Participatory Mapping, Learning and Change

in the context of

Biocultural Diversity and Resilience

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Abstract

This study set out to investigate the learning and change that emerged in and through participatory mapping in the context of biocultural diversity and resilience in rural Ethiopia. It did this through examining the learning and agency emerging from three participatory mapping practices (Participatory 3 Dimensional Modelling, sketch mapping and eco-cultural calendars) using two case study sites, located in the Bale Mountains and the Foata Mountains in Ethiopia, and honing in on in-depth reflective processes in two community contexts located within the broader case study sites, namely Horo Soba, Dinsho *wereda* in Bale; and Telecho, in Wolmera *wereda*, in the Foata Mountain complex. This study tried to answer three research questions related to participatory mapping: its role in mobilizing knowledge related to biocultural landscape, its role in learning and change, and its value in building resilience.

The study used qualitative case study research methodology underpinned by critical realist philosophy, and used photographic 'cues' to structure the reporting on the cases. It used four categories of analysis: biocultural diversity, educational processes, learning and agency, in the first instance to report on the interactions associated with the participatory mapping practices as they emerged in the two case study sites. This was followed by in-depth analysis and interpretation of participatory mapping and biocultural diversity, as well as participatory mapping and learning, with an emphasis on acquisition, meaning making and identity formation processes. The in-depth analysis drew on social and learning theory, and theory of biocultural diversity and social-ecological resilience. The study also included analysis of broader change processes that were related to and emerged from the social interactions in the mapping activities, and the resultant morphogenesis (change), showing that morphogenesis, while broadly temporal, is not linear, and involves 'little iterative morphogenic cycles'. These insights were then used to interpret how participatory mapping may contribute to resilience building in a context where social-ecological resilience is increasingly required, such as the two case study sites, where social-ecological degradation is highly visible and is occurring rapidly.

The study's contribution to new knowledge lies in relation to the role of participatory mapping in facilitating learning, agency and change which, to date, appears to be under-theorised and under-developed in the participatory mapping and environmental education literature. As such, the study findings provide in-depth insight into how participatory mapping methodologies may 'work in the world', in contexts such as those presented in the two cases under study. It has tried to demonstrate how participatory mapping has managed to mobilize knowledge related to biocultural diversity, facilitated the acquisition of knowledge and helped members of the community to engage in meaning making activities relevant to their biocultural landscape and renegotiate their identity within the wider community context. It has also shown that dissonance is an important dynamic in the learning process; and that morphogenesis (or change) occurs over time, but also in smaller cycles that interact at different levels; and that participatory mapping cannot, by itself mobilise significant structural change, at least in the short term. It has also shown, however, that learning and the desire for change can emerge from participatory mapping processes, and that this can be utilized to adapt to the changing socio-ecological environments, potentially contributing to longer term resilience of social-ecological systems.

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Chapter 1: INTRODUCTION AND ORIENTATION TO THE STUDY

1.1 Introduction

This chapter introduces the study, which investigates the learning and change that emerges in and through participatory mapping in the context of biocultural diversity and resilience in rural Ethiopia. The chapter begins with a biographical narrative that explains how the study emerged from ongoing engagement with environmental education and activism processes. It goes on to explain my motivation to ground the study in the experience that I have with working on agriculture and land related issues. It also highlights the key events that introduced me to mapping and to generating the questions for this study.

The chapter describes briefly the two institutions, namely African Biodiversity Network (ABN/Gaia)and Movement for Ecological Learning and Community Action (MELCA-Ethiopia), which gave me the contextual capacity, space and support which enabled this study. ABN/Gaia organized training and critical meetings and MELCA-Ethiopia provided the institutional support and context for the study. The Gaia Foundation[1] is a key partner to ABN and reference to ABN in this study includes Gaia.

This chapter briefly narrates the history of natural resource management of Ethiopia starting from the Hailesilasie regime which affected community narratives mobilized during the participatory mapping. Issues related to biodiversity and land degradation are briefly discussed to contextualize the study. Biodiversity discourses in Ethiopia tend not to include culture and discussions on land degradation often neglect the erosion of culture.

The chapter then describes the study areas and shows how the biocultural landscape is rapidly degrading. Wetlands, streams and rivers are drying, soil is being lost, trees are being wantonly cut and wild fauna and flora have largely been degraded. As the

[1] The Gaia Foundation works with individuals, organisations and networks in Africa, South America, Asia and Europe to regenerate healthy ecosystems, enhance traditional knowledge and practices for land, seed, food and water sovereignty, and to strengthen community self-governance. This enables communities to become more resilient to climate change and the industrial processes which have caused the many crises we now face. http://www.gaiafoundation.org/ accessed December 9, 2011

study is done in the absence of communal action to reverse these problems, it posits participatory mapping as one of the ways used to reverse the situation.

The chapter goes on to describe the research focus, objectives, questions and methodology. It then briefly explains the main concepts used in the study including biocultural diversity, social learning, morphogenesis and resilience. Finally, it provides an outline of the thesis.

1.2 Motivation for the study: a biographical perspective

Early interest in cultural biodiversity education and activism

The seeds of my interest in environment, especially the connection between environment and culture, activism and education, started when I was a Biology teacher at Gindeberet High School, in Western Shoa, Oromia Regional State, Ethiopia in 1987. In negotiation with the Ethiopian Herbarium, I started collecting plant specimens for their collection. I had to pick parts of the plants and ask about their cultural significance, mainly to document their local uses and vernacular names. My engagement with environmental issues did not translate into practice, though, until I attended the 2nd Biological Society conference in Addis Ababa University in 1992. A colleague called Workineh Endazenew[2] presented a paper on the activities of the Batu Nature Club in Bale and I was motivated by their advocacy work to save the Mountain Nyala from execution and extinction. There was a change of government and some community members used this opportunity to express their anger over their marginalization due to the Bale Mountain National Park, by killing wild animals, mainly the Mountain Nyala. The teachers and students collected the heads of these animals, staged a demonstration and managed to convince the local government to stop the killing.

[2] In Ethiopia the first name, rather than the surname, is used when referring to an individual. A child will take his father's and grandfather's name. I am called Million Belay Ali. Million is my name, Belay is my father's name and Ali is my grandfather's name. In Ethiopia nobody would call me either Mr. Ali or Mr. Belay. My son Enku will be called Enku Million Belay, so the great grandfather's name will be dropped as the generations continue. Therefore in this thesis I will use first and second names when referring to individuals, rather than the international convention of using surname only, as in Ethiopia this would then refer to the individual's father.

Through support from the Ethiopian Wildlife Natural History Society and the Biological Society of Ethiopia, I started a Nature Club in Dejazmach Geresu Duki School, which we named Walga Nature Club. The club became quite famous in environmental education circles in Ethiopia through innovative activities and communication with both local and international groups working on conservation. One of the innovative activities was an annual rally to motivate students to do practical work, increasing their own knowledge, and the knowledge of local government and communities, including school communities, about environmental issues. My learning from this experience was that if you want to motivate students to get involved in school activities, set an event and a purpose, in this case the rally or celebration, give them clear guidance, and their motivation will be enhanced. I was later invited to join the Ethiopian Heritage Trust due to my activities with the Walga Nature Club. I continued my interaction with my former club through helping them organize various events and raising funds for them.

The Heritage Trust introduced me to a range of individuals in Ethiopian society and challenged me to learn about how a bigger project like starting a people's park at the outskirts of Addis Ababa can be coordinated. The park has an altitude of 3200 metres and the 600 metre difference in altitude between the lowest and the upper part means the diversity in plants and landscape is spectacular. I used to organize tree planting operations and visits by various groups, which usually included those interested in the fauna and the flora of the park. I also worked with various voluntary groups that included those interested in the biodiversity of the area. My biggest interaction was with school environmental clubs and I recruited thousands of members for the Trust. Together we planted over 140,000 indigenous tree seedlings and my role was in coordinating the activity. These interactions allowed me to gain more knowledge on biodiversity and issues related to parks and people. My interaction with the local farming societies living around the park was limited and often hostile. We used to see them as a 'problem' threatening the protection of the trees and the interests of the Park and they saw us as a threat to their abilities to access what they considered to be 'their' forest.

I moved to the Institute for Sustainable Development (ISD) in 1998. The famous environmentalist and African Negotiator on biodiversity issues, Dr. Tewolde Berehan Gebre Egziabher, and his wife, Mrs Sue Edwards, started ISD. They were working with rural communities in Tigray on a sustainable agriculture project. They also had extensive communication with activists all over the world. I was the only employee working from the office and I had the responsibility of organizing the files of the Institute. I had to read each document for filing purposes and this gave me a chance to read through many documents! This exercise opened up a world of knowledge which had been hitherto peripheral to me. I encountered issues related to negotiations on farmer's varieties of seeds, biosafety protocols, Genetically Modified Organisms (GMOs), the corporatization of nature, and I also read about various activists and writers who were up front in international struggles for the rights of farmers in the South.

I made various trips to the North of Ethiopia, Tigray, where I met with farmers and discussed issues concerning seed, soil and water. It was in one of these trips with Sue that I met a friend with whom I was teaching in Gindberet, Debesay Teklemuz. He was the director of a school called Maichew Secondary School. We asked him if he was interested in participating in the study of traditional farmers' seed varieties and their cultural significance. Sue, an accomplished botanist, gave him a framework to collect information on farmers' seed varieties but it never materialized. We later arranged with a school in Addis to take up the project and they added to it an experiment in which they compared agricultural practices using compost and inorganic fertilizers with other forms of agriculture. The purpose was to teach students about sustainable agriculture and the value of diversity using farmers' varieties of seeds.

In 1999 I went to the United Kingdom to study a Masters degree in Tourism and Conservation after serving for three months in an international organization called the Heinrich Böll Foundation where I was working as a Regional Coordinator for Environment. My MSc gave me the chance to read into community and conservation related issues. I also did my research with indigenous peoples in the South Western part of Ethiopia, the Karo and the Hamer, and this provided me with the first

opportunity to fully appreciate the knowledge people have about their biocultural landscape.

After finalizing my study, I met the head of the Gaia foundation, Liz Hoskein, in the beginning of 2000 and she invited me to attend some of the preparatory meetings of the World Summit on Sustainable Development (WSSD) or Rio+10 as it was commonly called. This meeting with Liz turned out to be a pivotal moment in my life. I had 'known' her through reading her communications with Sue and Tewolde while I was working with ISD. In January 2001, we went to Southern Africa together and participated in series of workshops in Zambia and South Africa. I met many South African activists through Liz, especially in Cape Town and Johannesburg, and was exposed to various issues related to biodiversity and the rights of people to it. One of these people was Elfrida Strauss. She was heading Biowatch at that time. She told me about the work that she was planning to do around seeds and seed security, and asked me for advice. I told her we could start something in Ethiopia on the value of farmers' seed varieties and I developed a proposal while staying at her house.

On my way back to Ethiopia I passed through Nairobi, Kenya, and met my previous boss, Asegedech Ghirmazion of the Heinrich Böll Foundation. We agreed that I would take a lead in organizing Ethiopian Civil Society participation in WSSD under the 'Forum for Environment'. She also gave me a copy of the seminal book *The Cultural and Spiritual Value of Biodiversity* published by UNEP in 1999. On my way back to Ethiopia, I read an article by Walker (1999), which by chance, talked about the story of the origin of basketry in the Pacific North West. This story and other readings from the book, especially the introduction section by Posey (1999) 'Culture and nature – the inextricable link' inspired me to start a Cultural Biodiversity project in Ethiopia. I developed the proposal with inputs from Sue and sent it to Elfreida. It stayed dormant, however, until I told Liz about it and she managed to raise funding for us to start the process in Ethiopia.

The growth of the Cultural Biodiversity Education Project in Ethiopia

Following the approval of funding for the cultural biodiversity project, we hosted a first training workshop for teachers from 16 schools from around the country in

2001. I facilitated the training on the use of Participatory Rural Appraisal (PRA) techniques to learn from local communities and the teachers came back with an astounding amount of information from a semi-urban community (during the workshop activity). We agreed with the schools to start a cultural biodiversity programme in 17 schools across the country and ISD appointed one of their staff members, Fassil Gbeyehu, to follow up. In 2002, I met Colin Hudson in South Africa in one of the events organized by the Gaia Foundation and he presented an initiative called 'the village of hope' where people bring their solutions to an issue and exhibit. Their theme was energy crisis solutions. He sent me the basic working document and I conceived the idea of having a cultural biodiversity celebration, to bring all 16 schools together for a culture and biodiversity event. They came with their collection of artefacts, music, arts and stories. Heinrich Böll Foundation provided the funding. It was a hugely successful event attended even by the president of the country and the schools returned much more motivated and energized. This celebration continues, and today MELCA-Ethiopia (I am now Director of this NGO) hosts a series of these celebrations every year.

Another influencing dynamic in the narrative leading to mapping was the establishment of the African Biodiversity Network (ABN) and my subsequent role in it. ABN was formally established in 2002 at a meeting held in the Valley of 1000 Hills in Durban, South Africa. ABN had its conception in biodiversity negotiations. In a meeting in Nairobi in 2003, two other streams joined forces with ABN: one was the Earth Jurisprudence (EJ), which later became the community governance idea/concept, and the other was the Cultural Biodiversity (CB) Programme that was started in Ethiopia. The EJ programme has as its basic premises that current laws and legal justice systems are inadequate for protecting the Earth and new legal justice systems are needed that incorporate 'earthy systems', that give rights to other species in addition to humans and which also respect the rights of non- living beings including rivers, forests and mountains (Berry, 2000).

As noted above, the Cultural Biodiversity programme became one of the thematic areas and I was entrusted to start and coordinate cultural biodiversity processes in countries where ABN has partners. Together with others in the network, I started

clubs similar to those in Ethiopia, in South Africa, Kenya, Tanzania, Ethiopia, Benin, Togo and Ghana. My interaction with elders, activists and teachers from these countries deepened my understanding of the issues related to biodiversity and culture.

In 2004, Liz organized for me to meet with Andrew Muir, head of the Wilderness Foundation, South Africa, in London while we were there for different purposes. He told me about an initiative called *Imbewu,* which is a programme that was being run in collaboration with the South Africa National Parks for schools in South Africa. The Imbewu project takes marginalized black children to protected areas where they spend three days with elders, walking trails, experiencing solitary reflections in nature, listening to stories from elders around campfire, and taking turns to watch their campsites throughout the night. I saw the potential of this to strengthen the Cultural Biodiversity programme. A few months later, I went to one of the parks, the Kruger National Park, to experience the Imbewu programme, and I assessed its potential to strengthen our work with youth, and also considered what aspects could be improved. Later in the year, I participated in the experiencing nature programme in Botswana and suggested to ABN to combine the Cultural Biodiversity, the Imbewu and the Botswana initiatives and spread the programme in Africa. It was accepted and we began to look for the funding to start with partners who operate near protected areas.

In 2004 we registered MELCA-Ethiopia as an NGO and I started the Imbewu programme which we called *Segni* ('seed' in Ethiopia which combines the Imbewu, Cultural Biodiversity and Botswana initiatives) and started the first programme at the Bale Mountains. The elders were selected from the local community and they brought their experience to the process. The Bale elders are very wise, humble and extremely knowledgeable about the landscape and the stories related to it. Working with them provided me with a wealth of knowledge on biocultural diversity. I also participated in various international meetings related to culture and environment, which helped to deepen my understanding and curiosity on the issue.

Encountering mapping as a tool for cultural biodiversity education and learning

Even though I was familiar with social mapping having used it as one of the participatory rural appraisal (PRA) methodologies for research in Tigray in 2001, my involvement in mapping started in earnest in 2006. I participated in an exchange programme in Colombia organized by ABN/Gaia in 2006. During this exchange programme, I could see maps being used by the indigenous communities of the Pira Pirana in Colombia for various purposes including what they call 'territorial ordering'. This involves identifying critical places or sacred sites on the land and reviving their history and cultural significance, with leadership from the shamans. They used the maps to connect to those sacred sites and to decide how to manage the environment around them. They also used an 'eco-cultural calendar' and refined their use of this calendar to the point of designing a new curriculum based on it. The new curriculum that was developed by the Pira Pirana community fulfils the national educational goals but is implemented in their own way and ensures that children learn about the historical and cultural significance of their territory while also learning basic subjects including mathematics and sciences.

In 2006, I had my first chance to actually participate in the building of a Participatory Three Dimensional Model (P3DM) carried out in Nesuit, Kenya, with the local community of the Ogiek. The trainees, brought from some African countries and the local university, built the model and the local elders came to populate it with their cognitive maps. There was also a discussion among the participants about the purpose of mapping which enriched my experience of mapping. I was interested in pursuing the mapping processes, and after beginning to explore mapping in more depth, I decided to use it as a tool to understand both the historical and present relationship of people with their biocultural landscapes. I became increasingly more interested in the aspects of learning and change associated with the mapping processes, hence this study.

Over the course of 2009 and 2010, we built four models and this helped me to understand the use of this tool in various contexts. This has given me a broader perspective of the relationship that exists between people and their environment. In 2009, I participated in a sketch-mapping workshop in Venda, South Africa.

Indigenous community representatives and one of the people who started mapping in Colombia came to train us. He told us about a community located between Colombia and Ecuador named Pestos. The community lost their land, culture and most of their livelihood and was in a crisis. They prayed to their god called Huan Chiles and he advised them, through an elder, to revive their language and culture through mapping their food systems, including the histories and songs related to it, and through understanding their own traditional laws and the laws of the government. The mapping activity has especially helped them in this process. I was fascinated by this story and used it with local communities to motivate them before we started our own mapping process. This story from another place proved to be a powerful orientation for the Ethiopian communities that MELCA was working with, and inspired the communities to participate in the mapping (See Appendix6).

This biographical and contextual history informed my 'curiosity' to undertake this research. Out of this experience two key questions emerged: firstly, a question on why communities do not act even if they know that their biocultural landscape is being degraded. I wanted to find mechanisms, or methods, to engage communities in discussions on this issue, particularly mechanisms or methods which would strengthen their interest in, and willingness to respond to this increased degradation and change the status quo. I remember in 1994 doing an experiment on soil erosion with students. We were splashing a bucket of water on bare hilly land, on grass-covered hilly land and on semi-flat land. There were two farmers watching us and, out of curiosity I went over to them and asked them "what do you think is the cause of soil erosion?" Without thinking for a second, they said "It is rain and if the land is not covered by forest or grass, it will be much worse. But if there are plants then the erosion will be less". This is a simple answer to a straightforward question but it did not fit the popular development discourse of 'farmers degrade their environment so we have to go and teach them what the causes of soil erosion are, and how they should protect it' (Bishaw, 2003). This conversation was my U turn. I kept on wondering "Why then do they not act?' Although the response to this question is contextual and very complex, I was looking for a method that could help local communities to engage with this and other associated questions.

A second impetus for undertaking this research emerges from my experience of organizing various meetings over the years with communities to discuss land use, conservation of forests and ways of responding to environmental issues, but finding that these did not achieve the intended results. This too left unanswered questions about our methods or ways of working with communities, hence my interest in Participatory Three Dimensional Modelling (P3DM) arose, after interactions with the Colombian community and after participating in the P3DM mapping exercise in Kenya, whereafter I decided to test this method as a means of fostering social mobilization, reflection, dialogue, learning and decision making. Furthermore, as our usage of the terms 'cultural biodiversity' or 'biocultural diversity' grew, I developed an interest in understanding both the concept and how it could be used locally in more depth. I found participatory mapping to be a fertile avenue to do this. This biographical and professional arena, with the emerging questions arising in the context of my ongoing practice, formed the basis of my interest in this study.

In the next section, I will introduce the two institutions which form part of the context of this study and which are key for the analysis of learning and change in Chapter 7.

1.3 Institutional context

1.3.1 The African Biodiversity Network (ABN)[3]

The ABN was first conceived in 1996, in response to growing concerns about threatened biodiversity and community livelihoods in Africa – mainly due to the effects of ongoing commoditization and degradation of biodiversity and natural resources, coupled with the need to develop strong African positions and legislation, as well as African-led solutions, to protect Africa's heritage. By 2002 it was formalized in name and structure. Regional and Thematic Coordinators were designated.

[3] The text from this section was summarized from the ABN website http://www.africanbiodiversity.org/, accessed November 3, 2011.

The network now comprises over 300 concerned Africans who are engaged in promoting these activities in Africa and strengthening alliances with like-minded others, regionally and internationally. It has partners in 12 countries: Benin, Botswana, Ethiopia, Ghana, Kenya, Mozambique, Zimbabwe, South Africa, Tanzania, Togo, Uganda and Zambia.

ABN partners work at a grass roots level in 12 African countries. Partners come on board as they begin to pioneer culture-centred approaches with communities, or advocacy strategies, and then share their experiences. Partner organizations within ABN are responsible for developing and implementing their own community work, coalition building, legal and policy work. ABN provides an overall structure to facilitate research and the flow of information, experiential learning through workshops and exchanges, training support for community initiatives and to catalyze wider actions, as well as developing collective advocacy strategies. ABN encourages and supports partners to innovate and pilot new strategies and processes, which emerge from and with communities. The ABN secretariat is based in Kenya.

One of the areas that ABN works on is the concept of resilience. ABN understands resilience as 'the ability of a community to withstand negative internal and external pressures and threats. Resilience enables adaptation and strength, coherence and intergenerational learning. Communities can be resilient when they are empowered and clear about their future and can act together to protect their rights' (http://www.africanbiodiversity.org/).

The route to resilience is developed through intergenerational learning to revive indigenous ecological knowledge; the creation and use of eco-maps and calendars to facilitate agreement of land and biodiversity governance and control, first within communities, and then with local government; and community dialogues to analyse and strengthen relevant traditional ecological knowledge and practices, and build community ecological governance capacity. All of these methods promote dialogue, analysis, and negotiation to identify, agree, and implement local solutions that increase local control and protection of ecosystems and community rights and responsibilities.

1.3.2 Movement for Ecological Learning and Community Action (MELCA) - Ethiopia

MELCA was started in 2004 to work on issues of culture and environment. The word *melca* means 'ford' in both Amharic and Oromo languages – two of the widely spoken languages of Ethiopia. It means a crossing point on a river. An elder in the Bale mountains said '*melca* means connection. People has to cross it to connect.' We use the name to indicate symbolically the connection between culture and biodiversity; the old and the new generation and linkage among stakeholders working on the revival and enhancement of cultural practices which has sustainable relationship with nature. A river also signifies linkage with a source. If the source dries, the river also dries. MELCA signifies that culture, which in turn is partially ecologically embedded, is a key source of identity and wisdom, and that the destruction or degradation of culture can result in loss of knowledge and identity, as has been reported by many researchers who focus on the relationship between culture, knowledge and identity (Zent, 2009; Pretty et al., 2008; Mafi & Woodley, 2010).

Out of the seven thematic areas of biodiversity identified by the UN convention on Biological Diversity, namely Mountain Biodiversity, Agricultural Biodiversity, Inland Waters Biodiversity, Forest Biodiversity, Island Biodiversity, Marine and Costal Biodiversity, Dry and Sub-humid Land Biodiversity, MELCA-Ethiopia works on Agricultural, Forest and Mountain biodiversity. Cross cutting all these thematic areas is Traditional Ecological Knowledge.

MELCA currently works in three areas in Ethiopia with local communities, schools and youth. These are the Sheka Forest in the Southwest of the country, the Bale Mountains in the Southeast, and the Menagesha Suba forest near Addis Ababa (see Figure 1.1 in Section 1.5). MELCA is also a one of the major partners of the African Biodiversity Network and it supports the objectives of ABN, as discussed in Section 1.3.1 above.

The main objectives and activities of MELCA, the organization, are:

- To start a proactive youth movement, which promotes biocultural diversity and contributes to sustainable life. Children and youth are taken in to a forest and through various activities and self-reflecting sessions; they connect with

themselves, nature and, through the elders leading the programme, with culture. Through the clubs that they start in their schools, they learn their traditional ecological knowledge and organize various events to educate their school and outside community as well as contribute positively to the amelioration of environmental and social problems in their surroundings.

- To use participatory mapping for community mobilization, environmental education and planning for natural and cultural resource management. Participatory 3 Dimensional Modeling, sketch mapping and ecological calendars are used for this purpose. MELCA has also started to spread the use of this method in Ethiopia through organizing exchange visits and international workshops. (MELCA, 2010)
- To conserve forest ecosystems and rehabilitate degraded areas. Through: soil and water conservation measures; organizing tree planting operations; introducing natural protective measures and promotion of soil building measure including composting, MELCA works to rehabilitate degraded ecosystems and increases the productivity of the land.
- To facilitate the improvement of the quality of lives of people at MELCA's project areas and reduce pressure on natural resource through endogenous development. Women and youth who cannot support them are given capacity on how to fill confident of themselves and start to increase their income.
- To revive traditional ecological governance systems through establishing and strengthening community based organizations. As part of community empowerment, local people are taught the right that they have in their constitution and in international agreements that the country is party to and are supported when they decided to form an association. Their cultural organization is also strengthened to the level that is wanted by the community themselves.
- To influence environmental governance and policy implementation through organizing events, improved communication and networking both locally and internationally. Through actively working with civil society to identify issues for advocacy, MELCA works for implementation of laws when they are good,

for improvements of laws when there is gap and introduces new laws and measures when there is the need.

The next section discusses the various contextual issues that have influenced the mapping activity.

1.4 Contextual issues

1.4.1 Background

According to the United Nations Development Programme (UNDP) country report for Ethiopia (UNDP, 2011) Ethiopia is the second most populous nation in Sub-Saharan Africa, with over 80 million people living in a 1.14 million km^2 area. The majority of the country falls into one of two biodiversity hotspots[4], with over half of the Eastern Afromontane Biodiversity Hotspot in the Ethiopian Highlands, and over 40% of the Horn of Africa Biodiversity Hotspot lying within Ethiopia (GEF, 2006).

Ethiopia has land area coverage of 1.14 million $km^2$and, with a population of 79.8 million growing at 2.6% per year, is the second most populous country in Africa, next to Nigeria. With an altitude range of 116 metres below sea level in the Dallol to 4,620 metres above sea level on RasDejen, the country has been regarded as one of the most critical biodiversity hotspots due to the range of its physiographic features (UNDP, 2011; PCC, 2008; Gessese, 2010). There are more than 80 ethnic groups, with the Oromo (the ethnic group included in the study) making the largest group comprising 34.5% of the population. The country has nine regional states and two satellite cities. Christians make up 73.2% of the population while Muslims make up 25.9%. The rest, 2.6%, are called 'traditional' (PCC, 2008). The last figure can be misleading as both Christians and Muslims mix traditional beliefs with the major religions. (See Chapter 6 for a discussion on sacred sites and Appendix 6 contains tables of eco-cultural calendars).

[4] To qualify as a hotspot, a region must meet two strict criteria: it must contain at least 1,500 species of vascular plants (> 0.5%of the world's total) as endemics, and it has to have lost at least 70%of its original habitat.
http://www.biodiversityhotspots.org/xp/hotspots/hotspotsscience/Pages/hotspots_defined.aspx

1.4.2 Brief history of natural resource management under the Hailesilasie (1930 - 1974); Derg (1974 - 1991) and the Ethiopian People Revolutionary Democracy Front (EPRDF) (1991- present)

According to Yirga (2007), prior to the land reform in 1975, land tenure in Ethiopia fell within four categories, namely land owned by the state which is mostly pastoral lands; land owned by the Orthodox church, mostly in the northern part of the country; private owned lands which are mostly found in the southern part of the country and granted by the government to the loyalists of the regime; and communal lands owned collectively by local communities. The natural resource management within these categories differed considerably. Land owned by churches and private land were respected for religious reasons and by fear of reprisal by the community, respectively. Owners had to grant permission for use of the resources (See Chapter 6, Sections 6.4 and 6.5). As to the management of natural resources on the land owned by the community, Yeraswork (2001) divides this into categories of forests, grazing lands and *guassa* (a kind of grass which is used for construction). He claims that the nature of management depends on the nature of the lands on the qualities of the resources themselves (pp. 3-4).

He also adds that rules contributed to the management. This is because the rules were simple, have the power to exclude those who do not follow them, were supported by the local authority and are considered as legitimate because of their historical mandate. He also added the cohesiveness of the community and insulation for commercial interests as further considerations. In the Southern part of the country natural resources in the forested and pastoral parts are also protected for spiritual reasons (MELCA, 2005; Flintan, Worku, Dida & Ridgewell, 2008).

The Derg Regime (1974 – 1991) purged the country of feudalism "and swept away an agrarian system built over centuries on the bleeding back of peasants and at immense social, political and environmental cost to the country" (Rahmato, 2009, p. 321).

