and net-maps, that forest management is complex and we cannot expect easy solutions
S3	For sustainable management of our forest, building communication among diverse stakeholders will be very important
	I expect that forest use will have to be discussed intensively by the multiple stakeholders we have identified
	I gained insights into how my social structures must change to enable sustainable use of the forests
GM	The time I spent at the workshops, was worth my time
	The phases and sessions were well timed and transparent
	The photography and painting exercise would have needed more time
	The workshops were too long
	The overall experience of the workshops was positive

Example questionnaire from Phase III: WBI II, method generative picturing part 2.

1. The group members accepted my inputs while we painted

1	2	3	4	5
Disagree		Neutral		Agree

2. It was difficult to express my opinions when we discussed what I painted on the photos

1	2	3	4	5
Disagree		Neutral		Agree

3. I felt comfortable explaining what I had painted when we discussed

1	2	3	4	5
Disagree		Neutral		Agree

4. During the discussion of our paintings, different people who were there listened to what I had to say

1	2	3	4	5
Disagree		Neutral		Agree

5. Thinking back, some important persons were NOT there to contribute but should have been

1	2	3	4	5
Disagree		Neutral		Agree

6. While we painted, it was possible for all groups members to participate equally

1	2	3	4	5
Disagree		Neutral		Agree

7. During the discussion, it was possible for all participants to say what they really think

1	2	3	4	5
Disagree		Neutral		Agree

8. Looking at the maps and reflecting on our discussion, we made good compromises of how the different participants see the community

1	2	3	4	5
Disagree		Neutral		Agree

9. In this exercise for some of the participants, it was difficult to influence the painting

1	2	3	4	5
Disagree		Neutral		Agree

10. I heard an opposing opinion for the very first time during our discussion of the paintings

1	2	3	4	5
Disagree		Neutral		Agree

11. I thought for the first time in detail about how I feel about sharing the resources of the forest

1	2	3	4	5
Disagree		Neutral		Agree

12. I thought for the first time about how I see the future of my community and forests

1	2	3	4	5
Disagree		Neutral		Agree

13. During the discussions, I quite often felt like the activity should be done differently

1	2	3	4	5
Disagree		Neutral		Agree

14. The topics discussed were different to what we usually discuss

1	2	3	4	5
Disagree		Neutral		Agree

15. I felt confused about what I was supposed to be painting

1	2	3	4	5
Disagree		Neutral		Agree

In summary, my experiences during the painting and following discussion was:

1	2	3	4	5
Negative		Neutral		Positive