Nationalization of land and the subsequent creation of peasant associations by the government, as well as the appropriation of communal lands by the state agents including the Ministry of Agriculture, led to the demise of natural resources (Hoben, 1995; Rahmato, 2009; Yeraswork, 2001).

Yirga (2007) writes:

> Thus the land policy of the military regime, which was characterised by state ownership of land coupled with its economic policy of nationalization of industries, collectivizing commercial private farms, government control of agricultural input and output markets, forced food grain deliveries at fixed prices, villagization of farm households by denying favourable economic environment and the private incentives required for sustainable use of natural resources, contributed to the degradation of natural resources.
> (p. 128)

Coupled with the decrease in landholding and tenure insecurity, which is the result of the government land policy, this resulted in unsustainable utilization of natural resources. (Yirga, 2007 and Rahmato, 2009)

Natural resource management after the Derg regime is much more complex than the previous two regimes. The Ethiopian government has produced various policy frameworks and legislations related to natural resource management. These include the Ethiopian Constitution of 1995, the Environmental Policy and Strategy of 1997 and the Environmental Impact Assessment regulations of 2002. The government has also signed international agreements including the Convention on Biological Diversity, United Nations Convention to Combat Desertification and United Nations Framework Convention on Climate Change[5]. Despite all these local laws and policies, environmental degradation in Ethiopia remains a key problem. Many point fingers at the land tenure system in the country saying that as in the previous regimes, the Federal Democratic Republic of Ethiopia controls rural land and this control of land has reduced the incentive for farmers, agro-pastoralists and pastoralists to manage their lands sustainably. Numerous researchers have studied the changes in the livestock system (Rahmato, 2009; Bishaw, 2001; Yirga, 2007) and Flintan et al., (2008) claim that:

> A number of factors have influenced land, land distribution and use within the study Peasant Associations. These include the increase of enclosures; settlement, land certification and re-distribution of land; resettlement of

[5] http://akababi.org/intagree.htm accessed on 9 December, 2011

> settlers from outside the area; and subsistence and commercial agriculture. (p. iv)

There are also a number of positive achievements in natural resources management under the present regime. A notable example is the inheritance of the Managing Environmental Resources to Enable Transitions to More Sustainable Livelihoods (MERET) project which was started in the previous regime in 1980. This is being scaled up in the name of Sustainable Land Management (SLM) practices. These include soil and stone bunds, gully-control constructions, trenches, bench terracing, water-pond construction, organic fertilizer application, and the planting of strategically chosen tree, shrub and grass varieties (Paven, 2011).

It is in this historical and contemporary context that this particular participatory mapping project has been undertaken. Contemporary issues will be elaborated further in Section 1.4.1.

The participatory mapping exercise explored in some depth in this study, was undertaken in a context characterised by threats to biodiversity, and land degradation, which also affects cultural practices. In this study, I refer to the relationship between biodiversity and culture as 'biocultural' diversity (see Section 1.10.1 below). It is increasingly being recognised that environmental concerns should be viewed in the context of coupled social-ecological systems (Folke, 2010). The main contextual issues engaged with in the course of the mapping exercise was loss of biocultural diversity and land degradation, which includes deforestation, forest degradation, loss of rivers and wetlands and soil erosion, and erosion of culture (see Section 1.5 for detailed elaboration).

The following section will briefly describe the status of biodiversity and land degradation in Ethiopia and look at the country's new development policy, named the 'Growth and Transformation Plan' as these form the broader context for the mapping project.

1.4.3 Issues related to biodiversity

According to Tewolde Berhan (1991), an Ethiopian scientist, there are between 6500 and 7000 higher plant species in Ethiopia, of which about 12% are endemic. With

regard to animals, there are known to be 284 mammal, 861 bird, 201 reptile, 63 amphibian, 188 fish and 1225 arthropod species with about 10, 2, 5, 54, 0.6 and 21% of endemism respectively. There is an immense variation in farmers' varieties of crops and breeds of livestock. More than 100 crop plant species are cultivated with a sizeable proportion of them having their centre of origin or diversity in Ethiopia. There are also 30 cattle, 14 sheep, 14 goat, 4 camel, 4 donkey, 2 horse, 2 mule, 5 chicken and 5 honey bee breeds/ecotypes/populations recorded which are indigenous to the country. This biodiversity is of crucial importance in the socio-economic, cultural and political life of the people (IBC, 2009).

This study recognizes that the biodiversities listed in the paragraph above are interwoven with the culture of people (Posey, 2009) and this is what is implied by biocultural diversity (see Chapter 2 for a detailed discussion on the subject).

On threats to biodiversity, the IBC (2009) report states:

> The rich biodiversity of the country is under serious threat from deforestation and land degradation, overexploitation, overgrazing, habitat loss, invasive species and some water pollution. The underlying causes for these problems emanate from poverty, population growth, lack of alternative livelihoods, inadequate policy support, inappropriate investment and inadequacy of law enforcement. A number of endemic wild animals, birds, trees and herbaceous plants are reported to be endangered or critically endangered. Farmer's varieties are being replaced by uniform improved varieties, and livestock breeds are also similarly threatened through crossbreeding with exotic breeds. Resettlements and agricultural investment in commercial crop farms are also exerting pressure on the country's precious biodiversity. (pp. 1-2)

The report does not explicitly mention the erosion of traditional ecological knowledge as one of the factors in the loss of biodiversity. But it highlights policy issues and causes leading to land degradation as one of the factors.

The next section will deal with land degradation.

1.4.4 Land degradation

According to Gessese (2010) "land resource refers not only to soil but also to landforms, climate, hydrology, vegetation and fauna, together with conservation

practices such as terraces, agro-forestry and drainage works" (pp. 187 - 188). I find this broad understanding to be relevant to the context of the study but found it limited in that it does not include cultural aspects of the landscape in its definition. As we shall see later, the problem of looking at land in terms of the natural resources only is a characterizing feature of many Ethiopian scholarly analyses informed by Western education, which tends to dichotomise nature and culture. This view is translated into policies and strategies with further implications for the people and the natural resources of the country. (See the orientation to trade only of the recent Growth and Transformation Plan, MOFED, 2010).

Gessese (2010) has this to say about land degradation problems:

> Socio-economic and institutional factors are the underlying causes that affect land degradation through their impacts on farmers' decisions with respect to land use and land management practices. These factors include population pressure, poverty, the high costs of and limited access to agricultural inputs and credit, the low profitability of agricultural production, fragmented landholdings, short time planning horizons, and lack of information about appropriate alternative technologies for farmers. The direct causes of land degradation in Ethiopia are the expansion of annual crop cultivation into steep lands without adequate investments in measures to arrest loss of soil and water, erratic and erosive rainfall patterns, declining use of fallow, limited recycling of dung and crop residues to the soil, limited application of external sources of plant nutrients, deforestation and overgrazing. (p. 193)

Although it has many elements, this understanding does not include political expediency as one of the key problems aggravating land degradation.

Hoben (1995), after studying the project of environmental reclamation in Ethiopia in the wake the 1985 famine, critically comments on some of the assertions held by many to date and repeated here by Gessese, and says that they are informed by neo-Malthusian narratives.[6] He contends that the core narrative is quite simple:

[6] The original theorem of Malthus stated that while food production levels grow at a linear rate, human population grows at geometric rate if unchecked. Therefore, Malthus predicted a decrease of available food per capita with ensuing famines and the eventual extinction of the human race. This general idea of ecological determinism was taken up and broadened by Neo-Malthusian theorists to

> Long ago when there were fewer people in Ethiopia, indigenous farming systems and technology enabled them to make a living without seriously depleting their natural resources. Over the present century human and animal populations have grown. Indigenous farming systems have been unable to keep up. Population has exceeded carrying capacity, causing ever-increasing and perhaps irreversible environmental damage. (p. 1013)

He claims that this paradigm is informing most of the interventions that are planned by government and big NGOs and lead, in most of the cases, to much more land degradation and destruction of the social fabric of rural communities. What his work does, is highlight how this (neo-Malthusian) view turned people into 'problems', which has also contributed to the erosion of their knowledge. He continues:

> The neo-Malthusian narrative's denigration of indigenous agriculture has led experts and planners to overlook and filter out much information about the strengths of indigenous resource management practices. There is virtually no mention of the fact that agro-forestry is almost universal in highland farming systems. There is little discussion of indigenous techniques of soil amendment, including manuring, spreading ashes from manure, which has been burned, and the use of leguminous crops in rotation, except for the occasional claim that these practices are dying out. There is little discussion or even acknowledgement of indigenous terracing, which is extensive in some cases, to have sustained such densities for centuries. (p. 1015)

This denigration of indigenous agriculture is still continuing as is evidenced by the current agricultural policies of Ethiopia, which favour conventional, monocrop forms of agriculture (See Appendix 6 for interview with the Telecho community around their seeds.)

Land degradation problems are very complex in Ethiopia. In Chapter 6 I report on local people in the study sites and their understanding of the causes of the problems and the solutions. Gessese (2010) provides the following explanation and description of land degradation issues: little knowledge or capacity on land degradation among policy makers and professionals; lack of know-how on rehabilitation activities; top-down planning approaches which marginalize the participation of those who at the forefront of the problem; weak linkages among government offices for the proper

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include other resources than food, namely arable land. The assumption was made that population pressure on resources (PPR) leads to resource scarcity (Schubert, 2005). Conflict over natural resources because of population increase was also included by Homer-Dixon (1998, cited by Schubert, 2005).

coordination of activities and approaches; limited capacity of government both in funding and in professional capital; lack of adequate information exchange among the stakeholders; lack of implementation of policies, although the country has signed various national and international conventions; climate variability resulting in unexpected run-offs and heavy rain; frequent restructuring of offices directly responsible for land management leading to loss of experience and documents and shortage of resources and incentives as the main problems (pp. 205 – 209).

Hoben (1995) has a different, more critical narrative describing land degradation in Ethiopia to the 'problem centred' narrative provided by researchers such as Gessese (cited above). He takes a more historical, political stand on the land degradation issue, and says that land expropriation was the first problem. Although farmers do have usufruct rights over their land, all land was declared public property and was repeatedly redistributed to landless claimants. This has decreased the incentive to invest in conservation activities. The second problem, according to Hoben, is the massive push by the government to form rural cooperatives, which were quite ineffective and created a problem even for the members of the cooperatives, as they were involved in land distribution and appropriation. Thirdly, Hoben argues that the rural economic policy tended to favour state large-scale agricultural farms and peasant cooperatives rather than smallholder agriculture. The fourth and 'worst' policy was the Derg's hurried and ambitious 'villagization' process. The purpose was to facilitate infrastructure and improve the deliverance of social services and boost agriculture but, in his view, this has 'wreaked havoc', or caused undue problems in rural Ethiopia. Farmers in both study areas attested to this problem (see Chapter 6, Section 6.5). Hoben (1995) says further:

> The programme was intended to facilitate agricultural and social service delivery, social and political change and the formation of Peasant Cooperatives. Instead, it brought about further movement and disruption of individuals' land rights and caused many other problems, including environmental degradation, the loss of livestock through disease and reduced access to pasture, poor sanitation and de-capitalization of farms depending on tree crops planted near the homestead. (p. 1012)

The government of Ethiopia has embarked on what many have termed a 'highly ambitious' and unrealistic plan (IMF, 2011) called the Growth and Transformation

Plan (GTP) (MOFED, 2010). The main thrust of the programme is to speed up economic development. In the agriculture sector the main drive is to change agriculture from subsistence to market-led forms of agriculture. According to the policy, this will come mainly through the increased use of agricultural technology (ibid.). It is said that agricultural research will focus on producing high yield varieties and the country will work towards producing agricultural inputs, mainly fertilizers, pesticides and herbicides. Farmers must adapt usage of improved varieties and, instead of cattle roaming to graze, their breeds will be improved and they will be kept in barns (ibid.). These practices are substantively different to current agricultural practice 'norms' amongst rural communities.

The government is also putting in place policies and programmes for watershed management (MOFED, 2010). Under this policy, farmers are being told how they should work to rehabilitate their land; and many have agreed to do so. At least they have made verbal agreements to this effect. Government officials are responsible for making this happen. The emphasis is on growing tree varieties that can grow faster and become economically beneficial to the farmers.

Within this policy framework, it is possible that crop productivity may increase, but it may also lead to a heavy genetic erosion of farmers' varieties of both crops and livestock and of trees and other species (MELCA, 2010a). The focus of the policy is more geared towards markets and the market economy, and provides little space for deliberating with farmers to identify what they want; and how they see their future farming practices developing. There is little discussion on ways of enhancing and/or preserving the variety of seeds used by farmer; the discourse is more in favor of commercialized varieties (ibid.).

Within the broader contextual background described in this section, the next section discusses the contextual issues at the specific study sites.

1.5 The study sites

This study, involving three dimensional participatory mapping, learning and agentive decision making focussing on biocultural diversity and resilience, was undertaken in two sites in Ethiopia. These are the Horo Soba *kebele* in the Dinsho *wereda* and

Telecho *kebele* in the Welmera *wereda* of Oromia Zone (see Figure 1.1 below). To provide insight into the study sites, I now provide a contextual description of the two study areas.

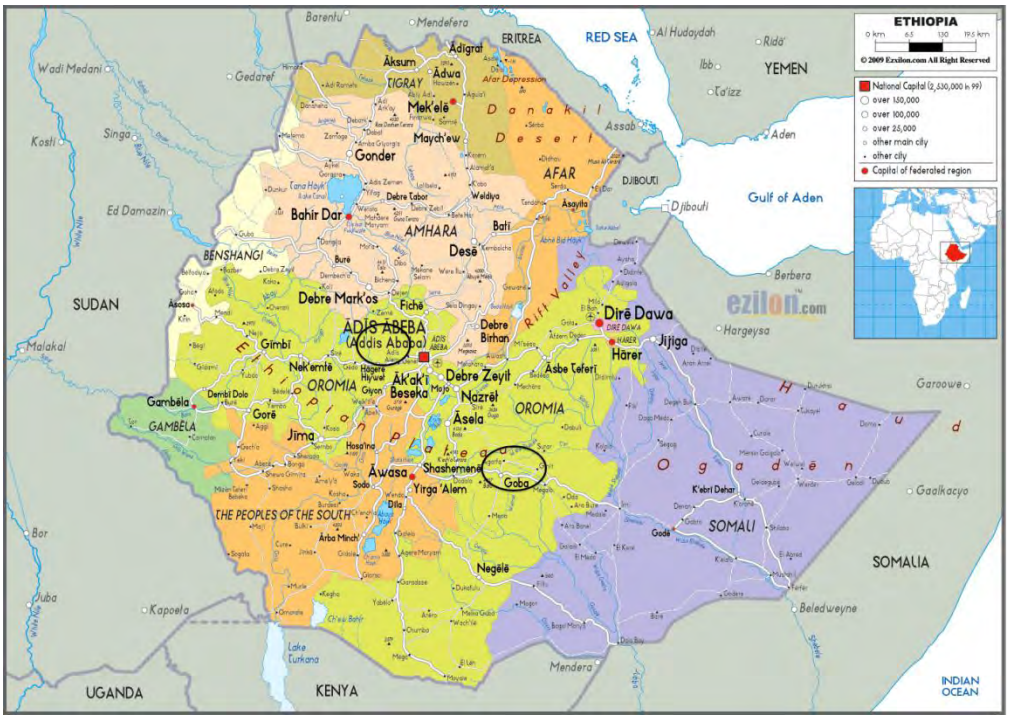

***Figure 1.1**: Map of Ethiopia, the black circles showing the project sites*
(Source: ezilon.com[7])

1.5.1 The Dinsho wereda

The Bale Mountains Eco-region (BME) forms part of the Bale-Arsi massif in the south-eastern Ethiopian Highlands. Located in the Oromia National Regional State, one of the nine regions which make up Ethiopia, the BME covers 22,176 km^2 over fourteen *weredas*[8]: Adaba, Agarfa, Berbere, Dinsho, Dodola, Gasera, Goba, Gololcha, Goro, Harenna Bulluk, Kokosa, Mena, Nensebo and Sinana. Oromia Regional State is the most populous state in Ethiopia, with 18,732, 525 or 36.7% of the national population (PCC, 2008).

[7] http://www.ezilon.com/maps/africa/ethiopia-maps.html

[8] In Ethiopia the highest level of governmental organization is Federal. There are 9 regions and 2 satellite cities, which make up Ethiopia. The regions are divided into zones. The zones are divided into *weredas*. The *wereda* is an important administrative level structure for biocultural diversity as they are semi autonomous in deciding on how the natural resources of their area should be managed. The next level is *kebele*. *Kebeles* are a cluster of villages called *gots*. The Dinsho *wereda* was modelled in the three dimensional mapping exercise focussed on in this study; and there are 9 *kebeles* included in the process. The modelling was done at the *wereda* level to make it useful for natural resource management planning.

Of these *weredas*, I choose to work with the Horo Soba *kebele* in Dinsho for my study. This is because most of the MELCA SEGNI programme activities (described briefly in Section 1.3.2 above) are run from this *wereda* and as a result, I was familiar with both the area and the people; and a relationship of familiarity and trust existed upon which I could base the participatory mapping activities (see Chapter 3).

The Dinsho *wereda* has nine *kebeles* and most of the *kebeles* are found in the boundary of a globally significant biodiversity area, the Bale Mountains National Park (BMNP) (BERSMP, 2007). A variety of flora and fauna can be found in the Dinsho *wereda*. This biodiversity is found to the north and north-eastern part of the Bale Mountains National Park. Part of the *wereda* is in the Bale Mountain National Park. A document prepared for the European Union by the Frankfurt Zoological Society (2009) describes the Park as follows:

> Bale Mountain National Park (BMNP): 2,200 $km^2$of Afro-alpine and Afro-montane forest habitat. Most important conservation area in Ethiopia: largest piece of Afro-alpine in the world, second largest moist tropical forest in Ethiopia. Largest populations of endangered and endemic Ethiopian wolves and Mountain Nyala. Over 3000 households resident in park and similar number of seasonal resource users. Socio-economic and cultural benefits accrue at local community, national and international levels through natural resources such as coffee, timber, grazing, non-timber forest products and hydrological services to southern Ethiopia and Somalia. BMNP qualifies for World Heritage Site and Biosphere Reserve Listing (p. 6).

Although the document recognizes the cultural value of the natural resources, it does not acknowledge the spiritual and other biocultural values that the park landscape has for people who live there.

The *kebeles* in the study are now discussed in some detail.

1.5.1.1 Horo Soba kebele

Horo Soba *kebele* is located to the western side of the Dinsho *wereda* and to the north-western side of the Bale Mountains National Park. The total area of the *kebele* is 4130 ha and it has 747 households (723 male and 24 female-headed households), with a total population of 6058. Regarding infrastructure, the *kebele* has two primary

schools, one health centre and one farmer training centre. There are five villages (*gots*) and 24 development groups (*gare*)[9].

The socio-economic activity of the community

The main socio-economic activity of the community is animal husbandry and crop cultivation. Barley is the only cereal crop that grows, as the area is very high for other crops, more than 3700 m above sea level. The production of barley is low. The villagers plant vegetables, mainly garlic and potato.

There is also a high level of dependency on forest resources for fuel wood, both for home consumption and market, for construction and timber. Non Timber Forest Products (NTFP) include honey, fodder and bamboo (see Appendix 6).

The Bale Zone is huge in terms of the area it covers and the agro-ecological zones it has and most of the problems mentioned for the Bale Zone in general apply to the study area. These more general problems include:

- providing support for agricultural projects at the expense of grazing areas;
- using areas for cattle fattening including *hora* and *haya* for agricultural purposes;
- land distribution to landless people (grazing areas are mostly used for this purpose);
- the increase of area enclosures for the purpose of rehabilitation;
- land certification and land redistribution;
- settlement from other parts of the country;
- restriction of mobility to other areas occupied by other peasant associations; and
- erosion of cultural practices due to influence from main religions (MELCA-Ethiopia, 2011a; Flintan, Worku, Dida & Ridgewell, 2008)

[9] In Ethiopian administration structure, the *kebeles* are divided into *gots* and each of the *gots* has four to five *gares*. These *gares* are composed of 10 – 15 households and are called Development Groups. Their responsibility is to coordinate the developmental and political activity of the government.

More specifically, according to a study done by MELCA-Ethiopia (2011a), land degradation in Horo Soba *kebele* has the following features:

- There are eight dominant tree species in Horo Soba *kebele* and, of these, one of the eight species is found to be in a critically endangered condition, three are found in small patches only, while four of the eight species are still in a generally satisfactory condition insofar as numbers of trees is concerned. This shows a forest degradation trend.

- There are 23 sacred sites in Horo Soba *kebele*. Of these only two were not located in the forest, and were boulders. 21 of the sacred sites were forested areas; this shows the linkage between sacred sites and the protection of forests. All of the forested sacred sites were degraded - four have become very small, 13 were small and four were of medium size[10]. This trend shows a decrease in the value of these places to people, especially the younger generation. People in the community have said this is linked to the influence of mainstream religions (see also Table 6.2 in Chapter 6). Praying is encouraged only in mosques.

- Wild animals were abundant in Horo Soba *kebele*. Some were very rare in earlier times, including leopard and lion, but today they have completely disappeared from the area. Except for the Mountain Nyala, hyena, warthog and baboon, which are still abundant, the status of the rest of the wild animal population is of concern to conservationists. Their number is dwindling with degradation of surrounding forest.
- There is a clear trend across the three major political regimes of the 20th century (see Section 1.4.2 above). Over this period of time, the status of forest resources including wood, honey, medicinal plants have worsened. Grazing intensity has increased and the exposure of the soil to erosion has increased. This shows how political change coupled with population growth

[10] Small, medium and large represent the extent of degradation. A small state indicates the severity of degradation while large means it is intact.

and other social and environmental factors can contribute to, or fail to successfully halt, land degradation.

- There were eight medium and 15 large streams in Horo Soba *kebele*. Of these, three of the medium rivers and five of the large streams have dried up. Seven of them are very small with one large stream in a 'medium' state. This shows a trend of rivers drying up. As the whole ecosystem depends on the flow of these rivers, it is a serious problem indeed, and represents a critical risk to the area.
- There were eight large and three medium wetlands. Of these, six of the large wetlands have already dried up. Four of the wetlands are very small. Only one of the large wetlands exists with a very low water content. This shows a trend towards loss of wetlands, and complete conversion of wetlands to other ecosystems.
- Of the seven *horas* (mineral water for cattle) in Horo Soba *kebele*, one has already dried up, and two are small; two became medium and two are still large. This also shows a trend towards decrease in these critical resources for livestock management and for the social functions they have in the communities.

It is clear from the discussion above that, in the language of resilience, there may be a regime change in the making (Folke, et al. 2004). It is in this context in Horo Soba *kebele* that the three dimensional mapping work was undertaken.

The following section discusses the second study site, the Telecho *kebele*, which is located within the Welmera *wereda*.

1.5.2 The Welmera *wereda*

Unlike Bale, there is little literature on the culture, biodiversity, socio-economic or any other feature of either the Telecho *kebele* or the Welmera *wereda*. The following data is accessed from the working document of the Welmera Adminstration Bureau (2011).

Welmera *wereda* is found in Oromia Regional State, Finfine Area Special Zone, about 40 kilometres from Addis Ababa, the capital city of Ethiopia.

It has 24 *kebeles*, of which 23 are rural. The livelihood of the *wereda* is agriculture 50%, livestock 40%, handicraft 4%, trade 6%. 61% of agriculture is practised in the highland areas and 39% on mid-highland. The highest point in terms of altitude is 3385m while the lowest is 2000m. Cereals, including wheat, barley and teff are the major products while people have started growing vegetables including potato, carrot and broccoli. There are 25 schools of which 24 are primary and one secondary.

1.5.2.1 Telecho kebele

While the Participatory Three Dimensional Model (P3DM) activity included the Foata Mountain Complex, the focus for the other mapping activity (sketch mapping and ecological calendar) involved the Telecho *kebele*. As detailed data was collected from the Telecho *kebele*, this section will describe the socio-economic activity of the *kebele*.

The Telecho *kebele* is found in Welmera *wereda*, Finfine Area Special Zone, about 14 km north of Holeta town, the centre of the *wereda*.

It has a total area of 1600 hectares out of which 967 ha are agricultural, 429 ha are pasture land, 22 ha are forest, 167 ha are residential area and the remaining is barren land. There are 1313 male and 1184 female residents, with a total number of 2497 residents. The livelihood of the people is based on agriculture and livestock. The *kebele* is located in mid- highland of which 70% is relatively flat while 5% is hilly and the rest is mountainous. The local government agriculturalists describe the soil as vertisol 5%, clay soil 85% and mixed 10% but the local community have a much more nuanced description of the soil which is shown on their map legend (see Chapter 6, Section 6.5; and description thereof in Appendix 6). There are two schools, one primary and the other junior secondary. There is no electricity and only one wireless telephone found in the compound of the office of the local *kebele* authority. The major agricultural products are wheat, barley and fava beans. They do not grow teff but buy it from the market. They have also started planting potatoes and onions.

In terms of land holding 5% of the people have 1-2 ha; 10% 2-3ha; and 30 between

3-4ha and the rest, 55% have more than 5ha. This puts the landholding well above the national average of less than 1 ha (Gebresilasie, 2006).

According to a recent study done by MELCA – Ethiopia (2011):

- The community identified 25 tree species, which they were using for medicine, for both livestock and humans, for construction and fuel. They rely on these forest resources both for the health of the biocultural landscape and themselves. Nine of these 25 tree species are not found in the area today, and the availability of the rest is very low. The main reason is widespread cutting of trees (deforestation) and expansion of agriculture.

- There were 22 sacred sites in Telecho. All of them had medium to high coverage of forest. Their status at present is that five of them have lost their forest cover, 13 of them have very low coverage and the remaining four have low coverage. This demonstrates degradation in the value of these places as cultural sites. Cutting of trees from these sites was unthinkable some years ago. This is said to be linked to the spread of Christianity and the decrease in value to these places among the younger generation.
- Of the three wetlands found in the *kebele*, two of them were large and only one medium, two of them have already dried and one large wetland has become very small. This last one may also dry up.
- The community has identified seven rivers and 30 streams. Out of these, two of the rivers and eleven of the streams have dried up. Three of the rivers and thirteen of the streams are already very small and the rest are small. This shows degradation of the river system. People used to have streams and rivers close to their home but now they are competing for what is left. As it is the responsibility of women to bring water, the drying of the streams adds an additional burden to their daily routines.
- Wild animals including hyena, antelopes, baboons, monkey and leopard were reported to have occurred in the area. Of the nine wild animals, five of them are no longer there, and the others are rare. Only the number of rats has increased. This indicates the degradation of the biodiversity.

- There were 18 barley and six wheat varieties. There were also other crops. The farmers have lost eight of these varieties and the majority is found only with some farmers. This indicates a rapid erosion of farmers' seed varieties. As these varieties are related to the knowledge of people living in the area, their loss also indicates the loss of the knowledge associated with them.
- There were also 12 traditional vegetable varieties. Of these, six have been lost, four are on the verge of disappearing and only two are found in reasonable amounts.

In combination, this shows a rather shocking trend in ecosystem degradation. It also highlights how people are losing their seeds, plants and livestock. The future is bleak as the trajectory of the government's Growth and Transformation Plan could potentially exacerbate the loss of farmer varieties and the knowledge associated with it due to the focus on market-led agriculture and introduction of high yield varieties.

The challenges that people in the study areas are experiencing are described in more detail in Chapter 6 and are analysed in Chapter 7. In short land degradation is the main problem. Major challenges seem to be: change in land ownership spurred by policies from the governments, expansion of agricultural lands, break up of traditional management systems, the focus by the government on conventional agriculture, and loss of diversity and associated knowledge, as well as inadequate law enforcement for environmental degradation.

Having outlined each of the study areas in the sections above, I now go into further detail on the focus of the research. I will explain the circumstances, which led to this research and define the research objectives. I will then state the research question and give a brief overview of the methodology I used. The subsequent section will introduce the concepts that are used to guide this study namely biocultural diversity, participatory mapping, social learning, morphogenesis and resilience.

1.6 Research focus

In Section 1.1 above, I explained how, through the visit to Colombia and in 2006 and 2008 I had gained insight and experience into how Columbian communities were

using participatory mapping to manage their land, revive their culture, and improve both the education and the health system. I described how I participated in Participatory Three Dimensional Model (P3DM) practice in Kenya and saw the value of this tool for learning and creating cohesion. After participating in experience exchange visits in Colombia and in the P3DM building process in Kenya, I considered the possibility of using participatory mapping in Ethiopia for mobilizing action where the diversity in both livestock and agriculture is declining rapidly; where indigenous forests are disappearing swiftly; where the land is degrading and the rivers are drying; where children are increasingly distanced from their culture and their history due to globalization, urbanization and formal education; much more importantly, where people have lost the hope of changing their socio-ecological environment to a better scenario; as this is what I had been observing in the community contexts where MELCA had been working, as described above.

Cartographers and those involved in participatory mapping assert that mapping creates understanding of biocultural diversity, creates social cohesion, excavates people's memory, creates an environment for internal and external conversation helping in the creation of identity and cohesion and mobilize agency for strengthening the resilience of local communities (see Chapter 3 for a detailed review of mapping theories). Is this claim true? Do other things happen in addition to what is claimed? What about learning? In this environment of land degradation and cultural erosion, can participatory mapping be used to mobilize people's learning, and will to change (their agency) in ways that strengthen resilience? A literature review of three dimensional mapping showed some possibilities for such learning and change (see Chapter 2), but I found that the learning and the agency development in and through three dimensional mapping to be either absent in the literature, or under-theorised and researched, hence this study (see Section 1.7).

The focus of this research is to investigate, explain and analyse the learning that may occur in and through participatory mapping in communities where land degradation and loss of biodiversity and cultural resources is prevalent; and to explore whether this has led to agency development and change. It will also explore whether the learning has relevance for building the socio-ecological resilience in the study areas.

As mentioned above, literature sheds light on how maps work in various contexts; but there is little explanation of how learning happens during mapping and what the significance of this learning is. This is where this study hopes to contribute to new knowledge.

1.7 Research objectives

The objective of this research is to investigate the learning and change that emerges in and through participatory mapping in the context of biocultural diversity and resilience in rural Ethiopia.

The objectives include:

1. To explore the role of participatory mapping for mobilizing knowledge related to the biocultural landscape and landscape management in the context of resilience.
2. To investigate the learning and change processes that may occur as a result of participatory mapping; and explore how this can contribute to resilience.

1.8 Research questions

The following three interrelated questions guide the research:

1. What biocultural knowledge and practices related to landscape and landscape management does participatory mapping mobilize in local communities?
2. How did learning interactions take place during participatory mapping; and did these influence agency?
3. What is the implication of the agency that emerged for the resilience of the community?

1.9 Overview of the research methodology

As indicated above, the study was located in two selected sites. To address the complex nature of the questions above, case study was used as the main methodology. Thomas (2011) offers the following definition of case study:

> Case studies are analyses of persons, events, decisions, periods, projects, policies, institutions, or other systems that are studied holistically by one or more methods. The case that is the *subject* of the inquiry will be an instance of a class of phenomena that provides an analytical frame — an *object* — within which the study is conducted and which the case illuminates and explicates. (p. 20)

In this case study, the events, interactions and outcomes associated with the participatory mapping are analyzed using a range of methods including Spatial Information Technology (SIT), group interviews, focus group discussions and individual interviews (see Chapter 5 for a more detailed description of these methods). Of the SIT methods, I used Participatory 3 Dimensional Modelling (P3DM) which involves: preparation, assembling the blank model, preparing the map key, depicting information by the elders, extracting data, digitizing and manipulating data, cross-checking and validating (Rambaldi, 2010). I also used two-dimensional (2D) sketch mapping and eco-cultural calendars to support the data gathered by P3DM. The model showed important sites including sacred, livelihood, wildlife related, historical, infrastructure amongst others (see Chapter 6). These sites are subjected to a narrative analysis and information is generated on what the landscape means to the local community. This information is analyzed using Wals' (2007) social learning framework, Vygotsky's Zone of Proximal Development and semiotic mediation (John-Steiner and Mahn, 1996) and Wenger's (1998) Communities of Practice (see Section 4.3.2 for a more in-depth discussion of these theoretical lenses).

Community of Practice theory is used both to analyze and interpret the learning that took place during the building of the model. Communities of Practice theory was also used to analyze the data generated during the reflective analysis of some of the pictures taken during the modelling process; these processes are all described in detail in Chapter 5.

To provide contextual depth to the analysis, I undertook socio-economic, historical and cultural analyses of the two study areas as well as of ABN and MELCA-Ethiopia as the main actors influencing the process (See Sections 3.1 and 3.2 in this chapter, Chapter 6 and Appendix 6 on eco-cultural calendar) in order to gain a fuller understanding of the change that may have happened due to the learning that took place in the processes of participatory mapping. This is to establish what has changed and how. To interpret these changes in learning and action, I drew on critical social theory, especially Archer's morphogenetic analysis (Archer, 1995; see Section 4.6 for more in-depth discussion of this perspective). This is to analyze the

causal powers that influence agents' (in this case local community members) capacity to reinterpret their socio-ecological environment and mobilize an array of resources in terms of cultural schema (norms) to effect change on structures (schemas and resources (both human and non human)) to produce the resulting structural elaboration or new action and learning system. In this case the morphogenetic analysis is used to investigate how the learning related to the biocultural landscape came about or emerged, how it has changed over time and why, and how it has influenced decision-making and action.

1.10 Some conceptual mapping

In this section I introduce some of the key concepts used in this study. The concepts are further elaborated in Chapter 4.

1.10.1 Biocultural diversity

The knowledge of local communities related to environment has been termed Indigenous Knowledge (IK), Local Environmental Knowledge and Practices (LEKP), and Traditional Ecological Knowledge (TEK). Recently another theory associated with these terms, named 'biocultural diversity' is gaining currency (Sterling, Cullman, Bick & Wali, 2008). This study will use TEK and biocultural diversity interchangeably as it focuses on particular localities or study areas, and mainly works with the traditional ecological and other landscape knowledge of local communities. Biocultural diversity denotes the link between biodiversity and human diversity. It recognises the role played by human diversity in biodiversity conservation because biodiversity represents a source of raw material on which the process of evolution depends (Cocks, 2006). Zent (2009) says:

> Local and traditional ecological knowledge (TEK) provides a key window for viewing at close range how the natural environment shapes, penetrates or even permeates human cultural expression and vice versa. Such knowledge is often intimately tied, on one hand, to local language, social organisation, economic goals, religious beliefs, aesthetics, ritual observances and material culture, and on the other hand, to re- source appropriation and management practices, environmental impacts, variety and distribution of natural species, the structure and functioning of biotic communities and long-term landscape modifications. (p. 40)

This study will focus on biocultural diversity at the landscape level. It will not enter into the study of language or the relationship of people with plants and animals. It will limit itself to the analysis of the learning that happens at both the individual and the group level through the mediation of the map.

In resilience literature, the phrase socio-ecological system (SES) is used to indicate the interaction between people and their natural and human-made resources (Folke, 2006) and does not focus much on biocultural diversity. One explanation might be biocultural diversity inclines towards the natural and cultural in the context of indigenous and local communities whereas social-ecological encompasses the human-made resources. But both recognize the inextricable link between nature and people. On this point and in the context of resilience thinking, Folke et al. (2010) claim that:

> many of the serious, recurring problems in natural resource use and management stem precisely from the lack of recognition that ecosystems and the social systems that depend on them are inextricably linked. It is the feedback loops among them, as interdependent social-ecological systems, that determine their overall dynamics. (unpaged)

Therefore, I will use the terms interchangeably to indicate the inextricable link between biodiversity and cultural diversity and the change that this faces in the context of resilience.

1.10.2 Participatory mapping

The concept of participatory mapping is a combination of a much contested word 'participation' (Cooke & Kothari, 2001) and 'mapping'. Participatory mapping arose from the frustration of development thinkers and indigenous people who were critical of the appropriation and application of mapping technology for the purposes of domination and marginalization by those in power (Chambers, 1994). It followed what is called 'counter mapping' which arose from a common interest among geographers and indigenous people in the late 1960's 'for expressing tacit knowledge of natural resources and their cultural significance' (Crawhal, 2009, p. 8). In the late 1980s the practice of using a collection of methods called Rapid Rural Appraisal (RRA) and later Participatory Rural Appraisal (PRA) was started (Chambers, 1994) and participatory mapping featured as one of these collective methods. But

now the method has advanced and includes a range of tools including GIS and Remote Sensing and is called Participatory GIS (PGIS) (Rambaldi, Chambers, McCall & Weiner, 2006).

I will focus in this research on exploring the role of participatory mapping for learning and change. Since the study has an emancipatory agenda (see Section 5.2), the focus of the study will be on explaining and analysing the role of mapping for learning and change in the context of biocultural landscapes and resilience.

1.10.3 Social learning

This study is located within the ambit of social learning specifically, focussing on participatory learning. Sfard (1998) talks about two metaphors that drive thinking and research on learning: acquisition and participation. Acquisition refers to concept development and the acquisition and accumulation of knowledge by the learner as the ultimate goal of learning. Learning in the case of the participatory metaphor is becoming a member of a community, a participant, and knowing is belonging, participating and communicating. Sfard argues that both are necessary for learning to occur. In this study I will explore how learning happened during the participatory mapping exercise that I conducted with two local communities. I will examine whether acquisition of knowledge about the landscape was acquired through assistance of a facilitator only, or whether learning occurred through participation in communities of practice, where meaning emerged out of the process through participation in knowledge construction and reification of practice in the forms of maps. I will draw on Sfard's 'metaphors' of learning as well as on social learning theory to explain the learning that may have happened during the mapping exercise.

1.10.4 Morphogenesis

Not only is this study interested in whether learning occurred, but also if change occurred as a result of the learning. The study examines the implication of this change for the resilience of the social-ecological system in which the communities exist and develop their livelihoods and practices.

The study uses Archer's (1995) theory of morphogenesis to explain the change that may have taken place due to the mapping exercise. Archer's theory divides agency

and structure through time, and uses analytical dualism as a methodological strategy. She recommends analytical separation of *structural conditioning* which is the historical and contextual elements (history, biocultural diversity, socio-economic environment) that actors find themselves in; *social interaction* which implies interaction that people have among themselves and with social structures; and *structural elaboration* which implies the change that may have come about as a result of the social interaction in the context of the structures that pre-exist social interaction. The analysis of the study is contextualized in the broader capacity building work of ABN and the work of MELCA at the grass roots level, as indicated in this chapter (see Section 1.3.1). Therefore structural conditioning implies the contextual situations and the social processes that influence the learning of the actors during and after the mapping exercise. Social interaction in this study involves the interaction in the context of mapping at ABN and MELCA level, and also the mapping practice at community levels. Structural elaboration will describe the morphogenesis that has taken place at ABN, MELCA and community level (see Sections 7.4 and Chapter 7 for further insight into these processes and concepts, as developed in this thesis).

1.10.5 Resilience thinking

The objective of this research is to investigate the learning and change that emerges in and through participatory mapping in the context of biocultural diversity and resilience in rural Ethiopia and the need for resilience thinking, which Folke (2006) describes as 'an approach or a way of thinking or guiding to help us organize our thoughts or help us to analyze social-ecological systems' (p. 253).

In the context of mapping, one of the opportunities that maps provide is the mobilization of memories. Communities produce maps and the maps help excavate the memory of the elders that could be used for resilience. On this point Folke, Folkes, Berkes and Colding (2003) say that:

> Social memory provides context for social response to ecosystem change, which is important during periods of crisis and increase likelihood of flexible and adaptive response. The knowledge of local communities aids ecological memory through management practices of the landscape. (pp. 363 – 367)

Resilience is the capacity to lead a continued existence by incorporating change (Holling, 1986) and social resilience is the ability of human communities to withstand external shocks to their social infrastructure. Folke et al. (2003) identify four critical factors for social-ecological resilience:

- learning to live with change and uncertainties, which includes learning from crisis;
- nurturing diversity for reorganization and renewal which talk about nurturing, sustaining and enhancing social-ecological memory;
- combining different kinds of knowledge for learning which includes combining different systems of knowledge;
- creating opportunity for self-organization which also talks about recognizing the interplay between diversity and disturbance.

As memory provides a framework of accumulated experience for coping with change, this thesis will discuss how the mobilization of memory through mapping has assisted local people in the two communities to work towards resilience (see Chapter 7). It will use the four critical factors to reflect on mapping, learning and change towards social-ecological resilience in this study.

1.11 Outline of the thesis

Chapter 1: This chapter places the study in context of land degradation and biocultural diversity in Ethiopia. In understanding the concept of land to include both the abiotic and biotic components of the landscape, it includes culture as a critical component for understanding the relationship between people and their environment and critiques the neglect of TEK in natural resources management, agriculture and land use management. The chapter also describes the social, cultural, economic and environmental aspects of the study areas. The motivation for the focus of the research, and the research questions are discussed including key concepts for understanding the thesis.

Chapter 2: This chapter discusses biocultural diversity. It defines the concept stressing that the way in which it is used in this study, is at the local biocultural

landscape level. It discusses the four bridges that link culture and biodiversity namely, spirituality, livelihood, language and knowledge, and norms and institutions. The chapter then discusses the threats facing biocultural diversity, and its value for education and development. It ends by discussing some of the critiques of biocultural diversity.

Chapter 3: This chapter is dedicated to mapping. It starts by historicizing mapping to elucidate the development of the concept and to stress that it is a method which has gained currency quite recently, in the last 100 years. It then describes participatory mapping and discusses how it is done and understood in Ethiopia. This is followed by a discussion of the mapping approaches that were used in this study, namely, sketch mapping, eco-cultural calendars and Participatory 3 Dimensional Modelling (P3DM).

Chapter 4: This is the theoretical chapter. In this chapter three theories are discussed. Firstly, theories of learning are discussed, focussing on theories used for understanding learning in the study, namely Vygotsky's semiotics and Zone of Proximal Development, and Wenger's Community of Practice theory (CoP), which is a social learning theory. This is followed by a discussion on critical realism, with particular emphasis on Archers' social realist theory of morphogenesis, which provides a theoretical vantage point for analysing change. Contemporary theories of resilience, particularly how such theories are being used in social-ecological studies, are discussed next, and an outline of how the concept is used to explain the value of the learning and change that has come about through the mapping processes for resilience of the community.

Chapter 5: This chapter explains the methodology and methods. It explains how case study methodology was used and why. I then discuss participatory mapping methods, involving sketch mapping, eco-cultural calendar development, and P3DM, all of which were used within the case study design. This is followed by a detailed explanation of the mapping processes at the two study sites. I will then describe additional methods that I used, which include group interviews, focus group discussions and individual interviews and the measures that I took to ensure validity

and trustworthiness of the data. I also discuss ethics. The chapter closes with a discussion on research reflexivity.

Chapter 6: This chapter presents a thick description of the data from the two study sites. It uses photograph narratives to present the data. The photo narratives are discussed under three headings: biocultural landscape, education and learning. While there is a thin line between education and learning, the analysis pointing to educational aspects reflects mainly on the interaction between facilitators, communities and the map, while learning describes the responses of the community to the interviews and the mapping activity.

Chapter 7: This chapter synthesises the research. It explains and analyses, using theories and concepts described in previous chapters, and reflects on the data presented in Chapter 6 from the vantage points of learning, change and the implications for resilience. The chapter is structured according to a set of claims or analytical statements on learning and change; these are justified through cross referencing to data in Chapter 6, appendices and theoretical claims. The chapter concludes with recommendations from the study which include recommendations for further research.

Chapter 8: This chapter concludes the study. It provides summative perspectives, recommendations and conclusions, and clarifies the contribution of the study to new knowledge. It also provides insight into the limitations of the study; and presents recommendations for further research.

1.12 Conclusion

In this chapter, I started by providing a brief biographical introduction, which explains how I came to be interested in this study focus. It also provides a brief introduction to the two institutions that influenced the mapping process and this research, namely ABN and MELCA-Ethiopia. The chapter also discussed the research context, with an emphasis on land degradation and biocultural diversity, and proceeded to describe the study sites, namely Horo Soba *kebele* in Bale and Telecho *kebele* in Welmera *weredas*. The chapter further outlines the main conceptual and theoretical frameworks and the scope, objectives and questions of the research, and

provides an overview of the structure of the thesis. The next chapter will describe one of the concepts of the study, biocultural diversity, which is a foundational concept informing this research.

Chapter 2: BIOCULTURAL DIVERSITY

2.1 Introduction

As mentioned in Chapter 1, the purpose of this study is to investigate the learning and change that emerges in and through participatory mapping in the context of biocultural diversity and resilience in rural Ethiopia. This chapter explains the concept of biocultural diversity and situates it in the context learning, change and value for resilience. The main thrust is to illuminate how cultural diversity and biodiversity are interlinked and to show that giving attention to both are critical in times of rapid environmental change, both at the local and global level. It also advances the notion that participatory maps have potential for visualizing biocultural diversity at the local level. This visualization or surfacing of the past in the context of the present may help local communities learn how to cope with, and adapt to the changing socio-ecological system.

The chapter starts by defining biocultural diversity and goes on to describe four key 'bridges' interlinking nature with culture: i) beliefs and worldviews; ii) livelihoods and practices; iii) knowledge bases and languages; and iv) norms and institutions. This interlinkage is analysed further in the context of participatory mapping. Following this, the chapter explores the value of a biocultural diversity approach to development, including education and learning, and notes critically how current forces of development and environmental changes threaten biocultural diversity. Current development philosophies and practice tend to ignore the biocultural diversity approach; the chapter discusses the consequence of this marginalization. The chapter ends with a look at critiques of the biocultural approach, especially the tendency to borrow concepts from the natural sciences to advance theories on the interlinkages between cultural diversity and biodiversity using language as an indicator.

2.2 The concept of biocultural diversity

The concept of biocultural diversity is briefly introduced in Chapter 1 (see Section 1.10.1). The definition provided by Maffi (2010) helps to further situate the discussion that follows in this chapter. This definition is useful in this study as it links

biocultural diversity with socio-ecological adaptive systems, a concept closely linked with resilience thinking (see Chapter 4 Section 4.7, where this is discussed in more detail):

Biocultural diversity comprises the diversity of life in all of its manifestations: biological, cultural, and linguistic, which are interrelated (and possibly co-evolved) within a complex socio-ecological adaptive system. The definition comprises the following key elements:

1. The diversity of life is made up not only of the diversity of plants and animal species, habitats, and ecosystems found on the planet, but also of the diversity of human cultures and languages.
2. These diversities do not exist in separate and parallel realms, but rather they interact with and affect one another in complex ways.
3. The links among these diversities have developed over time through mutual adaptation between humans and the environment at the local level, possibly of a co-evolutionary nature (pp. 5-6).

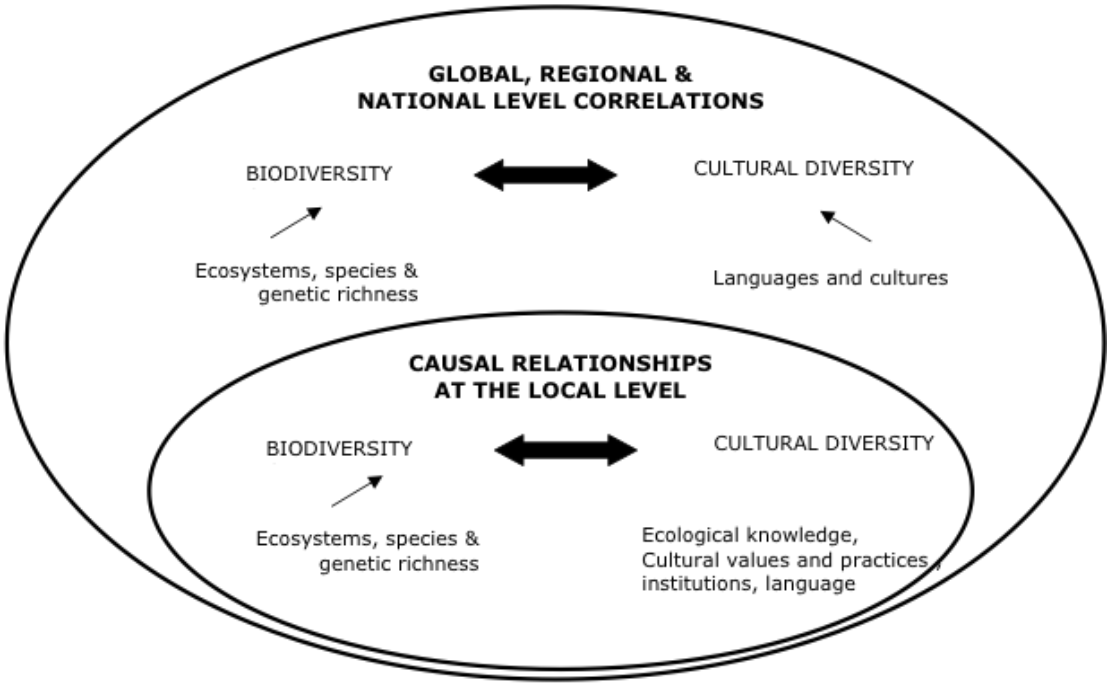

Figure 2.1*: Relationship between global/ regional/ national correlations of cultural and biological diversity and causal relationships between cultures and biodiversity at the local level* (Source: original work by Ellen Woodley for Terralingua, modified from Maffi, 2007)

To broaden the use of the concept of biocultural diversity to its application at the local level (see Figure 2.1), I will use Traditional Ecological Knowledge (TEK) and biocultural diversity in close association, as TEK expresses biocultural diversity. I will use the concept of biocultural landscape in particular to talk about the interactions between biodiversity and diversity within a cultural context, as situated in the landscape. It is at the landscape level that cultural and religious practices, as well as social and cultural institutions, established in a specific cultural context, play an important role in the perception of the value, use and management of biodiversity (UNESCO, 2007). Biocultural diversity at the local level can also be understood as "... the causal relationship between ecosystem, species and genetics on the one hand and the richness and ecological knowledge, cultural values and practices, institutions, and language on the other hand (See Figure 2.1)" (Maffi, 2010, p. 5).

In the context of resilience, Krasny, Lundholm and Plummer (2010) talk about how a shift is occurring from the reductionist paradigm to a complex adaptive systems worldview in understanding the linkage between sociological and ecological systems and say that:

> Concurrent with this shift are attempts to consider social and ecological systems as linked and nested and to integrate social and ecological values in managing the environment for change and sustainability. Such social–ecological approaches to environmental management address the nature of a system's resilience in the face of change and uncertainty. (p. 463)

Brown and Kothari (2011), drawing on case-study experience from many regions, describe a variety of mechanisms by which indigenous and rural communities help anchor biodiversity. They argue that common to each of these practices, is the fact that they are based in social-ecological interactions in which human communities adapt to their environment and change that environment in the process. Van Oudenhoven, Mijatovic and Eyzaguirre2011) add that virtually all ecosystems and landscapes must be seen as coupled social-ecological systems whose resilience depends as much on these practices (which link human and ecological components) as it does on ecological characteristics.

2.3 Four bridges of biocultural diversity

Pretty et al. (2008) claim that there are four key bridges interlinking nature with culture: beliefs and worldviews; livelihoods and practices; knowledge bases and languages; and norms and institutions. A discussion of these four bridges in the context of participatory mapping follows:

2.3.1 Beliefs and worldviews

The recent population census undertaken by the Ethiopian government states that 3% of the population believe in another system rather than the dominant religions – Christianity and Islam (PCC, 2008). There are also many Ethiopians who navigate between the major religions and other traditional belief systems. As can be seen from Chapter 1, even though the Bale community is Muslim and the Telecho Christian, the data collected for the contextual profile, and the maps (see Chapters 5 and 6) show a lot of sacred places where people still practice their traditional belief systems. As shown in Chapter 1, many of these sacred places are closely linked to the forest and forest cover, which shows how the worldviews and belief systems are still attached to nature. Culture can be understood and described as systems of meaning, the way in which people interpret the world around them (Geertz, 1973). These meanings and interpretations are perhaps the most diverse in their linkage to the natural world, with the most conspicuous links often observable within traditional resource-dependent communities. Not only do these communities interact with the biological diversity in their vicinity on a daily basis, but also their values, knowledge and perceptions are strongly centred on nature (Pretty et al., 2008).

In some traditional communities, natural elements are thought to be akin to humans and are respected as such. Therefore, many traditional cultures base their views of nature on spiritual beliefs and worldviews, whereas industrialized cultures tend to base their beliefs on science and the teachings of formal education (humans as a biological species), although many modern people in industrialized countries still acknowledge a spiritual or affective relationship with nature and the outdoors (Milton, 1999).

One of the aspects often identified through participatory mapping activities are sacred natural sites which comprise sacred rivers, mountains, water points, boulders and forests (See Sections1.5.1.1 and 1.5.2.1 in Chapter 1 and Chapter 6). These places are sites of belief and are places that are used for rituals in local communities. Sacred natural sites, as they are commonly known, are places of governance as well as religious practices. The places are linked with the management and governance of the natural systems around them. They also impact on what happens in the other components of the social and economic system. In the case of the Sheka forest, for example, distribution of land for agriculture, allocation of trees for hanging of beehives, marriage, mediation of conflict, etc. mostly involve the mediation of the spiritual leaders in the community (MELCA-Ethiopia, 2007). The spiritual leaders derive their power and claim their authority from the custodianship that they have over these sacred natural sites. Alcorn (2000, p. 1) describes how the people of Mentawaian, from the island of Siberuit in Indonesia, describe how nature and God are connected and how they would suffer if they violate this principle and how the mapping process helps the children to understand this principle.

2.3.2 Livelihoods and practices

The livelihood of the local communities in the two study sites is mostly agricultural, even though the Bale community was agro-pastoral. This livelihood practice is reflected in the biocultural landscape. Bigger grazing areas and features associated with livestock management abound in the landscape and make up a significant part of the Bale community's narrative (see Chapter 6). In Telecho, even though livestock management is an integral part of their practice, it does not feature as much as agriculture. Sauer (1965) alludes to the relationships between livelihoods and practices by saying that, as a set of practices or ways of doing things, cultures shape biodiversity through the direct selection of plants and animals and the reworking of whole landscapes. Landscape is also understood as a "meeting ground" – a place where nature and culture are intertwined – and a place that holds the past and the present, as well as tangible and intangible values (Phillips, 2005).

As indicated in Section 1.8, the first question of the study will explore the biocultural diversity that the maps can show at the larger ecosystem level. Landscapes, whether

agricultural or pastoral, are shaped by the inter-relationships between humans and their environment. In turn, the natural setting has shaped how people live, their settlement patterns, livelihoods, cultural practices and beliefs – indeed their very way of life. For this reason, many anthropologists perceive landscapes to be a product of the connection between people and place; they are spaces with which people feel they have a relationship and of which they hold memories (Robertson and Richards, 2003).

McCall (2004, in the context of mapping adds that:

> Indigenous Spatial Knowledge is specific and dynamic knowledge about the land and land resources and indigenous people's management of them. It is both problem- and solution-oriented, it sets people in their environmental context by describing activity-spaces and responsibility-spaces, and it uses a language understood locally. Land and place have deep, visceral, cultural values, rather than the simple economic categories of 'high value', 'marginal', or 'wastelands'. The sense of place associated by peoples in perceptual or mental maps, is qualitative, fuzzy, metaphorical, emotional, - holistic, not reductionist. (p. 8).

Among the striking features of traditional agricultural landscapes across diverse settings are their sophistication, complexity and resilience. Landscapes that are rich in agro-biodiversity are often the product of complex farming systems that have developed in response to the unique physical conditions of a given location, such as altitude, slopes, soils, climates and latitude, as well as cultural and social influences (Phillips and Stolton, 2008). These landscapes, in many cases created and cared for by indigenous peoples and local communities, have been shaped by the dynamic interaction of people and nature over time, mediated by sophisticated knowledge systems and practices. They encompass a variety of ecological settings, embody human ingenuity, and are continually evolving and adapting. They are rich in agro-biodiversity as well as inherent wild biodiversity and intangible cultural and spiritual values (Brown & Kothari, 2011).

As a demonstration of how some pastoral communities have a higher level of environmental management practices related to livelihood, Niamir (1999) claims that:

> Although no record was found of permanent range enclosure, many pastoral groups in Africa have temporary range reserves aimed at preserving forage

> for the dry season or drought years, preventing crop expansion, protecting timber, and regenerating degraded areas. (p. 247)

Participatory maps reveal how range lands and grazing areas are managed by those who depend on livestock for their livelihood (See Flintan et al., 2008).

2.3.3 Knowledge bases and languages

If diverse cultural practices and worldviews are central to the management of biological diversity, then a key linkage between nature and culture is the knowledge upon which these practices and worldviews are based (Posey, 1999; Maffi, 2001, 2005; Harmon, 2002). In the context of the study this will mean the knowledge that people will bring to the participatory mapping process: how people know the world governs behaviours, understandings and values that shape human interactions with nature. Berkes, Colding and Folke (2000) describe this as a "knowledge-belief-practice" complex that is key to linking nature with culture. The social organization of communities, what Pretty et al. (2008) calls 'norms and institutions' is not evident in the understanding of Berkes et al. (2000) but I would understand it as 'knowledge-belief-governance-practice' complex.

Knowledge of nature, traditional knowledge, indigenous knowledge, local ecological knowledge or eco-literacy is accumulated within a society and transferred through cultural modes of transmission, such as stories and narratives, and observation as people travel over the landscape (Pilgrim, Cullen, Smith & Pretty, 2008; Pilgrim, Smith & Pretty, 2007; Mundy & Compton, 1999). It comprises a compilation of observations and understandings contained within social memory that try to make sense of the way the world behaves, and societies use this collective knowledge to guide their actions towards the natural world. As a body of knowledge, it is rarely written down, enabling this cultural resource to remain dynamic and current, adapting with the ecosystem upon which it is based (Berkes, 2001; Turner & Berkes, 2006).

It is this body of knowledge that participatory mapping tries to surface for the resilience of the community. As we shall see later in the resilience section in

Chapter 4, memory of the past including practices, events, stories (amongst others) is a critical factor for the resilience of communities.

The importance of traditional ecological knowledge to resource management has been well described in recent years, re-emphasizing the inter-dependence of biological and cultural diversity. If sustained through stories, ceremonies and discourse, this culturally ingrained knowledge can enable people to live within the constraints of their environment in the long-term, without the need for catastrophic learning in the event of major resource depletion (Turner & Berkes, 2006; Berkes et al., 2000). Central to this is the ability to learn from and adapt to incremental changes in the environment efficiently and effectively, an important component for local community (social) resilience.

The documentation of place names, land management techniques, rituals, sacred sites, histories, and multiple other features, when recorded on maps, can contribute to the preservation and renewal of languages and cultures (Brody, 1988). Mapping place names, therefore, indirectly records histories and traditional associations, for example, between natural features and boundaries. Documentation of information as fundamental as traditional place names is of great cultural importance. Indigenous and local names are often made up of a series of words that give meaning to and hold valuable information about specific places. Direct and indirect communication processes established as part of mapping processes between elders, other community members, and those responsible for recording the indigenous knowledge ensure that names, histories, and oral traditions of places are being narrated, repeated, and recorded, and thereby passed on. Mapping such knowledge ensures that the information is available for present and future generations; it instils a sense of pride in communities and fosters cultural identity, and thereby survival (Chambers, 2006).

2.3.4 Norms and institutions

As indicated in Chapter 1, the two study communities are traditional communities. Even though the previous regime has broken down the local governance structure and has left the community in the hands of the government controlled bureaucrats,

traditional leaders largely control the social functioning of the communities. Most of the conflicts do not reach the local magistrate. They are solved locally. They use places on the landscape to invoke their wrath and ensure social order (see Chapter 6). These normative practices also help to manage the relationship of people and their environment (Ostrom, 1990).

People create norms to mediate between themselves in the periods of conflict and to be able to live both with each other and with their environment. The difficult part of participatory mapping is to make this visible. Crawhall (2010) writes:

> The management of human behavior within ecosystem limitations has led to complex social rules about natural resource use, rights, reciprocity and governance. Making these social 'rules' visible is a major challenge and opportunity in participatory mapping. (p. 7)

The significance of learning these places becomes apparent during the discussion in the process of mapping. Crawhall (ibid.) continues:

> The aims of mapping for learning are to get a list of landscape features and topographic terms and to help make visible the deeper meanings of what is relevant to the community members who use and care for the ecosystem where they live. Tacit and explicit governance rules guide a community in how to benefit from ecosystem abundance and how to constrain overexploitation. Where overexploitation is happening, the mapping can help show where the social rules are breaking down or are being undermined; it can also reveal if external drivers are impacting the social ecology. Landscape mapping is thus as much about culture and society as it is about nature. (p. 8)

Human cultures are built around and attribute meaning to natural systems and processes in various ways, including cosmologies, worldviews, and religious and spiritual beliefs (Berkes, 2008). These understandings fundamentally govern both individual and *collective actions* towards nature, connecting knowledge and understandings with behaviour. However, Kalland (2003) warns that "it is naïve to assume that everybody within a culture acts according to a fixed set of norms and values. Moreover, such conception ignores contradictions that exist in culture" (p. 236).

The above four frameworks (bridges interlinking cultural diversity and biodiversity), namely beliefs and worldviews; livelihoods and practices; knowledge bases and languages; and norms and institutions, will be used as a framework to answer the

first research question which explores the biocultural knowledge and practices related to landscape that participatory mapping mobilizes (see Chapter 7).

2.4 Threats to biocultural diversity

After looking at 45 cases gathered all over the world, Woodley (2010), categorized causes of loss of biocultural diversity under four headings namely: i) environmental degradation, land use conversion, changes in biodiversity and over-exploitation of natural resources; ii) economic development; iii) land and resource tenure security; and iv) acculturation and socioeconomic change. I will use this framework to discuss the threats to biocultural diversity in the two study communities.

2.4.1 Environmental degradation, land use conversion, changes in biodiversity and over exploitation of natural resources

Woodley (ibid.) refers to several causes of environmental degradation, land use conversion, changes in biodiversity and over-exploitation of natural resources. These include habitat loss, soil erosion, decline of water resources, degradation of forests, pollution of land and water resources, climate change, agro-industry and mono-cropping, replacement of traditional crops with non native species, wetland draining and exploitative commercial factories. This, he argues, mainly has an impact on agro-biodiversity.

Participatory maps of agro-ecological landscapes usually show changed landscapes, which is most often expressed in degraded forest and degraded land. This is, however, not always the case, particularly in communities where local governance systems have managed to persist (Pilgrim et al., 2008); and where agro-biodiversity is practised (Brown & Kothari, 2011). Modern forms of agriculture often involve significant change in land use.

Another cause for biocultural diversity loss is climate change. The Earth's climate is changing. Global atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial levels (IPCC, 2007). Climate change affects human health (see Patz, Campbell-Lendrum, Holloway & Foley, 2005) as well as cultural

practices and livelihoods, changing how people traditionally get food or build houses and threatening integral characteristics of sacred spaces.

2.4.2 Economic development

Woodley (2010) states that economic development is the second most significant cause of biocultural diversity loss and in this category she includes urbanization, mining, agricultural and grazing encroachment, tourism and natural gas or oil production.

Addressing the agricultural and grazing encroachment issues, Shiva (2002) says that our large-scale global agricultural systems depend on remarkably few staple crops and in consequence we are witnessing a plummeting diversity of agricultural varieties and livestock breeds.

Köhler-Rollefson of the Life Network (2007) agrees and adds for livestock that:

> the most frequently cited reason for the decline of livestock diversity are: the intensification and industrialization of agriculture and animal production, large-scale promotion of uniform high-yielding breeds and cross-breeding, policies and developments that disadvantage ethnic minorities, conflicts and wars, natural disasters and the decline of the pastures and common property resources that form the foundation of the production systems in which the breeds developed. (pp. 3-4)

Urbanization is one of the causes identified as aiding biodiversity loss. Today, more than half of the world's human population lives in urban centres; it is estimated that by 2030, 60% of the human population will be urban dwellers (Sterling et al., 2008). For ecological systems, the conversion of wild lands to unplanned or uncontrolled urban expansion constitutes a loss of habitat for plants and animals. Living in cities exposes urbanites to more consumer goods, advertising, and marketing, which increase per capita consumption. In addition, the increased numbers of people who live in cities affect the regions surrounding the cities. The two study sites are close to rapidly growing towns. In Bale, the Horo Soba community borders the Dinsho town and the town has been growing and will rapidly grow with the completion of the tarmac road from the capital city Addis Ababa, which will make the flow of tourists to Bale very easy. The Telecho community is near Holeta town, which is also close to Addis Ababa, the capital city. So there will be continuous interaction with town and

cities that may affect the resilience of the communities in both positive and negative ways. As rural areas experience loss of population, the social fabric of life becomes frayed. The spread of information and urban-centric worldviews and aesthetics has led to the de-valuation of local, rural ways of knowing and thinking (Sterling et al., 2008).

Maintenance of languages, cultural forms, and practices is deeply linked to traditional forms of livelihood, many of which are difficult to continue to follow in the urban context. Traditional environmental language may thus be lost first in situations of language shift as a response to radical cultural and ecological change such as urbanization (Maffi, 2001). Children of urban migrants do not possess the same traditional ecological knowledge that their parents have and do not engage to the same level of cultural practices as their parents even though their parents can still be connected to their food and medicine system (Belay, Edwards & Gebeyehu, 2005).

Shava, Krasny, Tidball and Zazu (2010) contest this and claim that in the context of resilience, a cultural practice can also be transferred to other contexts when members of the community change locations, showing the desirability of some of the practices in the local community. They reported that relocated or migrant farmers in the United States of America and Zimbabwe could use their agricultural experience in the context of the new environment and through this, they are showing how certain knowledge systems and practices are resilient. Shava (2008) reports a similar finding in a study of 'urban' indigenous knowledge systems in apartheid South Africa where, despite years of social disruption and forced removals, people still practise and use indigenous knowledge for nutrition and health related purposes, again showing the resilience of these knowledge systems and practices. In saying this, he was not commenting on landscape-based biocultural diversity knowledge loss, which had, of course been severely disrupted through forced removals, modern agricultural systems and so forth.

Globalization is also identified as one of the forces, which causes erosion of biocultural diversity. In the last century the pace of new market linkages has

increased dramatically, aided by improvements in technologies of transportation and information. In terms of biocultural diversity, globalization has an effect on ecology as it increases greenhouse gases because of long distance transportation of goods and pollution, leads to loss of agro-biodiversity because of the widespread use of agricultural chemicals and new farming methods for global market expansion, leads to loss of local languages because of the need for learning universal commercial languages, leads to trafficking of wildlife and encourages uncontrolled access to biodiversity and the subsequent degradation from distant users (Sterling et al., 2008). One of the consequences of globalization and the attendant systems of education has been the loss or marginalization of traditional ecological knowledge, the associated knowledge systems, their practitioners and traditions and vernacular languages which are sensitive to local biodiversity loss (Berkes, 1999).

2.4.3 Land and tenure security

The third cause that Woodley (2010) indentifies as impacting on biocultural diversity, is land and resource tenure security. To this list she adds contested sovereignty and land tenure, illegal incursion on indigenous and local people's territory, ineffective state governance, expansion of the state, lack of control over local resources, privatization of collective lands and forced evacuation.

In the context of one of the study areas, the Bale Mountains, Flintan et al. (2008), claim that the introduction of land measurement and taxes which encouraged settled agricultural expansion, aggravated by the declaration of grazing lands as 'no-man's lands', large-scale mechanized farms, villagisation and resettlement and the establishment of the Bale Mountains National Park (BMNP) in 1970, encompassing an area of 2400km^2, were influencing factors that have changed the face of livestock management.

Maffi and Woodley (2010) report that the traditional knowledge of the Tado and Waerabo communities called Mangari, in Indonesia, is gradually being eroded due to political, economic, cultural and ecological pressures. The government is supporting individual landownership, promoting hybrid crop varieties and cash crops at the expense of traditional agro-biodiversity. Coupled with this, the push by the Catholics

to abandon their religion, population growth and commoditization of their rituals and culture for tourism is taking a heavy toll.

In their evaluation of the participatory mapping experience done through a joint venture between SOS Sahel and Save the Children US, Rowley and Terfa (2008) reported that the pastoral way of life is rapidly changing in Ethiopia. The reasons include the expansion of agriculture to grazing lands and water points, increase in conflict among the pastoralist communities, the policy of government favouring settlement rather than a mobile way of life, increase in population and government's initiative on soils to inform the identification of more lands that can be allocated to agriculture.

2.4.4 Acculturation and socio-economic change

As a fourth cause, Woodley clusters a range of issues under the heading 'acculturation and socio-economic change'. This includes a range of inter-related factors, including lack of intergenerational transmission of knowledge of local biodiversity (changing socio-economic context, lack of communication between elders and youth, disinterested youth, few opportunities for traditional teachings), loss of languages and erosion of traditional knowledge and practices, loss of traditional knowledge relevant to biocultural diversity. These in turn are linked to breakdown of traditional education systems and modern formal education systems that discourage or impede teaching of local language, cultural knowledge and worldviews. Additionally linked are issues such as loss of food security and diminished availability of traditional foods, lack of recognition of the value of traditional knowledge by outsiders and the state. This affects knowledge maintenance and in some cases there is also evidence of misappropriation of cultural knowledge in the documentation process. Shava (2008) noted a similar pattern in his studies, where he commented critically on the way in which modern education and development institutions tend to misappropriate and mis-represent indigenous knowledge and practices, because their structural conventions use anthropological and scientific discourse which abstracts knowledge from context in particular formats.

In other research, Shava (2005) identifies a lack of intergenerational transfer of knowledge, the impact of western educational system, stigmatization of wild foods, the impact of modern agriculture and changes in lifestyles as causes for the decline in the use of wild food plants in southern African contexts.

Shiva (2002), writing from India on similar issues, discusses how indigenous knowledge about nature is marginalized in two ways. She terms one of them as the disappearance of knowledge systems. Scientific knowledge ignores and marginalizes local knowledge and posits itself as universal while ignoring its local origins. The local knowledge disappears because it is deliberately ignored by the dominant knowledge system.

The second way of creating what she calls “monocultures of the mind” (Shiva, 2002, p. 4) is by fragmenting knowledge systems through reductionist scientific knowledge production practices. She explains how this happens through the fragmentation of the parts of the ecosystems in scientific studies. She gives an example of how forests and agricultural lands are in ecological continuum, how scientists separate them in their studies and how the knowledge produced will undermine the knowledge of the local communities, which understand and live this continuum. She says dominant scientific knowledge thus breeds a monoculture of the mind by making space for local alternatives disappear, very much like monocultures of introduced plant varieties lead to the displacement and destruction of local biodiversity.

In the same vein, O’Donoghue (2003), after looking at the diary records of early interaction between Nguni people and the colonial missionaries, concludes that the indigenous knowledge of the people about environment was appropriated and re-oriented by the scientific institutions and colonial administrations. This process has marginalized indigenous ways of knowing and African knowledge systems and promoted Western science hegemony; a point also made by Shava (2008).

The causes of biocultural diversity loss gain further meaning, when one considers the value of biocultural diversity, which I discuss next.

2.5 Value of biocultural diversity

The importance of traditional ecological knowledge for resource management has been well described in recent years, re-emphasizing the inter-dependence of biological and cultural diversity (Bassi & Tachi, 2005, van Oudenhoven et al., 2011). A key value of biocultural diversity to local communities is livelihood sustenance. Most rural people derive a living directly from the environment (biophysical resources) on the basis of their local knowledge and practices.

Kalland (2003, p. 325) states that:

> Local knowledge is relevant to development on three levels.
>
> i- First there is empirical knowledge. To this level belongs knowledge pertaining to the behaviours of plants and animals, how these can be collected and captured, for what purpose they can be utilized.
> ii- The second level is paradigmatic knowledge. Alternative paradigms, that of local peoples, can provide us with important new insights which can stimulate us not only to reflect on our own relationship with nature, but actively to construct new understandings through a process of syncretism.
> iii- Finally, the third level can be termed institutional knowledge, which refers to knowledge embedded in their local institution or how people organize themselves in relation to their eco-system.

In this study, I will draw on the framework above to reflect on the claim by Folke, Berkes and Colding (1998) that traditional ecological knowledge is important for resilience, and for adaptive management in the context of a changing socio-ecological world (see Chapter 4, Section 7).

In their discussion of agrarian cultures of the Andean high plateau, Garay and Larrabure (2011) explored the role of traditional ecological knowledge in creating and sustaining cultural landscapes that encompass areas of high agro-biodiversity. The development of complex predictive systems has enabled people to respond to the high climatic variability typical of the Andes in order to practise agriculture. The authors describe how Andean societies developed farming techniques adapted to and manipulating micro-climatic characteristics as part of a strategy of “massive parallelism” (p. 215) enabling them to cultivate the highest number of lands at different altitudes. In the face of global climate change, the authors call for the recovery of “ethno-astronomical knowledge” (p. 229) as a fundamental predictive

system that can help Andean communities respond and adapt to the expected distortion of eco-climatic variability in the Andes.

A new and emerging form of developmental theory that is closely related to biocultural diversity is endogenous development. According to Haverkort and Rist, (2007), endogenous development is understood as the sum of views, values and practices which marginalized, silenced, oppressed societal actors create from within, in response to the initiatives of development coming from outside or being implemented top-down. Endogenous development is understood as a time-space and thus context-specific expression of biocultural diversity. Endogenous development recognizes and appreciates the diversity of ecological, social, cultural and economic systems around the world. It considers the diversity of ontologies and epistemologies underlying the manifold cultures in which development is debated as an important resource that enables mutual learning and the co-evolution of different forms of knowledge and the corresponding notion of development (ibid.).

Participatory maps might help endogeneous development by galvanizing people's will to change and creating cohesiveness or re-vitalizing their identity for a common involvement in development.

2.6 Contribution of biocultural diversity to curriculum and community learning

In Ethiopia, Environmental Science is offered during the first cycle of schooling (grade 1 to 4). It combines social science, natural science, home economics, agriculture, crafts, environmental education and health education. The curriculum guide aims to provide for a holistic approach to Environmental Science and tries to integrate what students are learning with their natural environment. The purpose is to help students observe, know, understand, measure and evaluate, appreciate, sustainably use and conserve their environment. Even though the intention is there, the contextual applications of this policy are not always successfully realized. A Belay et al. 2005 study found that supportive educational materials were not provided, nor was enough time given to practical work. The subject was considered less important than Science and Mathematics. Teachers assigned to teach Environmental Sciences,

are not given the same respect as teachers teaching the other 'high value' subjects. This, in some ways, shows that the integration of biocultural diversity and traditional ecological knowledge in formal education settings is marginalized in Ethiopia. This is despite the fact that many writers emphasize the importance of traditional ecological knowledge for the adaptability of local communities (Berkes et al., 2000; Folke et al., 2003).

On how information about TEK is generated and transmitted, Shava (2008) says:

> People (the knowers) are creators of knowledge; they give it discourse and meaning based on and relating to their experiences in interactions with their environment (the known) over time. The knowledge that indigenous people generate is embedded in their culture and in their practices. This knowledge is trans-generational, transmitted from generation to generation orally (through narratives, stories/folklore, songs and poetry), visually (through arts such as 'bushmen' paintings, writings, craft, cultural rituals and dance) and practically (through doing and artefacts associated with practice). (p. 7)

Mundy and Compton (1999) comment on how indigenous knowledge is communicated and identify six indigenous communication channels, which can be understood as learning mediums: folk media, indigenous organizations, deliberate instruction, records, unorganized channels, and direct observation. *Folk media* includes festivals, plays, dance, song, story-telling and poetry and are equivalent to exogenous (non indigenous) mass media. *Indigenous organizations* are social gatherings including religious organizations, traditional leadership organizations, including clan leaders and village elders, farmer groups, village meetings and other type of associations where communications happen. *Deliberate instructions* are those made by "an institutionalized act or set of acts performed by an individual to modify the behaviour of another individual and induce habit formation (p. 116)". This can include both informal types of learning and schooling such as traditional apprenticeship into generalized, gendered and/or specialized skills. Proverbs, folk role, rock art, memorised epics and genealogies and ancient scripts fall under the category of *records*. These records are vehicles to transform information. *Unstructured channels* include talks at home, communication among peer groups, talk at fields, in chief's houses and wherever else people meet and talk. *Direct observation* includes observation of others and nature. Learning in a community can

happen through one or a combination of the above communication methods (pp. 115 – 117).

The work of Mundy and Compton (1999), Shava (2008) and other authors such as Namafe (2008) who write about how local community knowledge and traditions can provide a source of education and learning, show the wealth of resources that exist in community contexts, that can be used for curriculum content, so that traditional ecological knowledge can be better integrated, and so that the holistic objectives of the curriculum can be met in the mainstream school system. Children are familiar with these forms of communication and this will greatly help in teaching abstract knowledge including mathematics. Teachers in Colombia used fish from rivers and fruits from the Amazon forest to teach mathematics to children in a community household setting (see report of Colombia in Appendix 6 CD Rom).

Although there are plenty of studies on how to communicate knowledge from outside, exogenous knowledge, into the indigenous knowledge systems, for example introducing farming practices and health services, there is little known about how this communication actually occurs among indigenous peoples. Studies on both intergenerational communication and lateral communication among community members are critical for development processes as they offer insights on how communities learn and how development can be meaningful to them (Mundy and Compton, 1999). As mentioned in Chapter 1, this study has an interest in understanding such learning processes as they emerge in and through participatory mapping processes. As the study will work with young people from local schools, it will also provide further insights into how the biocultural knowledge generated through the study can inform learning in the formal school curriculum, although this is not a core focus of the study.

In its publication on biocultural diversity, COMPAS (2007) says that:

> in different cultures there are different ways of looking at learning. The way that learning is perceived and how people actually learn, depends on the worldviews and the beliefs of particular groups or communities, as well as the socioeconomic and ecological context of their livelihoods. (p. 42)

This reflects a social / situated / social-ecological view of learning, which differs from some of the mainstream learning theory development work of the nineteenth and twentieth centuries. As will be explained in detail in Chapter 4, the cognitive, behaviouristic and humanistic orientations give emphasis to learning as an individual activity (Sfard, 1998; Lemek, 1997). This is the main difference between them and social/ situational orientations to learning which view learning as something that happens as an individual interacts with others within cultural and social contexts, and or as something that happens within groups and through participation in practices (Smith, 2003; Wenger, 1998).

Another notion, often observed in non-western cultures, is that learning is not the exclusive capacity of humans, but is a universal phenomenon. Every individual, every social group (and even every life form and possibly even matter) has a capacity to gather information and experience to react to it. In such cultures learning is not considered to be the activity of human 'subjects,' who learn about 'objects', but is seen as a result of interaction between different beings. In the traditional African view, learning implies being receptive to the teachings of those who have lived before us, the elders and ancestors, and reading signals of the spiritual world expressed in nature (COMPAS, 2007).

Mundy and Compton (1999), in their writing about indigenous knowledge and communication discussed above, say that the erosion of the indigenous ways of communication and sharing information will lead to loss of indigenous knowledge. This is because indigenous knowledge is both stable and dynamic. There is a stock of knowledge with local communities which is stable and that is important to perpetuate. It is preserved in the memories of the people, not written, so it must be repeated not to be lost. This is done in the usage of the skill or the knowledge and in the transmission of the knowledge through communication and or through established practices and artefacts (O'Donoghue & Neluvhalani, 2002)

They further assert that the knowledge in the community is not static. It changes all the time, a point also made by Shava (2008). Indigenous knowledge is dynamic because " ... experiences that come from outside and through the generation of

knowledge through deliberate experimentation, chance discoveries and adapting practices infuse it" (Mundy and Compton, 1999, p. 120). Information is also communicated laterally among community members and this lateral communication will bring knowledge from outside ensuring the dynamism of the knowledge. The purpose of participatory mapping exercises undertaken with local communities is to visualize both the stable and the dynamic knowledge so that the learning that comes through this process can be used for action (see Chapter 3).

In whatever form the indigenous knowledge may exist, it has the potential of impacting on the teaching/learning situation in significant ways, both in formal education settings and in NGO or other forms of facilitated community learning (e.g. through the use of participatory mapping). Since this knowledge arises out of the children and adult's real life experiences, its incorporation into schoolwork and or development, conservation, agricultural or land use management activities can serve to motivate the learners as they begin to see that recognition is given to what they do and say in their communities. Thus, the experiences that the students bring to the classroom; and the experience that adults have in the everyday, are an important component of the learning equation (George, 1999; see Section 4.3 where this is discussed in more detail).

In some instances indigenous knowledge may be used to teach language, to explore values, to recount history, to analyze changes in attitudes over time, and so on (ibid.). Furthermore, indigenous knowledge that deals with practices with respect to the conduct of one's life may be used in science classes and or in community learning contexts to permit learners to evaluate the relative effectiveness of indigenous knowledge for the conduct of their own lives (ibid.; Shava, 2008; O'Donoghue and Neluvhalani, 2002; Namafe, 2008)

According to Semali (1999), research undertaken by Hawkins and Pea (1987) suggests that knowledge develops as a result of the interaction between an individual and his/her environment in much the same way that biological organisms are biologically adapted to their ecological space. The child is surrounded by a rich cultural setting which Hawkins and Pea define as 'objects and events' (p. 249). These

'objects and events' are crucial in the construction of knowledge that the students brings into the classroom. They remain significant for the construction of knowledge in adult education learning contexts in communities (Shava, 2008). The 'objects and events,' which are particular to every culture and locality, may include the interaction of objects and events such as media, people, plants, animals, building structures, informal learning situations, and the practices of institutions such as the extended family, village communal structures, churches or schools. When students can bring into science laboratories their discovery and knowledge construction based on local botanical resources (for example, knowledge about local plants, birds, animals, water sources, local conservation techniques, medicinal herbs), such efforts demonstrate the production of alternative ways of knowing things, and keeping alive alternative forms of knowledge production. In the same way, farmers or community members can bring their knowledge of agricultural and other social-ecological practices into interaction with scientific concepts that circulate in modern institutions to create dynamic forms of knowledge production. Mukute's (2010) study on expansive social learning in agricultural contexts in southern Africa shows how such farming practices actually *require* diverse forms of knowledge to function effectively. He argues for 'cognitive justice' in agricultural education and training, which takes account of and fully acknowledges farmers traditional ecological and agricultural knowledge.

Bates (2009) contends that knowledge in indigenous contexts is not necessarily transferred from elders to youth in a structured way and is not necessarily encoded in language. Referring to the Inuit's way of living and communicating, he says that knowledge is transferred through experience and participation in practices, through interacting with nature. A learner learns through self-exploration of the outside, rather than being taught by knowledge holders through various indigenous communication mechanisms. Therefore for him, knowledge and language are not necessarily tied with the continuity of culture. Culture adapts and changes even if language changes and the Inuit have demonstrated that they can adapt the language of the colonialists for their purpose. He further asserts that integrating indigenous

knowledge in to the curriculum may "restructure and distort indigenous knowledge, and further erode ties between young Inuit and their elders on the land" (p. 7).

O'Donoghue (2003) and O'Donoghue and Neluvhalani (2002) have addressed this issue in their research. They argue for dealing with indigenous knowledge in learning situations, not through 'capture and transfer' methods which is the tradition of mainstream science teaching, but through methodologies that *mobilise* indigenous knowledge in contexts of practice through situated and active learning approaches. In this way the indigenous knowledge retains its social-ecological and situated contextual 'fabric', but nonetheless provides valuable knowledge and learning interaction opportunities. O'Donoghue (2003) also refrains from romanticising or reifying indigenous knowledge, and recognises the dynamic interplay of different knowledge forms or systems, and how they inter-penetrate and change the nature of knowledge. He argues that such knowledge issues need to be re-evaluated for their validity in relation to contemporary sustainability challenges in and through environmental education. He recognizes the availability of Nguni traditional knowledge in the sciences and in the memories of local communities and proposes the usage of this knowledge for environmental education. He says:

> … there may be useful fragments of earlier indigenous knowing embedded in the sciences just as there are fragments of earlier knowing still held in indigenous communities. Much of this knowledge is now mythical memories and abstract ideas, both disembedded forms awaiting re-appropriation into sustaining ways of knowing in the world today. (p. 65)

For the participatory mapping work that forms a central part of this study, these discussions on indigenous and traditional ecological knowledge are important, as biocultural diversity is often expressed in indigenous or traditional ecological knowledge. The mapping process works with learners who are in school, as well as members of the two study communities, so it is likely that these 'fragments' of indigenous knowledge and knowledge that circulate in school contexts will 'come together' in some way in and through the mapping activities. As indicated in Chapter 1, I am particularly interested in the learning processes and the development of agency in and through these mapping activities. Knowledge and how it is mobilised, expressed and manifest is key to these observations (see Chapter 6).

2.7 Current development practices and the extent to which they take account of biocultural diversity

According to Shava (2008) there are four main views concerning the extent of consideration of biocultural diversity by the development practices: 1) the appropriative nature of modern institutions which benefit from mining indigenous knowledge ['knowledge piracy' by for example pharmaceutical companies], 2) the current recognition of indigenous knowledge application and innovation by local communities for their own benefits [this is still highly underdeveloped and largely untapped], 3) joint projects between modern institutions and local communities [that consider benefit sharing under the Convention on Biological Diversity], 4) recognition of the fallibility of science and looking into indigenous knowledge as a source of alternative solutions to the world's problems.

Although the recognition of the traditional ecological knowledge of communities related to agriculture and pastoralism exists (See IBC, 2009 for example), there is little effort in trying to base development on the available knowledge and practice at the local level. Lamenting the lack of participation in international development discourse, Pimbert (2009) says this for the famous IAASTD report:

> This democratic deficit is apparent in the recent International Assessment of Agricultural Science and Technology for Development (IAASTD). The purpose of the IAASTD was "to assess agricultural knowledge, science and technology (AKST) in order to use AKST more effectively to reduce hunger and poverty, improve rural livelihoods, and facilitate equitable, environmentally, socially and economically sustainable development". The IAASTD has undoubtedly produced a landmark report that is both timely and remarkable in scope. This is the first independent global assessment, which acknowledges that small-scale, low impact farming sustains crucial ecological and social functions. Many of its more progressive recommendations, such as the need for much greater emphasis on agro-ecological approaches, are consistent with the food sovereignty paradigm. However, the analysis and priorities of indigenous peoples, nomadic pastoralists, small farmers, food workers, forest dwellers, and food consumers are largely absent from the IAASTD report. Indeed, this intergovernmental process did not develop any mechanism to directly include the perspectives of local food providers and consumers in discussions and policy recommendations on the future of agricultural knowledge, science and technology. (p. 4)

In many situations the national policies for land use, land ownership, marketing, health care, food systems, education and knowledge development are based on a

conventional reductionist notion of development and development which considers biocultural diversity is often marginalised, as discussed in Section 1.10.1 (Haverkort & Rist, 2007; Alcorn, 1999; Pimbert, 2009).

Alcorn (1999), referring to the importance of ethno-botanical knowledge to development, laments:

> for ethno biological knowledge to be mobilized as a resource to meet development goals, greater interaction is needed between the users of ethno botanical knowledge – rural residents – and specialists contracted to design, carry out, and evaluate development projects. Two barriers have limited this interaction: the status difference between ethnobotanical knowledge bearers and development specialists, and botanical literacy of development specialists. Ethnobotanical knowledge systems are currently associated with the lowest socioeconomic classes – tribal peoples and peasant farmers. That status association has led the elites who design development intervention to think of the knowledge base of these lower classes as the cause of their low socioeconomic status. Secondly, rural sociologies or agronomists who access and transfer knowledge are not educated to pay attention to natural vegetation as a resource. Instead, outsiders tend to see non-crop vegetation as a weeds, brush, useless forest, or wasteland. On the other hand local people often manage that same vegetation as a multiple-use resource to ensure future productivity of their farmlands, and to meet their needs for food, fuel, construction materials, micro-enterprise inputs and medicine. (pp. 1-2)

Mukute (2010) uses Visvanathan's concept of cognitive justice to talk about the need where different forms of knowledge should come together to replace the monocultures of the mind that Shiva (2002) mentions.

Pimbert (2009) adds:

> A future challenge will be to bring together the more plural forms of knowledge we advocate within a more comprehensive, power equalising dynamic of participatory learning and action. This approach to transforming knowledge will need to be grounded in empowering pedagogical approaches and decentralised ways of knowing that enable more rural people and other citizens to directly access, produce, negotiate and use knowledge on complex dynamic systems to secure their rights, resources and ecosystems. (p. 14)

Participatory maps may have the potential to create this environment for cognitive justice through bringing stakeholders with different forms of knowledge and through creating the decentralized way of knowing to which Pimbert (ibid.) refers.

2.8 Critiques of the concept of biocultural diversity

The concept of biodiversity comes from natural sciences while the concept of cultural diversity comes from social sciences. So talking about cultural extinction and the extinction of language in the same manner as the extinction of biodiversity is somewhat problematic due to the different 'nature' of biodiversity and cultural diversity. Species have boundaries and they do not intermingle. They have their reproductive mechanisms to prevent them from intermingling. Cultures have no boundary and the same person can speak more than one language. People can also lose their language and can have a distinct culture (Graef et al., 2008).

Graef et al. (2008) also problematise the use of mapping methods to reach conclusions on the linkage between biodiversity and cultural diversity using language distribution as an indicator. They state that using mapping methods, including remote sensing and GIS, is problematic. They state further that as the scale of the mapping grows, the oversimplification grows, and they site an example of a comparison between the USA and Papua New Guinea. Papua New Guinea has a higher linguistic diversity than the USA, when the number of languages per total area of those countries is compared. Yet, if the diversity of language per square kilometre of Papua New Guinea is compared with New York's Queensland, Queensland has a far greater linguistic diversity. This shows language diversity does not necessarily tally with biocultural diversity. New Yorkers share a fairly similar urban culture while the Papua Guineans are much more diverse (p. 7). But there are also those who contend that in the context of globalization and rapid urbanization, rural people migrating to urban areas, including those New Yorkers who migrated from the Southern part of USA, can have considerable cultural and biological diversity and can use this knowledge for sustainable living and resilience (see Shava et al., 2010 and Cocks, 2006)

Graef et al. (2008) further argue that the biocultural diversity discourse of sacred sites as places of biological diversity is borrowing the word from biodiversity hotspots; a core conservation concept. The need to 'save' them from the encroachment of various forces of resource extraction, is similar in assumptive

underpinning to conservation discourses that emphasise 'saving' of the biodiversity hotspots from encroachment from the same forces.

They said:

> It is problematic to talk about biocultural hotspots borrowing the word from biodiversity hotspots. Biological hotspots generated protected areas and took the attention from the larger landscape. They also led to the untold suffering of local and indigenous communities as their land and their livelihood was taken from them and put under protection. When we take sacred sites as an area to focus on, following the concept of biological hotspots, we will be forgetting the larger landscape where probably much more biocultural diversity is located. (p. 39)

These critiques have important implications for this study; most notably the scale of the mapping activities that are undertaken, and also provide a warning not to naively appropriate cultural concepts and constructs in and through lenses provided by natural sciences.

2.9 Conclusion

This chapter defined biocultural diversity in the context of the study as the local relationship between various cultural practices and their relationship with the local biodiversity. It also talked about the four bridges that interlink cultural diversity and biological diversity, and considered these in the context of participatory mapping. The chapter also discussed the threats to biocultural diversity and their value to development and learning. The chapter further provided a discussion on traditional ecological knowledge and learning, both in formal and informal learning contexts. The chapter ended by highlighting some of the critiques of the concept of biocultural diversity. The next chapter provides a more detailed discussion of participatory mapping.

Chapter 3: REVIEW OF MAPPING WITH A PARTICULAR FOCUS ON PARTICIPATORY MAPPING

3.1 Introduction

This chapter discusses mapping in general and participatory mapping in particular. It starts with a brief historical overview of mapping, and shows that mapping was never a neutral activity. It also traces the evolution of participatory mapping. The chapter indicates that mapping in Ethiopia is a recent event and that the recent explosion in Geographic Information System (GIS) is still in the hands of the specialists.

At this stage, participation hardly features in the horizon of Spatial Technological Systems. Participatory mapping is reviewed in some detail in this chapter, and is related to a discussion on learning and agency. Participatory mapping was introduced to Ethiopia in the late 1980s together with Participatory Rural Appraisal, which in most cases was and still is practised as Rapid Rural Appraisal.

Participatory mapping involves a number of participatory processes, and in this chapter a framework is discussed for describing the empowerment that may or may not have emerged from the mapping activity. In particular, the chapter discusses the kinds of participatory tools that were used in this research (described in more detail in Chapter 5): sketch mapping, participatory 3-dimensional modelling and ecological calendars. The chapter provides insight into why it is critical to ensure that local communities lead the legend building process, as it is central to the process of participation. The chapter concludes with a discussion on critiques of the participatory mapping process and reflects on how I have dealt with these critiques (refer also to the discussion on ethics in Chapter 5; Section 5.8).

The chapter also considers the relevance of the study by pointing out that focused research on the role of participatory mapping for social learning in the context of biocultural diversity and resilience is currently lacking.

3.2 History of map making

3.2.1 Ontological evolution of cartography

Maps are one of the most ubiquitous tools used by people of all ages in all the cultures of the world to convey their understanding of the environment. They are a mechanism through which understandings of the landscape and landscape use are communicated in graphic form. They have been “etched on leather, impressed in clay, drawn on papers, inscribed in stones” and have played an important part in human history (Tversky, 2002, p. 1).

Maps have historically shaped how we view resources, space and our relation with land and sea. Originally, maps were the realm of the powerful, including royalty, the government, explorers and the military. Maps also gave a sense of order and structure to the world. As shown later (see Section 3.2.2), mapping experts developed relatively universal conventions and norms specific to mapping to help them share data and spatial information. Map making is a subjective exercise and the maps reflect the creators’ needs and motives (CTA, 2010).

There is a general agreement among cartographers that the maps preserved on Babylonian clay tablets from about 2300 BC are the first maps. There is also a claim that cartography started in Egypt, Alexandria, and advanced in Greece and that Greek and Roman cartography reached a high point with, among others, Claudius Ptholemus (90 – 168 CE) (Aber, 2008; Bam & Dyer, 2004). Ptholemus is credited as the originator of modern mapping even though he thought that the sun revolved around the earth. Most of the maps produced in Europe were dependent on the word of travellers and the mapmakers recreated the world in people’s minds from their offices. Religious interests dominated maps: Christian maps put Jerusalem as the centre of the earth. Earliest maps also show the little knowledge that Europeans have about Africa calling, for example, the Atlantic Ocean on the southern part of Africa, Aethiopicus meaning ‘ocean of the black people’ (see Figure 3.1). Outside Europe the Arabs were producing maps roughly about the same time and their maps of Africa show trade routes and areas of resources. The Chinese also produced maps

from the 12th century through to the 16th century, showing maps of Asia (Bam & Dyer, 2004).

Figure 3.1: *Map of Africa from about 1635 by cartographer Willem Janszoon Blaeu* (published in Amsterdam, Blau, 2011)

Wood (2010), however, insists that maps, as we know them, have shallow roots in human history, dating maybe 600 or 500 years back. Before 1500, people drew plans of their properties but these were not actual maps. Uncontested maps of more than 500 years at any scale are rare from any corner of the world. He continues to say that cosmological maps are more common (they are nonetheless extremely rare), and large-scale maps more common still (though again the numbers are tiny). Prior to the 15th century, small-scale geographic maps are rare to the point of non-existence in any cultural tradition except that of China, where they begin to appear only in the 12th century (Wood, 2010, p. 20). He concludes: "In fact, almost all the maps ever made have been made during the past 100 years, the vast majority in the past few decades" (p. 20).

Wood (ibid.) describes the history written by European cartographic historians as

"spawning a hero saga that plotted cartographic progress from the humble origins of Mesopotamia to the putative accomplishment of the Greeks and Romans", the rediscovery of which during the European renaissance led directly to the development of "the triumphant scientific cartography that swept the world in the wake of Western Colonialism" (p. 21).

According to Wood (ibid.), ancient maps are nothing less than communication tools or discourses, the same as sign systems including sculptural, numeric, syllabic, alphabetic, pictorial, pictographic and drawings and they were not founded in some primal instinct "to communicate a sense of place, some sense of *'here'* in relation to *'there'* (emphasis mine) but in the needs of nascent states to take on form and organize their many interests. He equates the history of map-making with the history of states becoming conscious of the territories under their rule. He outlines how the Spanish rulers Philip II of Spain, Toyotomi of Hideyoshi of Japan, Louis XIV of France laid the ground for increasingly comprehensive and intrusive surveys by governments (p. 21).

3.2.2 History of cartography in Africa

Due to economic and environmental challenges, Europe could not benefit from their relationship with Asia, so they turned to Africa for alternatives. They started mapping Africa in the 15th century but mapmakers' information still relied on travellers and merchants. Bam and Dyer (2004) have this to say on the early mapping of Africa by Europeans:

> Up until the fifteenth century, European knowledge of Africa was limited to the northern parts of the continent. This is clearly illustrated in a map drawn Nicolas Germanus in 1486 – just two years before the Portuguese explorer Bartholemus Dias reached the Cape of Good Hope. Northern Africa is extensively mapped with Libya, Egypt and Ethiopia clearly marked. The land the of South of the Sahara is, however, only shown as "Terra Incognita" or "Unknown land" and the unchartered waters on the Indian Ocean coast of the continent simply designated as 'Sinys Barbaricus" or the "Bay of Barbarians. (p. 17)

As knowledge of Africa was very limited, some cartographers mapped Africa and populated it with pictures of kingdoms and monsters. Most of the maps produced by

Europeans also show trade routes and the location of resources including salt, cotton, gold and slaves.

The most famous event for the mapping of Africa was where the European colonialists divided Africa in Berlin in 1884 showing their portion of the land to avoid competition and war among themselves in what is known as the 'Scramble for Africa'. The vast area in the middle of the map is empty, with names of places or kingdoms, indicating that it was 'up for grabs'. According to Bam and Dyer (2004) "some 30% of the borders drawn during the Scramble for Africa were straight lines that cut through villages, ignoring cultural and ethnic identity and destroying African Kingdoms" (p. 20).

Such practices show the complete disregard for African societies and the symbolic violence (later translated into social violence) perpetuated on African societies by colonial powers.

3.2.3 History of mapping in Ethiopia

In this section, I will briefly trace the early history of mapping in Ethiopia and show that much of the focus of mapping in Ethiopia presently is directed to pure GIS. Although cartography has a very recent history in Ethiopia, the Ethiopian Mapping Agency (EMA, 1985) claims that Ethiopian kingdoms had relationships with the outside world and that the Axumite kingdom at the turn of the first millennia was a very advanced civilization. Their territory extended to South Arabia. They were the first Africans to mint coins. They were powerful enough to make military expeditions into South Arabia. If they had expeditions then they should have had maps to guide them. Successive kings also maintained their communication and had warships. One of the kings, Kaleb (514-542), had 423 ships and sent these to South Arabia to free Christians (EMA, 1985, p. 2). It proved difficult to verify the early possession of maps by Ethiopian rulers as I found it extremely difficult to find literature on the mapping history of Ethiopia.

Various Europeans produced maps of Ethiopia between the 16th and the 20th centuries. The Italian government also produced maps for the purpose of invading

the country and apportioning Eritrea. In a famous case, the International Tribune on the Eritrean-Ethiopian Border Commission (2003) used maps produced in 1900, 1902 and 1908 by the Italian government to reach a decision concerning the boundary demarcation of Ethiopia and Eritrea.

Mapping by Ethiopians started in earnest in Ethiopia in the second half of the 20th century (Mamo, 1963; EMA, 1985). There was no mapping done by the Ethiopian government prior to the Italian invasion of Ethiopia in October 1935.

Ethiopia used to buy maps of a scale 1:500,000, 1:1,000,000 and 1:2,000,000 from the United Kingdom and USA for various Ministries offices but the maps had large scales and were often incorrect (Mamo, 1963, p. 10) and were consequently not very useful. The first mapping was undertaken by a US contingent with a few Ethiopian nationals between 1957 and 1961 for a project called 'the Blue Nile River Basin Investigation Area' this was done at the scale of 1:50,000. However, this only covered part of the northern and the middle part of the country and it was only later that the Imperial government[11]organized mapping of the whole of the country with the scale of 1:50,000 (p. 10).

After being hosted in various institutions including the Ministry of Arts and Education, the Ministry of National Affairs and the Ministry of Land Holding and Management, the Ethiopian Mapping Agency was created under the National Production Campaign and Planning Authority in 1981. This created an opportunity for properly coordinating the mapping of the rest of the country at a scale useful for various and growing demands.

Both the Emperor and the Derg regime wanted to extend the mapping efforts mainly to create a natural resource inventory and to inform the building of infrastructure like roads, water pipes, electricity and irrigation dams. The Emperor also wanted

[11] This is the government of Hailesilasie.

mapping for the purposes of locating places for the election of parliamentarians (Mamo, 1963).

Although participatory mapping does not yet feature in the main arena of mapping in Ethiopia, cartography, mainly Geographical Information Systems (GIS), is literally exploding following similar trends worldwide. Fox, Suryanata, Herschock and Hadi Pramono (2006) link this to what they call the 'tyranny of technology'. A particular form of technology becomes useful and the use of it becomes normalised to the extent that it will be difficult to think of doing work without it. They use mobile phones and computers as examples. People's life becomes controlled by the technology and a deluge of uses and abuses follow. They predict that the situation will be or is the same with Geographical Information Systems. It is my observation that GIS is heading in this same direction in Ethiopia.

An interview that I had with Degelo Sendebo, Head of the GIS and Remote Sensing Directorate (see Appendix 6), confirms this. He said in the early years of mapping, the thematic interest started to increase. Agriculture, forest, roads, environment, geology and health required mapping for their purposes. The Ethiopian Mapping Agency does thematic maps for all these aspects. This need and responsibility has caused the organization to grow. The number of map users has also increased. Degelo said, "In the 1980s, the GIS industry came in. Digital interface was important. The remote sensing part started to be an important component of the Agency. Now we have a GIS and Remote Sensing Directorate" (from interview in Appendix 6).

Degelo states further that mapping work is changing from analogue to digital and the demand is so high that they are planning to decentralize the map-making process to regional levels. Related to this, he states:

> Now the kind of users and their number has increased. The biggest users are those working on environment. Their main need is detection of change in the environment. The usage is also changing its face. The users want digital maps. Now there is a need for revising all maps done by Ethiopian Mapping Agency (EMA) as they were done with analogue method. There is a section in our Agency who revises maps. There is also a section that converts the existing maps into digital maps. The main users are government; private entrepreneurs, NGOs use it very little. (ibid.)

A lot of research exists on the use of GIS for studying land use and land change regimes (Sherefa, 2006; Feoli, Vuerich & Zerihun, 2001; Temesgen, Mohammed & Korme, 2001) in Ethiopia. For example, Sherefa (2006) used satellite maps of 1973, 1987, 2001 and 2005 to look at the land use and land cover change of the Masha and Andracha *weredas* where he found significant change affecting both the environment and the culture of the people. Feoli et al. (2001) have also used GIS with the objective of evaluating the factors related to environmental degradation and assessing the effects of agricultural activities on natural resources. Environmental data, a digital terrain model, vegetation, geo-morphological, and erosion maps of the study area were integrated with socio-economic variables using a geographical information system (GIS). Their conclusion is that in northern Ethiopia in general and the study area in particular, topographic constraints such as steep slopes, climatic constraints such as frequent failure of the rains and social constraints such as human population pressure at high and intermediate altitudes, have resulted in highly degraded landscapes.

The use of participatory mapping is mainly limited to NGOs and some researchers. However, even these use it as part of a host of Participatory Rural Appraisal (PRA) methodologies and not by itself, and for the purpose of investigating learning and change in the context of biocultural diversity, as in the case of this study.

3.2.4 The development of cartography and its implication for participatory mapping

This section traces the development of cartography and shows its implication for participatory mapping. It starts with review of the philosophical basis and goes on to discuss the ontological arguments that relate to the study's main focus, which is the role of participatory mapping in learning and change in the context of biocultural diversity and resilience.

Mapping is epistemological but also deeply ontological – it is both a way of thinking about the world, offering a framework for knowledge, and a set of assertions about the world itself (Kitchin, Perkins & Dodge, 2009). Therefore, the philosophical basis orients the diverse constellation of theories that presently exist on mapping. One

such philosophical dimension is the mind and the body. The mind and the body distinction is a fundamental influence on how people think about the world. The way we look at the world influences the way we relate to mapping and maps. If we look at the mind and the body in the Cartesian way, as separate, then we think maps are representatives of the world and map creation is an objective activity where the mapmaker is removed from the map. But if we look at the world as the unity of the mind and the body, we will see a more hybrid, embodied and subjective quality of mapping which will make the distinction between the observed and the observer problematic (ibid.). In the latter case mapping is a process where the map and the mapmaker are in constant interaction. Whether we look at mapping as unique and context-dependent or as universal and amenable to generalization or theorization, will influence how we look at maps. This is the second philosophical dimension. Is mapping an idiosyncratic activity, a project to describe isolated events, or can we draw general principles and laws so as to universalize or theorize about mapping? There are also those who seek structural explanation of the significance of maps. Insights drawn might stem from class relations, psychoanalysis and or from cultural practices. On this point Kitchin et al. (2009, p. 4) say that:

> There is an ongoing debate in relation to mapping over how the agency of an individual might be reconciled with this kind of approach, given that structural approaches often posit fundamental and inevitable forces underpinning all maps.

There is also a shift from forces producing the maps to those who consume them. However, currently the shift is from theory to an emphasis on the contexts in which the maps operate, encouraging a shift from theorizing about production of maps, towards a philosophy of mapping grounded in consumption.

Participatory mapping principles and practices are attuned to philosophies that see mapping as a mind-body unity rather than these as separated entities. The problem that the map-producers/users are addressing and the context of map-making all interplay, making maps as much contextual as productions. Participatory maps are also consumption oriented in the sense that they are produced for a particular purpose which includes management of natural resources, research, conflict

resolution, land claiming, etc., and are intended to be used by those who made them (Herlihy & Knapp, 2003; Flintan et al. 2008; Lasimbang, 2004).

Kitchin et al. (2009) describe further how earlier in the history of mapping the aim was to accurately capture relevant features and their spatial relations and to re-present a scaled abstraction of this through the medium of the map. The focus of research was to improve map designs and the accuracy of the representation. This is based on the Cartesian view discussed above, which seeks to objectively represent the world through maps. Extending, and to some extent perfecting this tradition was Waldo Tobler's (1976) study which encourages the teaching of geography to reflect the dynamism of technological change and calls for analytical cartography to capture mathematically the cartographer's understanding of the world. This advocacy for science to 'accurately' represent the world paved the way for the development of Geographic Information System (GIS) technologies.

By the mid 1990s, a second dominant approach to mapping research which draws on post-structural research traditions in which power-knowledge relations come under scrutiny, came into being, challenging the view that cartography produces maps of truth in an objective, neutral, scientific fashion. This approach, discussed below, had replaced cartographic communication as the scientific orthodoxy (Kitchin et al., 2009; Chapin, Lamb & Threlkeld, 2005)

Working within this second dominant approach to mapping research, Harley (1992) provides insight into the manner in which mapping operates as a powerful discourse. Through this orientation to mapping research, he challenged the scientific orthodoxy of cartographic research. He proposed a new research agenda concerned with the roles maps play in different societies, arguing that maps often reinforce the status quo or the interests of the powerful, and that we should investigate the historical and social context in which mapping has been employed. In this view cartography was not necessarily what cartographers said it was. Instead, Harley (1992) argued that we could only understand the history of cartography if we interrogate the forces and power relations at play around mapping. He contended that the process of mapping consists of creating, rather than simply revealing, knowledge. In the process

of creation many subjective decisions are made about what to include, how the map will look, and what the map is seeking to communicate. As such, Harley (ibid.) observed, "... maps are imbued with the values and judgments of the individuals who construct them" (p. 61) and they are undeniably a reflection of the culture in which those individuals live. Maps are typically the products of privileged and formalized knowledge and they also tend to produce and promote certain kinds knowledge about the world. And in this sense, maps are the products of power and they produce and reproduce power. In contrast to the scientific view that positions maps in essentialist terms, Harley's deconstructionist research casts maps as social constructions and as expressions of power/knowledge (Harley, 1992; Alcorn, 2000).

Drawing on work of critical theorists such as Foucault, and the post-structural critical research tradition which became powerful in the social sciences in the post-1960s period of societal change, the work by Harley, Wood, Harvey and others laid the foundations of a new form of "mapping scholarship" that emerged in the 1990s, named critical cartography (see Crampton & Krygier, 2005) and with respect to wider geospatial technologies, critical GIS (see Schuurman, 1999; O'Sullivan, 2006). As a movement against the appropriation of maps by the elite and the powerful, the creation of maps by 'the people' started, which Peluso (1995) calls counter maps. Counter maps are explicitly intended to display the needs and requirements of groups who tend to be excluded scientifically, as well as socially and institutionally.

Hodgson and Schroeder (2002) did a study of the counter mapping process in Tanzania. They studied institutional contexts of mapping, including the colonial strategy of segregation of the Massai by German and British rulers, pressure from government institutions, recent interests including forest protection, the appropriation of land for protected areas, and land grabbing by big farms and tourism. They compared four mapping experiences: mapping villages to stop the expansion of other interests into Massai lands, mapping for starting community based tourism, mapping for identifying resources and expanding protected areas, and mapping for creating a legalized Massai territory. Their conclusion was:

> While the mapping efforts described above were born of complex and highly localized circumstances, it is important to recognize that they also represent

> much broader trends in environmental management, including well publicized initiatives to territorialize community lands, private natural resources, integrate conservation with development and protect indigenous land rights. In this regard, it is somewhat difficult to separate out the politics of popular resources mapping exercises, per se, from the practical and political ecological problems associated with the trends they represent. In addition counter mapping is not a panacea when there are long term and deep-seated animosities between state and local resources users. And also mapping strategies exercises must be accompanied by well-conceived legal and political strategies if they are to achieve their full potential. (pp. 95-97)

In the context of biocultural diversity mapping practices, participatory maps (see Chapter 5) show places of institutions, the practices of people and the discourses of local communities about their history and culture. Their purpose in the context of the study is to mobilize communities for further action to ensure the resilience of their socio-ecological system; a process which provided data for this study.

Continuing the discussion on the ontological evaluation of mapping, Wood and Fels (2008) argue that a map does not simply represent the world, it produces the world. They contend that maps produce the world by making propositions, which are placed in the space of the map. Wood (2010) adds:

> ... maps work because they can be used to change the state of a community from inaction to action. The connections on the map, the representations, can create a discourse or a way to change the behaviour of somebody. They can transform the society from one level to the other, from inaction to action. The descriptions on maps affect behaviour by binding people to each other through the territory they mutually inhabit. (p. 4)

The statement above, underscores the role of maps in enabling the development of agency, which is a core focus of this study. I will use this statement to reflect critically on the kinds of action that the 3D maps worked with in this study may have mobilized after their creation (see Chapter 6).

Latour (1987) describes maps as a cultural accumulation of the knowledge of those who make them. This occurs as the scientific bases of map-making and map-use became conventionalised and institutionalised. He argues that to understand maps, one needs to unpack the culture, technologies and mechanics of how mapping is done. Mapping can therefore be conceptualised as a suite of cultural practices involving action and effects.

Similarly, Woodward and Lewis (1998) claim that mapping in different cultures reflects multiple traditions including: an internal or cognitive set of behaviours involving thinking about space; a material culture in which mapping is recorded as an artefact or object; and a performance tradition where space may be enacted through gesture, ritual, song, speech dance or poetry. In any cultural context there will be a different blend of these elements. Interpreting mapping then means considering the context in which mapping takes place; the way it is invoked as part of diverse practices to do work in the world.

In the case of this study, the contexts of the mapping processes chosen for analysis were agricultural and agro-pastoral. The Bale communities researched in this study are agro-pastoral, although the government is settling them, while the Telecho communities are agricultural as indicated in Chapter 1 (see Section 1.5.2.1) This study will look at how the maps, as a cultural artefact, are constituted in and through diverse discursive and material processes.

Corner (1999) argues that cartographic theory has been hampered by a pre-occupation with viewing maps in terms of what they represent and mean rather than what they do. Corner develops an understanding of maps as unfolding potential, as conduits of possibilities, as the sites of imagination and action in the world. The "function of maps is not to depict but to enable"; "mappings do not *represent geographies* of ideas; rather they *effect* actualization" (p. 225; original emphasis). Mapping involves processes of "gathering, working, reworking, assembling, relating, sifting, …speculating and so on … [that] allow certain sets of possibility to become actual" (ibid., p. 228). In this sense, maps remake "territory over and over again, each time with new and diverse consequences" (p. 213). Corner explains that maps engender such re-territorialisation because they are doubly projective: they both capture elements from the world and also project back a variety of effects through their use. As such, the agency of maps lies not in "their reproduction or imposition, but in uncovering realities previously unseen or unimagined" (p. 213). He thus suggests that cartographic research and practice needs to focus on mapping actions and mapping effects and not solely on the construction of maps per se, a perspective

which is further developed in this study, through the focus on learning and agency (see Chapter 6).

These concepts of mapping are congruent with participatory mapping in that its main purpose is not the construction of the map per se*,* but the mobilization of agency for further action (IFAD, 2009; Chambers, 2006). In particular Corner's (1999) idea that "maps permit a kind of *excavation* (downward) and *extension* (outward) to expose, reveal and construct latent possibilities within a greater milieu (p. 225, emphasis mine)"implies that producing maps of the past, the present and the future exposes, reveals and constructs latent possibilities. Producing models of the map of the present and having an in-depth discussion about the past and the future also tallies with the excavation and extension concepts. The emphasis on past, present and future is also congruent with environment and sustainability education, which seeks to establish practices that take past, present and future into account (O'Donoghue, 2003). The participatory mapping process is said to encourage community learning as members of the community of all ages and sex participate in the process (see Chapter 6).

The next section will discuss participatory mapping focusing on its potential role as a learning and change mechanism.

3.3 Participatory mapping

Participatory mapping emerged from the evolution of Rapid Rural Appraisal (RRA), Participatory Rural Appraisal (PRA) and Participatory Learning in Action (PLA). These are commonly understood as a "growing family of approaches, methods, attitudes and beliefs that enable people to express and analyze the realities of their lives and conditions, to plan themselves what action to take and to monitor and evaluate the results" (Chambers, 2006, p. 10). Of all the participatory development methods that have been adopted, adapted and applied in a development context, it is "participatory mapping that has been the most widespread" (Chambers, 2006, p. 1). The fundamental aspect of participatory mapping is that it uses local people to map places. The methodology combines "participatory research with cognitive mapping, fusing spatial and environmental knowledge with technical understanding of

geography" (Herlihy & Knapp, 2003, p. 203). There are a rapidly growing number of participatory mapping initiatives throughout the world. These initiatives are often referred to using different terms including participatory mapping, indigenous mapping, counter mapping and community mapping. Though there are differences among initiatives in their methods, applications and users; the common theme linking them is that the process of map-making is undertaken by a group of non-experts who are associated with one another based on a shared interest (IFAD, 2009.)

Corbett et al. (2006, p. 14) have adapted a number of participatory tools and methods that are used in practice (Rambaldi, 2005; Corbett & Keller, 2005). These participatory mapping tools include: ephemeral or ground mapping, sketch mapping, transect mapping, scale mapping, Participatory 3 Dimensional Modelling (P3DM), GPS mapping, using aerial and remote sensing images, multimedia mapping, Participatory GIS (PGIS) and Internet mapping. These are explained briefly below:

a. **Ephemeral mapping**is a basic method that involves drawing maps on the ground. Participants use raw materials like soil, pebbles, sticks and leaves to represent the physical and cultural landscape.
b. **Sketch mapping** is a slightly more elaborate method. A map is drawn from observation or memory. It does not rely on exact measurements, such as having a consistent scale, or geo-referencing. It usually involves drawing symbols on large pieces of paper to represent features in the landscape.
c. **Scale mapping** is a more sophisticated map-making method aimed at generating geo-referenced data. This allows community members to develop relatively accurate scaled and geo-referenced maps, which can be directly compared with other maps.
d. **Three dimensional (3D) modelling** integrates spatial knowledge with elevation data in order to produce three-dimensional stand-alone, scaled and geo-referenced relief models. Geographic features relating to land use and cover are depicted on the model through the use of pushpins (points), yarn (lines) and paint (polygons). When the model is finished, a scaled and geo-referenced grid is applied to facilitate data extraction or importation. Data depicted on the model can be extracted, digitised and plotted.
e. **Photomaps** are printouts of geometrically corrected and geo-referenced aerial photographs (orthophotographs). Orthophoto-maps are a source of accurate, remotely sensed data that may be used for large-scale community mapping projects. Community members can delineate land use and other significant features on transparencies that have been overlaid on the photomap. Information on the transparencies can be scanned or digitised and geo-referenced later. Remote sensing images at a suitable

scale are an increasingly appropriate alternative, when they can be easily and freely (or very cheaply) downloaded from the Web (Muller & Wade, 2003).

f. **Global Positioning Systems** (GPS) have become more affordable, and their use has spread rapidly among NGOs and community organisations. GPS is a satellite-based positioning system that provides information on exact locations on the earth using a known co-ordinate system such as latitude and longitude. The technology is often used for the demarcation of areas of land where access to and control over natural resources are in dispute. Data recorded are frequently used to add accuracy to information depicted on sketch maps, scale maps, 3D models and other less technology-rich community mapping methods.
g. **Map-linked multimedia information systems** are similar to GIS technologies but simpler to understand and manage. Local knowledge is documented by community members using digital video, digital photos and written text, stored on computers and managed and communicated through the interface of an interactive, digital map. By clicking on features of the interactive map the other multimedia information can be accessed.
h. **Geographical Information Systems** (GIS) is a computer-based system designed to collect, store, manage and analyse spatially referenced information and associated attributed data. GIS technology is increasingly being used to explore community-driven questions. In the process, local spatially referenced, as well as non-spatial data are integrated and analysed to support discussion and decision-making processes. 'Mobile GIS' has become much better adapted to participatory and local community use since the development of GIS software designed to work with hand-held computers or laptop computers in the field.

Of those listed above, I used sketch mapping and Participatory 3 Dimensional Modelling in this study (see Chapter 5 for detailed descriptions of how I used these methods). I will therefore describe and discuss P3DM and sketch mapping since I used these two approaches for data collection and analysis. I will also discuss a method referred to as 'eco-cultural calendar', which has not come into the main focus of participatory mapping as yet, but which I think is in itself a robust tool to help understand the relationship between people's cultures, aspects of land use and biodiversity and spatial and temporal elements in the landscape. It can also be used to explicate the relationship that exists between people's cosmology and their material and cultural life.

3.3.1 Use of participatory maps

As with any type of map, participatory maps present spatial information at various

scales. They can depict detailed information of village layout and infrastructure (e.g. rivers, roads, transport or the location of individual houses). They can also be used to depict a large area (e.g. the full extent of a community's traditional use areas, including information related to natural resource distribution and territorial boundaries). Participatory maps are not confined to simply presenting geographic feature information; they can also illustrate important social, cultural and historical knowledge including, for example, information related to land-use, occupancy and mythology, demography, ethno-linguistic groups, health patterns and wealth distribution (IFAD, 2009; Fox, Suryanata & Hershock, 2005).

Participatory maps often represent a socially or culturally distinct understanding of landscape and include information that is excluded from mainstream maps, which usually represent the views and/ or scientific traditions and methods of dominant sectors of society, as discussed in Section 3.2.1 above. Participatory maps can pose alternatives to the languages and images of the existing power structures and become a medium of empowerment by allowing local communities to represent themselves spatially. Participatory maps often differ considerably from mainstream maps in content, appearance and methodology (IFAD, 2009; Chambers, 2006; Chapin et al., 2005).

According to IFAD (2009) criteria used to recognize and denote community maps include the following:

- Participatory mapping is defined by the process of production: Participatory maps are planned around a common goal and strategy for use and are often made with input from an entire community in an open and inclusive process. The higher the level of participation by all members of the community, the more beneficial the outcome because the final map will reflect the collective experience of the group producing the map.
- Participatory mapping is defined by a product that represents the agenda of the community: it is map production undertaken by communities to show information that is relevant and important to their needs and is for their use.
- Participatory mapping is defined by the content of the maps, which depicts local knowledge and information. The maps contain a community's place names, symbols, scales and priority features and represent local knowledge systems.

- The level of compliance with formal cartographic conventions does not define participatory mapping. Formal media does not confine participatory maps; a community map may be a drawing in the sand or may be incorporated into a sophisticated computer-based GIS.
- Whereas regular maps seek conformity, community maps embrace diversity in presentation and that said, to be useful for outside groups, such as state authorities, the closer the maps follow recognized cartographic conventions, the more likelythey will be seen as effective communication tools. (p. 7)

In endorsing the growing influence of the Participatory Geographical Information System (PGIS), another form of participatory mapping, Corbett and Keller (2006, p. 1) identified three potential benefits of PGIS:

- it can enhance capacity in generating, managing and communicating spatial information;
- it can stimulate innovation; and ultimately,
- it can encourage positive social change.

They concluded that tools generated and used in this practice could become interactive vehicles for networking, discussion, information exchange, analysis and decision-making.

Even though it is implied in the second point, social learning is not explicitly mentioned and, since the authors made the statement as a synthesis of a workshop which gathered known thinkers in participatory mapping field, I will assume that the use of participatory mapping for social learning is not explored well enough to merit their mention of this as one of the potential benefits of PGIS. This study will try to fill this gap by describing the learning that has happened in the process of the participatory mapping that was done in the study areas and evaluate or reflect on this learning in terms of social learning theory to reflexively 'assess' or review the learning potential of 3D and 2D mapping for agency development and change (see Chapter 7).

Many organizations use participatory mapping to help communities articulate and communicate spatial knowledge to external agencies, to allow communities to record and archive local knowledge, to assist local communities in land-use planning

and resource management, to enable communities to advocate for change, to increase capacity within communities and to address resource-related conflict (IFAD, 2009; Di Gessa, Poole & Bending, 2008).

As mentioned in Chapter 1, MELCA-Ethiopia (the organization I work with), started working with these maps in 2009. Since then, we have produced four three dimensional models and scores of sketch maps. Participatory mapping has become one of the 'signature activities' for MELCA in Ethiopia. We organized an international workshop on participatory mapping and invited participants from Latin America, Africa and Europe (MELCA-Ethiopia, 2011b). As explained in detail in Chapter 4, I have used the data collected in the process of mapping and the product of the mapping process for this study. As mentioned in Chapter 1, Section 1.3.2, the stated purpose of the mapping exercises in MELCA-Ethiopia is to mobilize local communities that we work with so that they are more able to take action to change their livelihood and ecosystems, and through this, to develop social-ecological resilience (ibid.).

Alcorn (2000) comments positively on approaches such as those used by MELCA-Ethiopia, and notes that while researchers have long used mapping techniques and satellite imagery to analyze local situations for academic purposes and for making recommendations to donors and government, NGOs are now increasingly bringing this analytical power to the local level for improving local decisions and enabling local analyses to be shared with outsiders in order to improve national level policies. She (ibid.) states further "Maps communicate information immediately and convey a sense of authority. Mapping programmes can empower civil society efforts to bring accountability and transparency to local and national governments" (p. 2). This point has similarly been made by authors of the participatory mapping tradition (Chambers, 2006; Rambaldi, 2010; McCall, 2004, 2005), as noted above, but in my readings around participatory mapping, I have found little reference to the role of participatory mapping in learning, or social learning in particular, and to the relationship between this learning, agency and change processes.

3.3.2 Participatory mapping as a tool to visualize tacit knowledge

Co-construction of knowledge through the promotion of social learning is one of the purposes of participatory mapping, which is implicitly assumed but not very well explored or articulated (Rambaldi, 2010; McCall, 2004). The construction of knowledge (learning) is an inherently social process in which the learner actively constructs meaning through a process of information exchange and social interaction with other people. Furthermore, both the personal implicit knowledge of the learner (his/her previous knowledge, interests, values and beliefs), his/her current context of intention (e.g. a problem or task at hand) and the social and cultural context in which the learning takes place (e.g. team, workplace, community) fundamentally determine the possible meanings that the learner can/will construct in this process (Jasminko & Michael, 2005). The principal implication of this statement is the notion of a shared cognitive and social context, which has to be established in order for the members of a social group to negotiate, share meanings, and hence construct collective knowledge.

In the context of participatory mapping, I will explore the existence of the interaction between the learning, the problem at hand and the learning context to describe the social learning that has happened and the agency that may or may not emerge (see Chapter 7 for a detailed discussion on this).

Different authors have emphasized the largely tacit nature of human knowledge (Nonaka & Takeuchi, 1995) and the difficulties of codifying and formalizing socially distributed knowledge in communities. Existing solutions to this problem can be roughly classified into three main approaches: the 'internalisation' model based on individual reflection on the community discourse, the 'socialisation' model based on direct interaction mediated by technologies and the 'externalisation' model based on the explicit construction of shared conceptualisations (ibid.). In this study I will explore whether participatory mapping facilitates the internal conversation of participants with themselves mediated by the maps, the exchange of information among the participants and the co-construction of a shared repertoire or discourse

of the participating community members (see Chapter 7). The shared repertoire should indicate the tacit knowledge of people participating in the processes.

Tacit knowledge is best understood when it is considered in relation to explicit or what Ambrosini and Bowman (2001) call objective knowledge (p. 822). Objective knowledge is communicated from its possessor to another person in symbolic form and the recipient of the communication becomes as much in the know as the originator. It is similar to articulated knowledge, explicit knowledge, verbal knowledge, and declarative knowledge. Tacit knowledge, on the other hand, is difficult to write down or formalize, is mostly held personally, is practical and is context specific (ibid.).

Even though interest in, and studies on tacit knowledge abound, there is very little to be found on how mapping can make tacit knowledge explicit and on how the knowledge, which has become explicit, has become so in the context of social learning. Literature is also scarce on how explicating tacit knowledge leads both to individual and collective agency. This study will try to address this gap by exploring and describing how tacit knowledge becomes explicit both on the maps and in the reflections that the community members have of what is communicated on the maps (see Chapters 6 and 7).

Rambaldi & Callosa-Tarr (2002), referring to the use of P3DM for eliciting tacit knowledge, say that, in a practical context, the intervention phase wherein a 3-D model is manufactured, leads participants through a collective learning process to the visualization of their economic and cultural domains in the form of a scaled and geo-referenced relief model, which can be used subsequently for different purposes (p. 2). They further add that the difference between P3DMand other mapping tools is the vertical dimension that is achieved because of the model building. This additional dimension will "... give *essential clues to stimulating memory and for establishing spatial associations*" (p. 3, emphasis mine*)*, which may indicate the translation of tacit to explicit knowledge. In this study I will try to explore whether or not this occurs during the model building process; although it is well known that there can never be a direct correspondence between tacit and explicit knowledge as

they are fundamentally different forms of knowledge/knowing (Bourdieu, 1990; Gamble, 2006; see also Chapter 5).

3.4 The issue of participation

'Participation' is a key concept in participatory mapping discourse. It is a concept that is not uncontested, and which carries different meanings which need to be explicated for a deeper understanding of participation in the participatory mapping process. What is the implication of participation in participatory mapping and what does it mean for learning in the context of biocultural diversity and resilience? As mentioned in Section 3.3 above, participation is the key and the essence of participatory mapping and P-GIS. The participation is said to be more important than the map or the GIS (McCall, 2004), although it is difficult to sensibly de-link the two (process and product).

The participation debate ranges from a focus on the politics of participation (see Cooke & Kothari, 2001; McCall, 2004; Corbett & Keller, 2005) to participation in learning and change (see Reid, Jensen, Nikel & Simovska, 2008; Lotz-Sisitka & O'Donoghue, 2008; Lave & Wenger, 1991; Wenger 1998). This section dwells more on participation in learning activities and briefly discusses the politics of participation, as it is also necessary to understand that a relationship does exist between the politics of participation, and some aspects of participation in learning activities (particularly at the level of access to the learning interaction). Maru, Alexandridis and Perez (2009) write

> Participatory approaches emerged in the 1980s out of dissatisfaction with the then dominant expert-based, externally imposed and top down research, development and conservation planning approaches in developing countries. Participatory research approaches share theoretical roots in different writings that emphasize that local people can and should conduct their own inquiry and analysis in matters of importance to their often complex and diverse livelihood and environmental issues. (p. 3012)

Robert Chambers developed Rapid Rural Appraisal and later Participatory Rural Appraisal methodologies "which were designed to reverse roles and shift attitudes of research experts and development professionals so as to provide locals control in inquiry and development interventions" (Maru et al., 2009).

They continue:

> Since then there has been explosion in the numbers of techniques developed, the domains they have been employed in, and the geographical spread of their use: Participatory Learning and Action (PLA), Participatory Action Research (PAR), Participatory Learning Methods (PALM), Participatory Farming Systems Research (PFSR), and *Méthode Active de Recherche et de Planification Participative* (MARP). The list can include participatory mapping even though it is subsumed in other participatory research techniques. (p. 3012)

The introduction of these participatory methodologies have been accompanied by theorising and reflection on the nature of the participatory process; and the development of a range of 'typologies' of participation, best captured in a community-based natural resources management context by Pimbert and Pretty (1995) who explain the different 'forms' of participation in natural resources management projects and activities. See Table 3.1 below.

Table 3.1: *A typology of participation* (Pimbert & Pretty, 1995, modified from Pretty, 1994)

Typology	**Components of each type**
1. *Passive Participation*	People participate by being told what is going to happen or has already happened. It is unilateral announcement by an administration or project management without any listening to people's responses. The information being shared belongs only to external professionals.
2. *Participation in Information Giving*	People participate by answering questions posed by extractive researchers and project managers using questionnaire surveys or similar approaches. People do not have the opportunity to influence proceedings, as the findings of the research or project design are neither shared nor checked for accuracy.
3. *Participation by Consultation*	People participate by being consulted, and external agents listen to views. These external agents define both problems and solutions, and may modify these in the light of people's responses. Such a consultative process does not concede any share in decision-making and professionals are under no obligation to take on board people's views.
4. *Participation for Material Incentives*	People participate by providing resources, for example labour, in return for food, cash or other material incentives. Much in-situ research and bio-prospecting falls in this category, as rural people provide the fields but are not involved in the experimentation or the process of learning. It is very common to see this called participation, yet people have no stake in prolonging activities when the incentives end.
5. *Functional Participation*	People participate by forming groups to meet predetermined objectives related to the project, which can involve the development or promotion of

	externally initiated social organization. Such involvement does not tend to be at early stages of project cycles or planning, but rather after major decisions have been made. These institutions tend to be dependent on external initiators and facilitators, but may become self- dependent.
6. *Interactive Participation*	People participate in joint analysis, which leads to action plans and the formation of new local groups or the strengthening of existing ones. It tends to involve interdisciplinary methodologies that seek multiple perspectives and make use of systematic and structured learning processes. These groups take control over local decisions, and so people have a stake in maintaining structures or practices.
7. *Self-Mobilization*	People participate by taking initiatives independent of external institutions to change systems. Such self-initiated mobilization and collective action may or may not challenge existing inequitable distributions of wealth and power.

However, this discourse on participation, which sought to classify different types of participation according to the politics of 'levels' or types of participation, has been critiqued for failing to identify and be reflexive of what has been termed a 'tyranny of participation' in development practices, including community based natural resources management (Cook & Khotari, 2001). Such critiques focus on the inadequacy of some of the assumptions that underpin participatory practices, particularly inequalities associated with who defines the parameters of the participatory processes (ibid.).

A new development in participatory discourse, which seeks to counter the emphasis on the politics of participation, is an emphasis on the participatory processes involved in learning and change. Reid et al. (2008), in the introduction to a book on 'Participation and Learning', talk about the complex field of participation and raise a range of issues: participation might lead to legitimizing some while excluding the others; participation might be used to import new ideas from outside in the guise of participation; participation can assume that those who participate lack capacity, motivation and engagement; the participation of children can be influenced by adults; and, possibly, the less interference by professionals, the better.

In seeking to elucidate the debate on participation and learning, Reid and Nikel (2007), drawing on Greeno, Collins and Resnick (1996) outline three mainstream perspectives on learning (see Table 3.2) which are the behaviourist, cognitive and situative.

Table 3.2: *A broad overview of developments in learning theory research*

Perspective	Behaviourist	Cognitive	Situative / Social / Cybernetic
Epistemology	Empiricism	Rationalism	Socio-historicism / Pragmatism Relational
Traditions and sources of concepts contributing	Associationism Behaviourism Connectionism	Gestalt psychology Constructivism	Social-cultural psychology and sociology Activity Systems Communities of Practice Networks / Cybernetics
Knowing as...	Having associations affecting behaviour	Conceptual and cognitive development Personally meaningful	Distributed, relational and embodied cognition
Learning as ...	An organised accumulation of associations and components of skills	Understanding of concepts and theories in different subject matter / disciplinary domains, and general cognitive abilities	Becoming more adept at participating in distributed cognitive systems; engagement in interpersonal relations and identity in communities of practice; engagement with dissonances that exist in and between people and activity systems; networked relations
Learning and Transfer	Acquiring and applying associations Behavioural and attitudinal change	Acquiring and applying conceptual and cognitive structures	Initiation and induction; development of shared repertoires; collective and relational forms of knowledge and agency; uncertainty
Motivation and Engagement	Extrinsic motivation	Intrinsic motivation	Engaged participation Connectedness
Focus on accountability and assessment	External	Individual	Community ; Networked relations
Underpinning links to theories of societal change	Societal change is attendant on responses to conditions or stimulus inputs	Societal change is attendant on the 'knowledgeable actor'	Societal change occurs through learning interactions amongst members of communities of practice and/or through within different human or cybernetic activity systems and networks

Adapted from Reid and Nikel (2008, p. 40; cited in Blackmore et al. in press)

A key feature of the above table is "that people's capacity for participation in societal change processes is learnt, constructed and dynamic – and that this can be enhanced (rather than being regarded as something that is, for example, fixed, largely inherited, or stable)"(Reid & Nikel, 2008, p. 41).

Each of these learning theory traditions have theorised participation differently, but there is also a commonality across all three approaches, as learning cannot take place without some measure of participation. It is the orientation to participation, and the assumptions about participation in learning that differ. Reid and Nikel (2008) and Blackmore et al. (in press) explain further that the differences relating to participation in learning within these three learning theory traditions, stem from their epistemological groundings, and the diversity of views available on knowing, knowledge and learning, motivation and engagement, purposes of learning and assessment and so forth. Within the behaviourist tradition, the focus of participation is participation in socially acceptable behaviours; and the acquisition of these via external conditioning and or shaping processes; while within the cognitive learning theory tradition, the focus is on cognitive acquisition through participation in mental processes of acquisition and assimilation. While the cognitive learning theory focus is primarily on individual participation for learning through self-reflection and self-understanding, this has been broadened into understandings that locate construction of meaning within social contexts; and recognition of the influence of language and culture (both social practices) on learning. This expansion of cognitive research has led to the situative learning theory tradition, where the focus on participation is on participation (and learning) in practices which are constituted in and through communities' collective (social) knowing. The basic premise for situative learning is that participation in social practices is needed for learning and knowing to emerge (Greeno et al., 1996, cited in Reid & Nikel, 2008). Chapter 4 will focus in more depth on learning theories in the context of participatory mapping. Chapters 6 and 7 will review how learning has taken place in the context of the study and will critically consider the evidence of participation in relation to the theories of participation in learning. Learning theorists are recognising that there are various 'combinations' of all of the above mainstream social learning theories at play in

explaining learning processes and outcomes. On this point Reid and Nikel (ibid.) say that "different modes and approaches to participation in environmental learning are required, i.e. there is no single best approach for all situations" (p. 43).

According to Greeno et al. (1996):

> All three [perspectives] ... have contributed, and continue to contribute, important insights to fundamental scientific knowledge and understanding of cognition and learning and have influenced educational [and other social practices concerned with learning] significantly. While each perspective is valuable, they frame theoretical and practical issues in distinctive and complementary ways. (p. 16)

In his seminal book on Communities of Practices (CoP) Wenger (1998) focuses on developing the understanding of participation in learning and says that participation suggests both action and connection. He describes participation as "the social experience of living in the world in terms of membership in social communities and active involvement in social enterprise. Participation in this sense is both personal and social" (p. 55). This, he says, creates mutuality, which in turn is the source of identity. In the case of the study, this might imply that, even if members of the community live in bigger socio-ecological communities of practice in their day-to-day engagement with each other and with the environment, the practice of mapping may lead to identity building that is "constituted through relations of participation" (ibid., p. 56).

Lotz-Sisitka and O'Donoghue (2008) say that participation is a process of collaborative meaning making and education is participatory either in its active or passive form; i.e. learning cannot take place without some form of participation, and this may be active or passive (referring to Table 3.1. typology that refers to the politics of participation). Wenger (1998) explains meaning making as a dual interaction between participation and reification. Reification, he says, is the production of objects to congeal the experience into 'thingness'. He says "in so doing we create points of focus around which the negotiation of meaning becomes organized" (p. 58). In this sense, maps can be viewed as reified objects of communities' participation in map making around which the community may make meanings of their landscape and their socio-ecological life. But he talks about the

double edgedness of reification and says “the power of reification – its succinctness, its portability, its potential physical persistence, its focusing effect – is also its danger” (ibid., p. 61). The reified object might be seen as a substitute for deep understanding of an issue: “The tool can ossify activity around its inertness” (Wenger, 2008, p. 61). In the context of the study, maps produced as a reified product of a participatory learning process in the two communities involved in the research, may fall into the trap of being seen as a final product representing the outcome of the process and the subsequent process of using the maps produced for agency may be substituted with fleeting satisfaction of producing something pleasing to the eye or an object of pride. The map and the documents produced in the process may be seen as representing the rich experience that has taken place in its making. If this occurs, then the actual *processes* of learning and agency development may be obscured (see Chapters 5, 6 and 7). Addressing this potential problem will therefore be an important methodological dynamic in this research process (see Chapter 5).

Drawing on the politics of participation discourse (see above), McCall (2004) classifies participation in the context of Participatory GIS (PGIS) in four categories, using a ‘participation ladder’, a strategy that it typically used within the politics of participation discourse (Hart, 2008, p. 5). This typology is useful to reflect on what kind of participating environment may be more conducive to learning in the context of the study (see Chapter 7). To do this, I will use this typology of participation to reflect on this aspect of participation and learning, during the participatory process of building the Participatory 3 Dimensional Models. The typology outlined by McCall (2004) includes:

3.4.1 Information sharing

This involves one- or two-way communication between ‘outsiders’ and local people, involving primarily technical information, such as baseline information or status reports. Although the topics are pre-determined by outside agencies, even this level needs a (low) degree of participation in making maps, primarily in eliciting or exploiting local people’s knowledge of, for instance, resources.

3.4.2 Consultation

Here outsiders refer selected issues to local stakeholders for refinement or prioritizing. External agents pre-define the salient problems before consultation, and outsiders control the analysis into scientific knowledge. Examples include mapping of community 'needs' or 'demands' in PRA exercises, or Indigenous Technical Knowledge in ethnobotany or ethnopedology.

3.4.3 Involvement in decision-making by all actors

This involves interaction between internal (local) and external actors who jointly identify priorities, analyse current status, select alternatives, and implement. Participation is seen as a right, not just as the means to achieve a project's goals, but it is still basically externally initiated.

3.4.4 Initiating actions

This entails independent initiatives that emerge from, and which are 'owned' by local people, and self-mobilization to perform relevant activities. This is categorically different from implementation of external ideas with local people's labour inputs. If full participation is construed at all stages, this is an indicator of empowerment and it implies control of the whole Geographic Information Technology process – from problem prioritisation, geo-data collection, spatial analysis, through to map representation and subsequent decision-making.

Learning can happen at all four levels in varying degrees of intensity. It can be much more powerful at the fourth level if the process involves participationby the wider community and if the legal and other contextual conditions are right. In working with this typology in the context of the study, I will seek to review the extent to which the participation that was happening in the mapping processes enabled learning, agency and co-construction of their landscape in and through the mapping activities (see Chapter 7).

3.4.5 Critiques of participatory approaches and the politics of participation

As noted above, participation has become a key theme in development theory and practice, but it has not been without critique. Cooke and Kothari (2001, p. 4) critique

the capacity of participatory research and development. They argue that it can simply serve to facilitate and reinforce an illegitimate and /or unjust exercise of power. They identify three interlinked and real threats of participatory approaches in enquiry and decision making which can also extend to learning through mapping. These are the *tyranny of decision making*, which involves control of decision making by those who initiate, facilitate and fund the participatory enquiry and development; *tyranny of the group* which refers to the manner in which powerful actors in the community may marginalize the powerless including women, youth and other voiceless members; and the *tyranny of method* which refers to the manner in which participatory methodologies dominate social action and other forms of enquiry and interaction.

Participation is not without certain dangers. Participation can lead to solidifying the power of those who participate and can even stifle individual agency. If the purpose of participation is to create an agreement over the wider group and avoid dissent, then individual agency will be sidelined for the sake of the group (Cleaver, 1999). Participation may also lead to maintenance of existing power structures and relations; and or maintenance of the status quo, particularly if the participatory process is dominated by those who maintain an interest in existing power structures, relations and/or the status quo. In such situations alternative perspectives may be marginalised and/or ignored (Price, 2007).

Whether in learning environments or through applications in other forms of projects, participation should be interrogated based on its final outcome. In the case of MELCA-Ethiopia, learning is seen to be of interest, as it has potential to create and support the emergence of agency and community-based decision making. In this sense, some of the questions that McCall (ibid.) asks are of interest to this study. He asks: why participation takes place, who participates, what is going on in the participation process, when does the participation occur, and how does it function to become relevant (pp. 5-6).

If the purpose of learning through participation is empowerment, meaning the creation of agency through the meditative tools of mapping, then what are its

elements? Community maps, it has been argued, can be a medium of empowerment by allowing groups of people to represent themselves spatially, using their own maps to seek recognition and inclusion in land and natural resources planning and management (Corbett & Keller, 2005). The process of making community maps has also been identified as an empowering activity that serves to unify and embolden community (Harrington, 1995). Building on claims made for community mapping, PGIS processes, models and products have been argued to empower participating communities.

If the ultimate purpose is to support the emergence of agency through learning about biocultural knowledge and practices, then it is important to ask why participatory learning is wanted, who is involved and at what stages, what kind of geospatial information is going on and what or in which place is its is happening and how it functions (adapted from McCall, 2004, p. 8). These questions are all reflected on in Chapter 7.

Lotz-Sisitka and O'Donoghue (2008) raise further questions about participation, and note that there is always a submerged paradox in the *participation* concept, in that participation is always promoted and guided, if not even directed, by *someone* whether within the local community, or more often from outside. They conclude after discussing participation in the South African education context that:

> Current patterns of practice in participatory education favour individualized meaning – making approaches that are disembodied from the realities of everyday life. Our analysis points to a need to probe the roles of habitus, culture, structural conditioning, emergence, and power relations in this, as key dimensions of 'reality congruent' participatory processes and of the development and research agenda in this field. (p. 124)

Through this comment, they link the politics of participation to the educative/ situated dynamics of participation, learning and emergence; which is a core interest of this study.

3.4.6 Participatory mapping in Ethiopia

When asked what he thought about the participation of people in mapping or participatory mapping Degelo Sendebo (Director of the GIS and Remote Sensing

Directorate of the Ethiopian Mapping Agency) (see interview in Appendix 6) replied:

> We need to improve the knowledge of our people on mapping before talking about participation. There are only around 2000 people who use mapping. So these people are not enough. Our educational system gives it only to high school geography students. It is given as an attachment in universities. The local people are not educated and we have to work on people's knowledge on mapping. The interest is increasing because of cadastre making (mapping land for individual ownership). We are planning to organize a national day for mapping. We need to organize the system before we invite people to participate. (p. 2)

His response demonstratesa somewhat limited understanding of the possibilities associated with Participatory Mapping within the Ethiopian Mapping Agency and amongst those who practise conventional cartography. Here I recognise that the views of one person are not an adequate basis for generalising to the whole of the Ethiopian Mapping Agency, but triangulated with other sources and evidence, the views of Degelo could be seen to be indicative of some of the issues and perspectives influencing participatory mapping discourse in Ethiopia.

There are, however, some Ethiopian researchers who havetried to combine participation with GIS in what is commonly called PGIS for Research. An example of such research was produced by Aynekulu, Wubneh, Birhane and Bergashaw (2006). They selected a group of community elders from four *kebeles* (the lowest administrative unit in Ethiopia) and asked them to make maps of the past and the present using ground/ephemeral mapping in which they used mainly stones and leaves. They then copied the ground maps onto paper. They followed this up with GPS recordings of the geographic positions of the areas indicated on the maps. They then transferred this into GIS and made an analysis with the conclusion that the size of forests and arable lands had decreased mainly due to increases in population and livestock and expansion of agricultural lands. The participation of the community was limited to giving information as an input to the GIS produced. There was no indication ofhow those who participated in the mapping process were selected and whether the resultant mapswere returned to the local communities. Community participation in this case appeared to be mainly oriented within the 'giving information' type of participation (as described by McCall, 2004 above).

Ethiopia is one of the countries where many NGOs useparticipatory rural appraisal (PRA) for research with rural communities (Kirsopp-Reed, 2001; Waters-Byer, 1994). It is, therefore, realistically safe to assume that participatory mapping came to Ethiopia with PRA in the late 1980s and was practised widely in the early 1990s. Mapping was undertaken as part of a host of other participatory methods. As Chambers (1994) lamented, it was usually Rapid Rural Appraisal (RRA) rather than PRA as most of the facilitators are not necessarily trained to have the sensitivity torespect local peoples' knowledge and often lack the skill to guide participation, and the processesare often hurried to meet donor demands.

Ammassari's (1995) comment is telling in this regard:

> The drawing and colouring of maps on the ground gave an overview of the village, its infrastructure and its institutions. Of course it would have been particularly interesting if different groups (men, women and children) had separately drawn maps of the same village. People appeared to have difficulty in imagining a bird's-eye view of the village and in using rough indicators for wealth, health or other attributes of single households. Such detailed illustration would have been very time-consuming. It did not seem convenient to extend the exercise longer than one and a half hours. (p. 4)

The citation above indicates that Ammassari does not think that the community haveadequate mapping capacity to represent their environment or that they areadequately capable of expressing certain dimensions of their social life. It also shows that Ammassari wanted to find a considerable amount of information about complex social and spatial patterns and processes in an hour and half and was disappointed when this was not possible. It is difficult to interpret this as a participatory in the full sense of the word, which is why it may be more appropriate, along the lines of Chambers' argument cited above, to term this kind of activity as a Rapid Rural Appraisal, rather than Participatory Rural Appraisal, when considered from the vantage point of McCall's typology.

In another context, Rowley and Terfa (2008) evaluated the participatory mapping experience of the joint venture between SOS Sahel and Save the Children United States (US). SOS Sahel was undertaking the mapping on behalf of Save the Children US. The methodology used for the mapping in this case was simple sketch mapping.

The SOS Sahel mapping was undertaken in the context of a rapidly changing pastoral way of life in Ethiopia. The contexts include the expansion of agriculture into grazing lands and water points, increase in conflict among the pastoralist communities, the policy of government favouring sedentary settlement overa nomadic way of life, increase in population, and the study being done on soil allocated by the regional government to identify more lands for agriculture.

The purpose of the mapping was to understand pastoral natural resource management strategies and patterns of mobility. However, the aim appeared to be somewhat shortsighted as it did not include the 'so what?' question after the mapping, and the mapping process was not community led. There was also no clear strategy for using the results of the mapping. The process was not fully participatory as it selected only a few elders and the majority of the community was not involved, and did not know what was happening. The facilitators (asking the community) produced the maps and the legend and sometimes the items on legends were changed without consulting community members. The facilitators did not leave a copy of the map with the communities concerned. There was also a heavy focus on boundaries, and this unfortunately limited the use of the maps to cover the distribution of resources across boundaries. The focus on boundaries was also difficult to execute and this took most of the mapping process time (Rowley & Terfa, 2008).

Despite all these drawbacks (when viewed from a broader perspective of participation) the mapping process did lead to some action. Some of the local communities built schools from their own resources after mapping. One community identified degraded areas and enclosed them from the reach of animals and people and this resulted in the rehabilitation of the area. Another community also identified a local tree species as a resource and organized the selling of resins coming out of the tree (ibid.).

The study recommended the giving of the copies of maps to the communities, the development of an action plan for the facilitation of the strengthening of the local governing structure, and further digitization of the maps with GPS (ibid.).

Other than these few references to participatory mapping in Ethiopia, it is difficult to find documented experiences, both from research and development projects, that have the specific purpose of investigating learning and change. Therefore, I am hoping that this study will address this gap.

3.5 Review of participatory mapping tools used for the study

With all of the information on mapping and participatory mapping outlined above in mind, this section moves on to review the particular participatory methodologies that are used in this study, namely sketch mapping, P3DM, ecological calendar and legend making. As little documented work exists on the use of the ecological calendar, I will draw on and recount the experience and observations from Colombia (see Section 1.2), to exemplify the uses of ecological calendar for education and learning.

3.5.1 Sketch mapping

Although not in the context of participatory mapping per se, Tversky (2002) makes some useful points about sketch mapping, She, however, notes that sketch mapping provides awayof externalizing ideas, making internal thought public, and making fleeting thoughts permanent (p. 2). She claims sketch maps convey "visio-spatial knowledge" and that "...elements and special relations of the world will be conveyed through elements and spatial relations on paper" (p. 1). She adds that sketch maps "... express abstract ideas" (ibid.). The same can be said about participatory maps as they express abstract ideas including the relationship among the landscapes and the value of sacred sites to the well-being of the ecosystem (Pain, 2004).

The externality of maps promotes ideas and converts unreliable ideas to reliable information. The public nature of maps allows the community to observe, revise ideas, and enact those revisions in an external representation.

Corner (1999) agrees, although not particularly for participatory mapping, and says:

> Mapping is a ... fantastic cultural project, creating and building the world as much as measuring and describing it. Mapping is ... particularly instrumental in construing and constructing living spaces. Maps and territories are co-constructed. Space is constituted through mapping practices, amongst many

> others, so that maps are ...not a reflection of the world, but a re-creation of it; mapping activates territory. (p. 231)

Tversky (2002) extends her argument to include the value of maps for communication and says that they provide a form of communication with the self, and help with checking the consistency of ideas. Therefore, they provide a 'lateral model' of an idea (p. 2). She also discusses how externalization of *relationships* amongst elements in the landscape can promote new ideas. She adds "maps schematize. They represent selected ideas according to the importance of the purpose and the context" (p. 4). Here she refers to how mapping abstracts some ideas while leaving some unrepresented. What differentiates participatory mapping from a range of other abstraction processes is that the abstraction is done by the local communities themselves and not by the researcher or the development worker, although aspects of the abstraction process may be facilitated by researchers and/or development workers (Herlihy & Knapp, 2003). (See also Chapter 6.)

Commenting further on this point, Tverksy says that maps (or the map makers) can simplify, distort and omit information to fit the purpose of the mapping and the context. The structure presented on the maps is not a direct replica of the structure of the environment but is rather reflective of the conception of the presenter and the conceptual structure of the information in his/ her mind (Tversky, 2002; Wood, 2010; Nonaka & Takeuchi, 1995). Today mapmaking also reflects technologies that are available for map making (Corbett et al., 2006). Maps can also depict information that is not necessarily part of the reality, like boundaries and arrows and symbolic names including place names, population statistics and distances. Therefore, sketches are not correspondent presentations of reality but representations. They are not only an externalization of images or spatial features, but also of ideas.

The use of elders and those who are familiar with the history and the elements of the landscape are critical for the success of mapping. Tverksy argues that sketches convey abstractions from which an inference can be made but the inferences that one can make depends on the ability and the expertise of the sketcher (2002, p. 3). This emphasis on expertise and knowledge of landscapes can provide a defensible

justification for working with elders and those who know the landscape with a depth of knowledge and experience.

Sketch maps are the most ubiquitous form of participatory mapping (Chambers, 2006). Most PRA exercises talk about sketch mapping when they refer to participatory mapping (Flintan et al., 2008). However, an increasing number of NGOs are undertaking large scale sketch mapping for various purposes (ibid.). One example is the 2010 mapping work of Save the Children US and SOS Sahel Ethiopia mentioned above. The mapping was undertaken at Borena Zone, Oromia Regional State, Ethiopia. As mentioned previously, it involved both government and local communities.

3.5.2 Participatory 3 Dimensional Models (P3DM)

MELCA-Ethiopia has built four P3DMs in four differing contexts in Ethiopia. As is explained in detail in Chapters 5 and 6, I used the data collected to analyse the Bale Mountains and Foata Mountain Complex mapping and learning process. This section shares insights from literature on P3DM.

Rambaldi, Kyem, Mbile, McCall and Fox (2006) claims that P3DM brings GIS to rural and marginalized people. It also brings actors together and creates an environment for public participation for decision-making. Although he does not explain how or what kind of learning takes place, he further claims that it promotes collective learning processes as it allows the visualization of the social, economic and cultural domain of the community. One may ask, how is it different from sketch mapping then? Tversky (2002, p. 1) says that one of the main functions of sketch mapping is visualizing or making public the knowledge of those who participate in mapping. The big difference Rambaldi, Bugna, Tiangco & de Vera (2002) claim, is the vertical dimension. They argue that this additional dimension will "give *essential clues to stimulating memory and for establishing spatial associations"* (pp. 6-7*, emphasis mine*). Having the vertical dimension of a landscape represented reduces distortion in the transmission of a message because one layer of interpretation is removed.

Rambaldi (2010) further claims that people's knowledge and spatial information comes together to produce a stand-alone relief scale model. The model may work alone or can be strengthened with information collected through Geographic Positioning System (GPS) and /or other information sources.

Although not as widely used as other Participatory GIS systems, P3DM has been used in various circumstances for various purposes. Gaillard and Maceda (2009) reported that they used it to integrate scientific and indigenous knowledge as well as to create a platform for various stakeholders to come together to deliberate risk issues. They also claim that it is a cost effective methodology.

There are a variety of advantages to P3DM which are articulated by Rambaldi and Lah (2003, pp. 78-79):

- The physical 3-dimensional representation of space offers users a so-called bird's eye view and a common perspective from which to acquire a holistic view of the landscape where landmarks and salient features are visible to everyone.
- If the method is applied in a genuinely participatory manner, it generates relatively accurate qualitative and quantitative geo-referenced data that are intellectually owned and understood by those who have compiled them (Chambers, 2002).
- Both process and output fuel self-esteem, raise local awareness of linked ecosystems, and delineate intellectual ownership of the territory.
- Relief models provide stakeholders and local authorities with a powerful medium for easing communication and language barriers, and create common grounds for discussion.
- The method is especially effective in portraying relatively extensive and remote areas, overcoming logistical and practical constraints to public participation in land/resource use planning and management.
- Manufacturing a relief model has positive effects in stimulating community cohesion because it gathers people to share information and concerns and frequently reinforces community self-actualization through the revival of local knowledge.
- In Participatory Monitoring and Evaluation (PM&E) sketch maps transect diagrams, or other conventional spatial tools produced at different times are compared. There is an inherent weakness in the fact that the outputs are not properly geo-referenced and consistently coded. P3DM overcomes this weakness, because the relief model is a constant with its legend and coding embedded.
- Most protected areas in Less Developed Countries do not have demarcated boundaries. Relief modelling can give communities and local

authorities a clear first time factual understanding of their perimeter. This facilitates a bottom-up approach to boundary delineation and zoning, both of which activities tend to otherwise be characterized by bureaucratic logistics and lengthy negotiations.

- Thanks to the use of differentiated coding systems and materials, 3-D models, similarly GIS, accommodate overlapping information layers, thus facilitating community-based analysis and decision-making.
- Experience gained in the Philippines over almost a decade has shown that 3D modelling exercises conducted entirely at community level, and as a response to local needs versus external threats, have yielded positive effects in terms of community-cohesion, identity building and decision making (PAFID, 2001).

The usefulness of P3DM for learning is also noted by other writers including Gaillard and Maceda (2009) where they reported local communities' increased understanding of their landscapes after participating in the process.

Rambaldi (2010) claims that the process of mapping helps participants to remember the past and reclaim their lost memories. It helps to create cohesion in the community for a common goal, promotes intergenerational knowledge and helps participants to achieve an holistic goal. The participants also become aware of the power of their spatial knowledge when they see it geo-referenced and printed. Although what he claims is not specific to P3DM, the same can be said about other modes of participatory mapping.

Rambaldi (2010) argues that manufacturing a 3D model has positive effects in stimulating community cohesion because it gathers people together to share information and concerns and frequently reinforces community self-actualization through the revival of local knowledge. Alcorn (2000) adds that

> One of the reasons mapping works so well as a community-organizing tool is that the mapping process can bring everyone together to share information and concerns. Old people share history with young people, passing on legends and religious beliefs, and knowledge of sacred rites and places so essential to conserving tradition. (pp. 1-2)

Rambaldi (2010) claims further that:

> Three-dimensional models provide local stakeholders with a powerful medium for easing communication and overcoming language barriers. In providing open access to information, 3D models add transparency and create common ground for discussion. They broaden individual perspectives and limit the

> distortion of messages between communicating parties by offering a shared language of colours, shapes and dimensions. In doing this, 3D models bridge language barriers and ease communication on issues bound to the territory (and its resources). This is particularly relevant for people with different education levels, cultural backgrounds and diverse or conflicting interests. Maps reproduce people's geo-referenced knowledge in a cartographic format, which is understood by the "outside" receivers; this places insiders (i.e. community members) and outsiders (e.g. scientists, government officials, consultants, etc.) on an equal footing, thus facilitating interaction, reciprocal learning and negotiation. (p. 11)

One of the criticisms of P3DM is its poor mobility. All of the models that have been produced at MELCA-Ethiopia are so heavy and cumbersome that it is challenging to move them around. Although this has the advantage that those who facilitated the mapping have to leave the model behind, it nonetheless is a hindrance if the community want to use it as a flexible communication tool. This challenge can be overcome by digitizing the model. This requires taking photographs of the model, scanning the pictures, geo-referencing and digitizing the model with GIS. In turn, a GIS can generate data sets, which can be entered onto the 3D model to enrich the learning and negotiation process (Rambaldi, 2010; see Chapter 5).

The size of P3DMs can be manipulated to fit the purpose and the context of the exercise. One can make, for example, a model of a whole country. In order to get buy-in from the regional government for using the method for watershed management (Fisseha, G., personal communication, December 11, 2010) built a model of one of the regions in Ethiopia at a scale 1:200,000. After getting the buy in, from government he built models at a larger scale. A much larger scale is necessary, though, for effective participation within local communities. Rambaldi (2010) says that by miniaturizing (i.e. 1:5,000 to 1:20,000) real world features as they are known and perceived by participants, P3DM has proven to be particularly effective in dealing with relatively large and remote areas and in overcoming logistical and practical constraints to public participation in land- and resource-use planning and management.

However, as shall be discussed in detail at a later stage (see Chapter 7), P3DM can also limit the creativity of the people. Using coloured pens on white paper can

provide local communities with the freedom to represent their landscape as they understand it. They can draw the shapes of elements of the landscape and emphasize what they want to emphasize. P3DM can also limit the continued interaction of communities with their maps. Sketch maps do not need paints and coloured pins, and members of the community can go back to add or remove elements using only drawing material. They can also put arrows to demonstrate movement of elements including animals and other natural features. P3DM is also limiting in terms of using symbolic language. Sketch maps can be represented in a real life images while this is challenging for P3DM. It will also be very expensive and time consuming to do a model of the present, the past and the future to visualize for comparative analysis through one can have these discussions using narratives alone in P3DM. P3DM is also time consuming: it takes on average 7 days to build one 3DM (see Chapter 5).

3.5.3 Ecological calendar

Although not in the manner that the calendar was used in this research (see Chapter 6), different researchers have used seasonal calendars as part of a repertoire of other methods that fall under PRA methodology (see Flintan et al., 2008, for example). For example, Husein, Malik, Fatima and Yousuf (2005) used a seasonal calendar to describe the seasonal prevalence/importance of different animal diseases in their training programme focussing on researchers collecting data on the prevalence of Rinderpest in Islamabad. The purpose was to get accreditation linked to freedom from Rinderpest, to sell the country's meat on the world market. Mearns et al. (1994) also used a seasonal calendar in their fieldwork to train Mongolians in participatory research as part of developing a policy alternative for livestock development aimed to facilitate the transition from a centrally planned to a market economy. In this context they used a seasonal calendar to show seasonal differences in distances covered from their houses to pasture. They also used a seasonal production calendar showing climate variations, incidence of disease, and labour requirements. Flintan et al. (2008) used seasonal calendars, in combination with other tools, to develop a clear understanding of where livestock movements occur

and the degree to which local communities still relied on livestock and livestock systems as part of their livelihoods and how in the context of Bale.

Prober, O'Connor and Walsh (2011) undertook a review of ecological calendars produced in Australia with the purpose of finding out the method's potential application to Natural Resource Management and to evaluate its contribution to socio-ecological resilience. They say that their evaluation has found that the ecological calendar indicates that the Autstralian Aborgines have basic knowledge of the environment and how it should be managed, with the potential of informing modern management. They also state that this ecological knowledge comprises knowledge about the weather, the seasonal cycles of plants and animals and this links with culture and land uses. The local community uses seasonal calendars to organize their life around their food and health systems, resources and cosmology. They also interpret stars, the weather, and other physical and biological events and use this information to decide when to pursue cultural activities.

The difference between the ecological calendar of indigenous and local communities and the Western form of calendar is that the latter has a structural time reference, which is fixed, whereas those of local communities and indigenous peoples has 'ecological time', is cyclical and is embedded strongly in the place and ecology of the place or the context.

Another interesting aspect of ecological calendars is the links with customary law. Customary laws are used, among other things, to allow or restrict access to certain part of the ecosystem from use by the local community. The ecological calendar helps this by indicating the seasonal timing of access or restriction to resources, frequency, intensity and long-term usage patterning. This is related to resilience as it sustains the diverse resource base (Prober et al., 2011).

Prober et al. (ibid.) argue further that ecological calendars provide a framework to organize and communicate traditional ecological knowledge (TEK), including intergenerational knowledge. They provide seasonal frameworks that can be used as a vehicle for knowledge recovery, retention, communication, and application. They

can be used to demonstrate the direct linkage among cultural, ecological and spiritual aspects, emphasizing the context of TEK. They can also be used to illustrate that an indigenous natural resource regime could be better than Western forms of conservation because of its holistic nature, reflecting a broader cosmology.

Prober et al. (2011) undertook an extensive literature review on the topic. From this, it is clear that studies linking participatory mapping with an ecological calendar in the context of biocultural diversity and resilience are scant. Furthermore there appears to be no focused study on how ecological calendars and maps in combination may enable learning and agency of both individuals groups in the community.

As indicated in Chapter 1, my interest in working with ecological calendars arose from interactions with indigenous communities in Colombia who were using these maps. An excerpt from a trip report that I wrote after my visit there in 2008, shows that the local communities used ecological calendars for community learning about biocultural diversity and for organizing their life system.

> The Pira Pirana community in Colombia use maps as one of their research tools. Maps tell them the names and the significance of each sacred area, how each is managed, what they can do at certain places and the things that they were doing wrong. In this way maps help environmental management. They know what could happen to them if they do not abide by the rules of the places on the map. The elders are at the centre of this exercise.
>
> They think education must be aligned to the environment of their community. Elders and women, mainly through rituals and storytelling, taught before. Now children go to school. Therefore, the knowledge from the elders has to come to the children through curriculum. They recognize the potential of formal education. They want to use the organizing power of formal education for their purposes. Certain cultures from the west, such as writing and curriculum development can be used to pass on knowledge. For them the education system has brought a system of organizing knowledge but if this does not help the environment, then it is not useful. Everything surrounding you will only make sense if only every methodology is tuned to it. Education and environment are not separate.
>
> They have asked themselves “what is education?” Is it to destroy the world through irresponsible using? Is it to adopt other cultures and be ‘civilized’? Is it being civilized to look like others? Their definition is education is for the management of life and to learn how to live well.

So they have started to develop a life plan. The basis of their reflection was education, health, governance and the environment. They have asked three questions under each of these four areas. The questions were: How was it before? How is it now? And what do we want it to be in the future? So they analyzed their education system and they could see that it is one of the major forces eroding their culture and degrading their environment. The Shamans recognized it as such and also made it their priority. The women did the same. In this way, through participative discussion, everybody had the same and clear vision – to have the education of their own.

According to Leonardo Bolivar, a captain and a teacher, the shamans are the lungs of the society as they order the natural system and follow the seasonal changes and advise the community to live according to their seasonal calendar. They have selected five centres as the basis of education: the Chagra (farming plot for women), the forest, the rivers, the Maloca (the house for the shamans and his family) and the household as the centre of family education. They organized a group of researchers to look in to these five elements and bring detailed information. They then developed their own ecological calendar. The ecological calendar is a circular figure that has mostly four sub-circles, one circling the other. The inner circle represents the main seasons, the second outer circle the activity of humans under each season, the third the manifestation of nature including fruiting of trees and the appearance of certain species of fish, and the outer circle shows the climatic phenomena. The ecological calendar helped develop curriculum. The Shamans, the researchers (most of the researchers become teachers) and the women experts bring information to be included in the calendar and eventually in the curriculum. Teachers should have a depth of ecological and social knowledge and should be exemplary in their communities. Producing the ecological calendar helped them to achieve this. Through repeated workshops, they have managed to integrate their knowledge into the curriculum and align this with the national curriculum. Natural Science, Physical Education, Mathematics, Social Science and Ethics were included. This is to justify to the government how all the areas of education are covered. Students are given research projects to do based on the ecological calendar. For example, when the rivers are full of fish, it is about fish, when many trees are fruiting in the forest, it is about the fruits and the forest (Belay, 2008).

As indicated in Chapter 1 and in the methodology section (Chapter 5), I facilitated the production of ecological calendars with the Bale and the Telecho communities in Ethiopia (see Chapter 5, Section 5.4.2).

3.6 Map legends

Legends are made to allow conversations with maps. Rambaldi, Chambers, McCall and Fox (2006) says mapmakers use maps to convey information mainly through a

visual language made of legend items, a combination of symbols (points, lines, polygons, and volumes), their variables (hue, orientation, shading value, shape, size, and texture), and interpretation keys.

Participatory mapping is a map-making process that attempts to make visible the association between land and local communities by using the commonly understood and recognized language of cartography (IFAD, 2009).

Latour (1987) argues that maps increasingly took on the status of "immutable mobiles" (p. 67). That is, the mechanisms used to generate cartographic information and the form maps took (in terms of scale, legend, symbols, projection, etc.) became familiar and became 'standardized discourse' through protocols and conventions, so that the map became a stable, combinable and transferable form of knowledge that is portable across space and time. As such, a map produced in South America by Argentinean cartographers is decipherable to someone from another country because it shares common principles that render it legible. This statement indicates that legends are one of the ways that scientific knowledge disciplines the practitioners who produce such knowledge.

Legends are also made to communicate intergenerational knowledge. Through the use of legend items, elders can pass knowledge to the new generation about social and ecological changes. Maps can survive their current use and legends will help communicate changes that have taken place in the environment to the coming generation. Crawhall (2009) adds that mapping can reveal time-based shifts in how humans are using natural resources and the changing context of the environment itself. All of this relies on creating a coded system that captures local knowledge and makes it understandable to those who may not know the landscape or the cultural system being described.

Legend making is perhaps the most important element of the P3DM process. A legend, if made correctly, puts the knowledge holders in the 'driver's seat'. It allows them to express a complex network of ideas, concepts and interlocking criteria that will be visualised and coded on the model. A well-prepared legend allows clearer

meanings, and maps out the relationships between natural and cultural features (Rambaldi, Kyem, Mbile, McCall & Weiner, 2006).

Rambaldi et al. (ibid.) continues:

> ...the talkative capacity of maps rests in the selection of featured items, in the manner these are depicted, and in the capability of users to understand, interpret, and relate these to their real worlds. Particularly when a map is used to support a dialogue, it is important that its graphic vocabulary is fully understood by all parties involved. Each displayed feature needs a key to be interpreted. (p. 6)

This indicates the necessity for the co-construction of map legends during the participatory mapping process.

However, map legends also have a political side. Harley (1992) says that through both their content and their modes of representation, the making and using of maps has been pervaded by ideology, as reflected in Latour's (1987) comment on cartography.

As a tool for facilitation of learning, the process of legend making is *as* critical as the product. The participants in the learning project must represent their landscape through legend items that hold meaning for them and this process should be iterative. As they identify more ecological and cultural features, they may decide to change the legend items, and add more or new legend items. This creates a particularly rich environment for learning. Those who make the legend should also ask those who are not involved to comment and critique the legend items, and to establish whether it is possible to reduce the number of the legend items, and to see if the legend items hold meaning for a wider group of people in the community concerned.

3.7 Critiques of mapping

One of the issues associated with mapping, is the issue of ownership, control and deployment of information. Fox et al. (2005) convened a workshop in to test and refine socio-ethical ideas and practices associated with the deployment of System Information Technologies. They agreed to come together after a year of research at

their respective sites and review potential ethical impacts of the PGIS processes they were involved in. Their major conclusion was that the impacts of widespread adoption of Spatial Information Technologies (SIT) including PGIS (one of the participatory mapping methodologies) at the local level are not just limited to the intended objectives (p. 99). They noted that mapping has demonstrated value in empowering local communities, and can be used to win land claims for local people. It, however, also has the potentially adverse consequence of providing information to local government which can be utilized to control land or community activities; or to disrupt established land use practices, and may even be used as an instrument that leads to dispossession of land, as has been the case in many African contexts (e.g. declaration of conservation areas; or apartheid and colonial land policies) (Murphree, 1993).

Spatial Information Technologies may disfranchise communities if they become a norm for assessing land use and land change trends. Fox et al. (2005) continue:

> Reflections by practitioners in the project case studies identified several ironic effects of mapping that could undermine the goals of community-based management. While mapping is useful for bounding and staking claims to ancestral or traditional territories, it also facilitates a shift toward exclusive property rights. It provides outsiders with a legal means to gain access to common property resources. Common property resources are managed through rules and practices that enable sustained control of knowledge about the location of valuable resources. By making knowledge accessible to all, mapping weakens existing common property management systems. Mapping generally promotes practices that shift attention and concern away from a fluid human/environment relationship to a relationship with quantifiable limits implied by boundaries/borders. So the newly acquired authority to define and exert control over the use of space has begun to compromise the customary uses and governance. Tensions thus exist between new patterns of empowerment yielded through SIT and broader social, political, economic, and ethical ramifications of the technology. (p. 103)

Fox et al. (2005) further assert that “the tools, families of technologies, and practices associated with SIT use are value-laden and deploying SIT will necessarily have ethical consequences”. That is, the deployment of SIT will affect the constellations of values that distinctively shape any given society, its spatial practices, and its approach to reconciling conflicts or disharmony among competing goods or interests.

I have discussed ethical considerations in some detail in Chapter 5 (see Section 5.8) under the section on ethics, including asking free and prior informed consent (FPIC), not hurrying the process, allowing time for and handing over the processes of mapping to community members (Chambers, 2006), and leaving original copies with them and taking only photographs. What also helped in the case of MELCA-Ethiopia, and thus this research, is that the mapping was part a longer term process of engagement with local communities in the two sites, which helped with creating a trusting environment for the mapping work, and also with post-mapping follow-up and support for implementation of actions that were decided on as part of the mapping process (see Chapter 5).

3.8 Conclusion

In this chapter I started by discussing the history of mapping focusing in particular on Ethiopia. I then elaborated the ontological development of the concept of cartography to lay the basis for the understanding of the emergence of participatory mapping, which places local people at the centre of the mapping project. I then discussed the concept of participation in the participatory mapping process placing an emphasis on learning rather than on power relationships with which the concept is mostly associated. I then went on to describe the concept of participatory mapping including the methods that I will be using, namely sketch mapping, ecological calendar and P3DM. The chapter was concluded with a discussion on the limits of participatory mapping which are basically ethical. In the next chapter I will explain theories of learning and change which will be used to explain and analyse the data that will be presented in Chapters 5 and 6.

Chapter 4: THEORETICAL FRAMEWORK: LEARNING, CHANGE AND RESILIENCE

4.1 Introduction

This chapter focuses on learning and change theories that will be used to understand, interpret and explain the processes and results of the Participatory Mapping (PM) activities undertaken in the two study sites. These theories are required to address two of the three questions of this study which are: "How did learning interactions take place during participatory mapping; and did these influence agency?" and "What is the implication of the agency that emerged for the resilience of the community?" (see Chapter 1, Section 1.8).

The chapter opens with a description of two frameworks that provide insight into *how* social learning processes occur. These frameworks will be used later to analyze both the process and the result of the learning that may have happened as a result of the participatory mapping activities.

This discussion on learning is taken further through a consideration of the metaphors used by Sfard (1998): 'acquisitive learning' and 'participatory learning'. She uses these to describe two main theoretical traditions or explanations of learning. I draw on this to discuss Vygotsky's (1978) theory of semiotic mediation in and through the Zone of Proximal Development (ZPD) (an acquisitive learning theory according to Sfard); and its potential relevance for providing a language of description for discussing both the individual and the collective construction of knowledge of landscape. This is followed by a discussion of Lave and Wenger's (1991) theory of Legitimate Peripheral Participation (LPP) and Communities of Practice (CoP) (participatory learning theories according to Sfard), and their potential relevance for providing a language of description for discussing the learning that may have happened in the participatory mapping activities. In particular, I will focus on Communities of Practice theory, to discuss how meaning making processes occur through the dual interaction of participation and reification, and how identity is created in and through participation in practices (in the case of this study, mapping

practices). Sfard's (1998) argument is that one needs *both* acquisitive and participatory metaphors to adequately explain learning processes and outcomes.

As indicated in Chapter 1, this study is interested in both learning and agency, and to fully describe and understand the relationship between learning and change, theories of structure and agency are needed. I draw particularly on Archer's (1995) morphogenetic approach as it provides a well-developed language of description for analysing change in ways that emphasise both structural conditions and social interactions. To contextualize Archer's theory of morphogenesis, the chapter also provides a brief discussion on Critical Realism, especially its ontology of stratification into the real, the actual and the empirical and its emphasis on emergence, as these are important to understand morphogenesis. Analytical dualism, Archers' methodology, is then discussed to pave the way for understanding the analytical strategies to provide morphogenetic explanations. The chapter explains how the learning theories discussed, and Archer's theory of morphogenesis were used together in this study. The concept of resilience, a key interest and outcome of the learning (as briefly described in Chapter 1, Section 1.10.4) is also discussed in more depth in this chapter, as it is a key focus of the learning and change processes in this study.

4.2 Social learning systems

As discussed in Chapter 3, different traditions of learning can be identified through a review of learning theory and these theorise participation in learning differently (see Section 3.4). In recent years environmental educators have become particularly interested in social and situated approaches to learning (Wals, 2007; Glasser, 2007; O'Donoghue, 2007; Reed & Nikel, 2008; Blackmore et al., 2011) as these help to explain how learning is influenced and mediated not only by social interactions, but also by situated experiences in changing environments. As this study is located broadly in the field of environmental education and it has a similar interest (see Chapters 1, 2 and 3), I draw on social learning theory to locate the learning theory interest of this study. Wals, Van der Hoeven and Blanken (2009, drawing on Hurst, 1995) present a very useful figure (see Figure 4.1 below), which I have found useful to begin to understand and analyse the learning processes in the participatory

mapping activities (see Chapter 3). This is extended descriptively, by the social learning framework that Wals (2007) presents as descriptive analytical means for examining social learning processes.

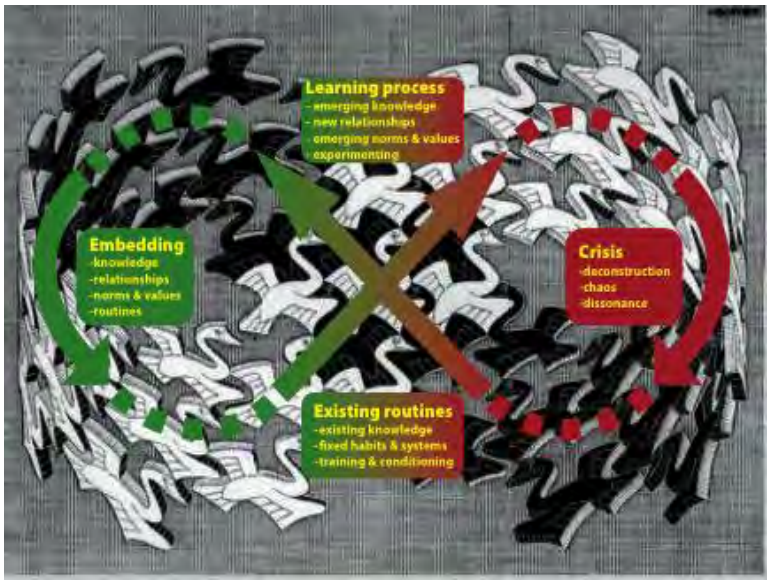

Figure 4.1: *Learning system, Wals et al. (2009, based on Hurst, 1995)*

Wals et al. (2009) use Figure 4.1 to argue that social learning systems involve complex processes of engaging with dissonance and crisis, challenging accepted routines, and embedding new concepts and practices in and through learning. They explain that social systems are full of setbacks; they are insecure, complex and risky and there is a need for people to engage in social learning processes to meet these challenges. They say in particular:

> … as is the case in eco-systems, periods of relative stability and calm can alternate with periods of increased dynamics and a greater degree of insecurity caused by a disruption or a new challenge. It is particularly in a period of dynamics and insecurity that one must rely on the learning ability of the system and, with that, on social learning. A period of stability and calm will once again present itself once the system is able to cope with the disruption as a result of its learning process. (p. 8)

Working with Figure 4.1 it is possible to surmise that 'Existing Routines' are the situations that exist before the participatory mapping, 'Crisis' could mean the dissonance created or 'brought out' by the mapping experience, 'Learning Process' could be the new understanding that may emerge, and the new relationships that may have been created; and 'Embedding' may be consolidating the learning that has

come about and implementing this through new discourses and practices. In Chapter 7, I review the data with this in mind and reflect on whether this is, indeed the case or not.

Wals (2007) using a similar processural framework tries to describe social learning processes as sequential moments that are related to the learning system described in Figure 4.1. The main thrust of his argument is that a key precondition for social learning is dissonance. He claims that "there is no learning without dissonance, and there is no learning with too much dissonance" (p. 40). He asks "How can the dissonance created by introducing new knowledge, alternative values and ways of looking at the world become a stimulating force for learning, creativity and change?" (ibid.). It is perhaps significant to this study that Wals' (2007) work is providing theory for understanding learning in complex, rapidly changing social-ecological systems; and he argues that such learning processes are reflexive, and must engage with the dissonance created through current social-ecological issues and risks. Wals' (2007) work on learning and change relates to the second research question of this study, which focuses on learning and change (see Section 1.8); it is therefore at the heart of this study.

Wals (2007) sees the facilitator as an important actor in creating the right level of dissonance so that people are moved from their 'comfort zone' and, in the process, their zone of understanding expands. Mukute (2010) working on expanding sustainable agriculture learning in southern Africa also emphasizes the significance of the facilitator or what he terms the 'intervention researcher' in managing levels of dissonance in boundary zones where expanding social learning takes place (drawing on Engeström's expansive social learning theory). The significance of the facilitator's role in creating and managing dissonance in an education or learning situation is also brought to the fore in Vygotsky's theory of social mediation in a Zone of Proximal Development, which is discussed in more depth in Section 4.3.1 below. This will also be an important point of reflection in this study, as I have already mentioned that MELCA-Ethiopia are facilitators of the participatory mapping processes, and as a researcher, I have had a significant role to play in facilitating the learning processes reflected on in this study (see Chapter 5).

Wals (2007) sets up dissonance as a prerequisite for social learning process and reorganizing the learning that has come after the 'chaos', and then uses a six-phase process structure to frame social learning (outlined below). The six-phase structure further unpacks Figure 4.1, which in combination can potentially provide a useful language of description for the learning processes in the participatory mapping activities. Wals' (2007) framework is presented with the caveat that is important not to view these processes as *necessarily linear*; in other words they can occur in more complex combinations (as was shown by Masara's 2010 work on social learning amongst beekeepers in southern Africa). Referring back to the role of the facilitator, Sinyama's (2011) research, using this framework to interpret social learning processes in schools, identified the significance of critical questioning by the facilitator, in the de-framing and co-constructing process phases. The six-phase process framework includes:

- **Orientation and exploration** – identifying key actors and, with them, key issues of concern or key challenges to address in a way that connects with their own prior experiences and background, thereby increasing their motivation and sense of purpose;
- **(Self) awareness raising** – eliciting one's own frames relevant to the issues or challenges identified;
- **De-framing or deconstructing** – articulating and challenging one's own and each other's frames through a process of clarification and exposure to conflicting or alternative frames;
- **Co-creating** – joint (re)constructing of ideas, prompted by the discomfort with one's own deconstructed frames and inspired by alternative ideas provided by others;
- **Applying/experimenting** – translating emergent ideas into collaborative actions based on the newly co-created frames, and testing them in an attempt to meet the challenges identified;
- **Reviewing** – assessing the degree to which the self-determined issues or challenges have been addressed, but also a review of the changes that have occurred in the way the issues/challenges were originally framed, through a reflective and evaluative process.

Applying this framework to possible interpretation of the mapping activities, it is possible to surmise that the first processes of orientation and exploration can be termed the pre-mapping phase activity. The three processes that follow – (self) awareness raising, de-framing or deconstructing and co-creating – can occur through the actual mapping process. The applying and experimenting phase can be linked to

the carrying out of the decisions that are agreed upon as a result of the mapping process, while the reviewing phase could involve looking back at the process of the mapping and following up on the results of the changes in practices after the mapping activities are done. With recognition of Wals' (2007) point that the framework is not 'neatly linear', I will draw on this framework when discussing and interpreting the social learning occurring in and through the mapping processes; and the events that may or may not emerge from the process. As Wals (ibid.), accepts, learning does not happen in a sequential way and some of the processes can be happening at the same time; while Sinyama's (2011) research shows that learning may or may not be impeded by the role of the facilitator in the process. Sinyama's environmental education research particularly emphasizes the importance of critical questioning in the de-framing and co-constructing social learning phases for change to occur in and through the learning process; which is of interest to this study.

4.3 Socio-cultural and situated learning theories of relevance to this study

Social learning theory, as it is being developed in the field of environmental education and in engagements with social-ecological issues and change interests (Wals, 2007; Glasser, 2007; O'Donoghue, 2007; Reid & Nikel, 2008; Mukute, 2010; Masara 2010; Sinyama, 2011; Blackmore et al., 2011) is located within broader learning theory (see Chapter 3 section 4); particularly the social-cultural and situated learning theory tradition, which emerges mainly from Vygotsky's early research on social mediation in social and cultural contexts; which I discuss next in more detail.

As mentioned in Section 3.4, there is a long and established history of learning theory, which has been particularly dynamic over the past 100-150 years as research in the social sciences, and particularly in psychology, sociology and education rose in stature. Of most interest to this study, are environmental education social learning theories (discussed above); which in turn are related to socio-cultural learning theory informed by Vygotsky; and situated social learning theories, particularly the theory named 'Communities of Practice' by Lave and Wenger (1991). These theories provide robust languages of description for the kinds of participatory learning in which this study is interested.

The genesis of learning theories including social learning theory legitimate peripheral participation and communities of practice theory (Lave & Wenger, 1991; Wenger, 1998) seem to emanate from the frustration of social scientists, anthropologists and environmentalists with the separation of mind and body, man and environment, and thought and action, which was informed by philosophy of the 17th century mainly the work of Rene Descartes. Theorists critiquing such reductionist thinking equate the rise and dominance of acquisitive learning with the idea that knowledge can be presented as a discrete and de-contextualized activity in a classroom situation (Handley, Sturdy, Fincham & Clark, 2006; Lave, 2008; Lemek, 1997; Salmon and Perkins, 1998; Sfard, 1998 and Wenger, 1998).

Sfard (1998), in her paper describing the acquisition and participatory metaphors of learning, talks about the acquisition and participation metaphor as representing major divisions in the current field of educational research. She locates behavioural, cognitive and even constructivist theories of learning within the acquisition metaphor as, ultimately, they talk about *concept development* and the *acquisition and accumulation of knowledge* by the learner as the ultimate goal of learning (emphasis mine). In contrast, she argues that the participatory metaphor has replaced the word 'concept' or 'knowledge' with 'knowing' which indicates action while "the permanence of *having* gives way to the constant flux of *doing",* which in turn foregrounds learning as participation in social practices (Sfard, 1998, p. 6. emphasis original). Of the participation metaphor she says:

> The original learning activities are never considered separately from the context within which they take place. The context, in its turn, is rich and multifarious, and its importance is pronounced by talk about situatedness, contextuality, cultural embeddedness and social mediation. (p. 6)

Learning in the case of the participatory metaphor involves becoming a member of community, a participant, and knowing is belonging, participating and communicating. The goal of learning is community building, unlike the acquisition metaphor, which is individual conceptual or cognitive enrichment (p. 6).

As mentioned in Section 3.2.4, philosophies on mapping have also shifted from the notion of the creation of a duality in cartography between mind and body to situating mapping in the context of the mapmaker and the community (Kitchin et al.,

2008). It has moved from considering maps a true representation of the outside world and the quest of the mappers to perfect this presentation, to the understanding that the map maker reflects his own abstractions in the process and, in case of participatory mapping, reflects communities' cultural artefacts and socio-political realities.

Sfard (1998), however, concludes her paper by cautioning against an over reliance on one of the metaphors to the neglect of the other. She says that "the most powerful research is the one that stands on more than one metaphorical leg" (p. 11). In this research, I draw on both metaphors to analyse the learning processes. I discuss specific theoretical aspects associated with these metaphors, and their relevance to this study in the next section.

4.3.1 Socio-cultural learning theory and knowledge acquisition

Socio-cultural approaches emphasize the interdependence of social and individual processes in the co-construction of knowledge. Socio-cultural approaches to learning and development were first systematized and applied by Vygotsky (1978). In contrast to behaviourist approaches, which focused on the external, Vygotsky conceptualized development as the transformation of socially shared activities into internalized processes. The major theme of Vygotsky's theoretical framework is that social interaction plays a fundamental role in the development of cognition (John-Steiner & Mahn, 1996; Daniels, 2008).

Useful to this study, are the three concepts that Vygotsky uses to describe processes associated with the acquisition of knowledge: internalization, semiotic mediation, and Zone of Proximal Development (ZPD). ***Internalization*** refers to the transfer of activities carried out in the external plane, within the social context, to the internal plane, individual cognition. ***Semiotic mediation*** differentiates between lower natural behaviours and higher natural behaviours and how culture, language and social context act as a psychological tool to bring the individual from a lower to a higher level of cultural behaviour. ***Zone of Proximal Development*** conceptualizes the learner having an actual development level, which is actively performed and evident without external support and a proximal or possible development level, which the

learner can attain through the guidance and support of others. This gap between the actual independent problem solving level and the potential or possible problem solving level that can be attained with the support of others, is called ZPD. The support that is given is called scaffolding (Daniels, 2008). Scaffolding is a kind of support normally provided by a more experienced other (facilitator; interventionist researcher; educator; elder; parent; peer etc.), which does not alter the nature of the task for the learner. It holds the task constant while adjusting the nature of the learner's participation through graduated assistance (Daniels, 2008; Hodson & Hodson, 1998; Wang, 2003)

I found semiotic mediation and ZPD useful to analyze the learning that may have happened as a result of participatory mapping. According to Vygotsky, semiotic mediation is key to knowledge construction. It mediates social and individual functioning and connects the external and the social and the individual. It includes language, art, writings, schemas, paintbrushes and computers (amongst other mediation tools). In the case of this study, it includes maps and mapping technologies and approaches. As John-Steiner and Mahn (1996) describe, maps are central to the appropriation of knowledge through representational activity by developing the individual. John-Steiner (1995) coined the term 'cognitive pluralism' to remove the monistic focus on language and bring in other mediation tools including ecology, history and culture. The concept of cognitive pluralism provides a broader means of discussing maps as semiotic tools; particularly in a context where the mapping work is closely linked to exploring understandings of local socio-ecological environments (see Section 1.4), which in turn is influenced by cultural and ecological experience as discussed in Chapter 2. Writing in an African environmental education context, Mukute (2010) argued that recognizing cognitive pluralism in a social learning process is also a process of cognitive justice, in that previously marginalized forms of knowledge (such as Traditional Ecological Knowledge) can also be expressed and recognized in and through the learning processes (see also Visvanathan, 2006). This, he argues is important for change processes to emerge in and through environmental learning processes.

It is also possible to see the links between individual and social learning within the definition of ZPD provided by Del Rio and Alvarez (2007). They define ZPD as "…a zone of human development, the frontier where we can find the links between the situated-embodied mind and the cognitive mind; the individual mind and the social mind; the development already attained and the development to be attained". This definition is useful for helping to explain both the cognitive and the social development of participating community members.

Socio-cultural theorists, expanding the concept of the ZPD, increasingly conceptualize learning as distributed, interactive, and contextual and see learning as a result of learners' participation in a community of practice, which in the case of this study, can be the participatory mapping activities. Full development of the ZPD depends upon full social interaction. The range of skills that can be developed with the guidance of a more experienced other, or peer collaboration exceeds what can be attained alone (Daniels, 2007; Daniels, 2008; John-Steiner & Mahn, 1996). Working with the semiotic mediation and ZPD concepts in this study, helped me to reflect on questions such as 'How did the mapping activity help with knowledge acquisition amongst the community members who took part in the mapping activities? What was my role as facilitator in the process? How did MELCA-Ethiopia, and myself as facilitator scaffold the learning?' Such reflections on the data are important to address the research questions.

4.3.2 Legitimate peripheral participation and participation in Communities of Practice

4.3.2.1 Legitimate peripheral participation

Learning, as described by theories of legitimate peripheral participation and as participation in communities of practice, are categorized by Sfard (1998) within the participatory metaphor. I found the concept of legitimate peripheral participation to be useful for the study because it describes the learning process when newcomers join old-timers in a practice. As is explained in more detail in Chapter 6, local communities are of a heterogeneous entity both in their cognition of their landscape and in their social standing. Legitimate peripheral participation provides a language of description for potentially explaining how learning occurs during the mapping

process. It can shed light on how knowledge of participants increases through participation in the practice of mapping, and through encounters with the knowledge of elders in the community.

As indicated already, the principal aim of this study is to explore how learning happens in the practice of participatory mapping, and how this learning creates agency. Legitimate peripheral participation and communities of practice theory talk about how all practice involves ongoing learning and how legitimate peripheral participation involves relations of newcomers to old timers in the fields of practice. It also involves identity building and production of artefacts (Lave & Wenger, 1991).In the case of the study, this could mean that those who know the landscape are the experts (old timers) and those who know little about the landscape are the novices (newcomers), although it may be difficult to say how much the novices do not know about the landscape, especially since they may well have other forms of knowledge relevant to the landscape and its management which may not appear relevant at first glance. Those newcomers who are at the periphery also have an important role, which is to develop with the support of the more experienced other, and use skills required for collaboration. This mixing of expertise and involvement of the novices has potential to produce new knowledge for all (Lave & Wenger, 1991; Barab & Duffy, 2000).

Barab and Duffy (2000) call this reproducibility, in which newcomers are able to become central to and expand the community and its practices. Communities are continually replicating themselves in and through their social practices, with new members moving from peripheral participant to core member through a process of enculturation (Lave & Wenger, 1991). Barab and Duffy (ibid.) claim that it is essential that the community reproduce itself if it has to have a common cultural heritage. It is a process that is continually occurring in all communities of practice. It is also these reproduction cycles that define learning. In other words, they say, the social and physical structure that defines and is defined by this cycle defines the possibilities, and what is called legitimate peripheral participation in learning (p. 39). In fact, for Lave and Wenger (1991) legitimate peripheral participation is learning. Any discussions of learning, therefore, according to them, “must begin within a

community of practice and must consider the individual's position with respect to the hierarchical trajectory of the social and power structures of that community" (pp. 39-40).

What makes the concept of legitimate peripheral participation significant in this study, is not that it is an instructional tool but, rather, in the words of Brown and Duguid (1991, p. 48), that it is "…an analytical category or tool for understanding learning across different methods, different historical periods, and different social and physical environments".

Relating legitimate peripheral participation and communities of practice theory, Lave (2008) notes that the theory of legitimate peripheral participation opens up a way of analyzing learning in historical, cultural and political milieu, while community of practice theory helps us to talk about the practice that is taking place in these learning environments. So both are analytical tools even though the focus of community of practice theory is more on the participation in the practices, the practice itself and how it is changed and shaped in and through learning, and the identity created in the process of learning and participation in practices. In the case of the study, I see legitimate peripheral participation as a useful theory for contextualizing the learning relationships in the participatory mapping process, and also their location in a broader socio-economic reality, history and cultures of practice (see Chapter 1). I also see legitimate peripheral participation as a way to potentially explain how members of the community said they gained understanding because of their participation in the mapping activities. Communities of practice theory will complement this analysis, and provides explanatory tools for describing the mapping practice including the participation and reification that may occur, and the meaning making that community members may engage in, and how this may influence their identities (see Chapters 6 and 7).

Another set of concepts related to legitimate peripheral participation, is continuity and displacement. Continuity refers to old-timers insistence on continuities, and displacement refers to the changing of ideas and practices as a result of the newcomers' addition or subtraction (Lave, 2008). This of course assumes that old-

timers are interested in preserving cultures of practice, and newcomers are interested in changing these practices, which may or may not be the case. There is also a central contradiction between continuity and displacement. Culture needs continuity in terms of history and the shared stories of people. It also needs to change, which may come from outside or inside. There is always a conflict among the two and the change may be both desirable and/or undesirable. Desirable changes build the resilience of the community in positive ways, and undesirable changes may destabilize or negatively affect the community (ibid.), as has been discussed in some detail in Chapter 2 (see also Section 4.7 below).[12]

This study will explore whether the mapping process contributes to continuities, or whether and how processes of displacement occur during and through the mapping process, and what the significance of this is to resilience and biocultural diversity, as outlined in Chapter 2. As mentioned in Chapters 1 and 2, people in the two communities involved in this study, have developed ideas of the landscape as part of their personal understanding and through their practices even though these are located in the context of the community artefacts and practices (stories, proverbs, songs, ways of producing food etc.). The consistency of their idea of the bigger landscape was never tested, and mapping may provide them the opportunity to do that. So, as they co-construct their landscape in and through the mapping process, the ideas that they have may either get affirmed or changed by the new conceptualization. This conceptualization and re-conceptualization of their landscape may be a continuous process of continuity and displacement.

4.3.2.2 Communities of Practice

As mentioned above, communities of practice theory draws attention to participation in practices, to community, identity, meaning making and practice. This theory has value for understanding community learning in the context of the study. Wenger (1998) provides a contextual framework for describing a social theory of

[12] Here it should be noted too that resilience may also be a negative concept (e.g. the resilience of the current economic order continues to leave millions of people in poverty). Refer to Section 4.7 for more discussion on this topic.

learning, presented in Figure 4.2 below. As Wenger (1998, p. 5) says, the elements in the figure are "… deeply interconnected and mutually defining"; it is therefore necessary to understand the elements and their relationality within the learning process.

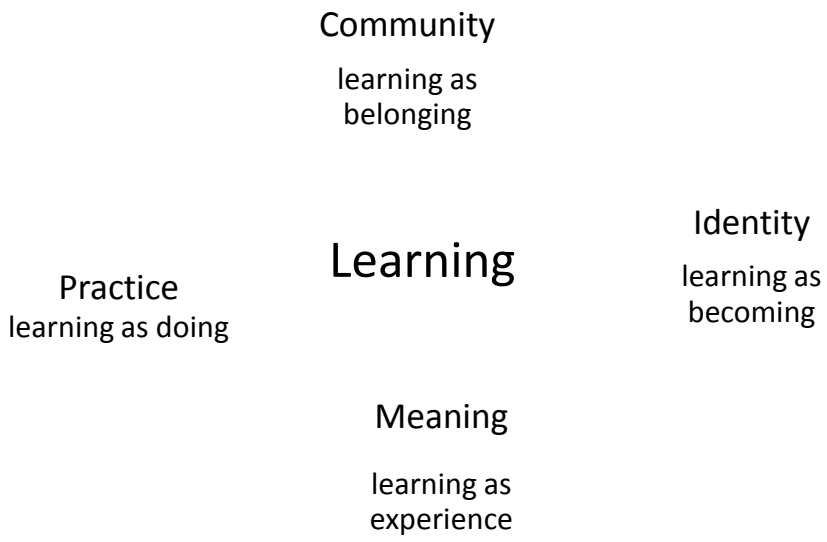

Figure 4.2: *Components of a social theory of learning: an initial inventory adapted from Wenger (1998)*

In discussing Figure 4.2, Wenger (1998, p. 5) says that 'meaning' means a way of talking about our changing abilities, individually and collectively, to experience life and the world as meaningful; while 'practice' for him is a way of talking about shared historical and social resources frameworks, and perspectives that can sustain mutual engagement in action. 'Community', on the other hand, is a way of talking about the social configuration in which social enterprises are defined as worth pursuing, and in which participation is recognizable as competence. 'Identity', for Wenger (ibid.) means a way of talking about how learning changes who we are, and how learning creates personal and social histories of becoming in the context of communities and their social practices.

Learning in the case of communities of practice theory, as described in more detail in the sub-sections that follow, is emergent, participative, based on practice and builds

the identity of learners. Learning in this frame (as briefly described in Section 3.4 and in Section 4.3.1 above) is seen as moving away from the traditional paradigm of considering the learner as a receptacle of taught knowledge and learning as a discrete cognitive process, to the identity of the learner embedded in the context in which the individual is co-participating (Fuller, Hodkinson, Hodkinson & Unwin, 2005; Wenger 1998).

- ***Community in the context of communities of practice***

Lave and Wenger (1991) coined the term 'communities of practice'. Communities of practice have three parts. The first is the domain, which is a shared interest, competence and commitment of the group. The domain also represents the identity of a group. The second is community. These are members of a group interacting in a social environment and sharing their concern and learning together. The last one is practice. This is the shared repertoire of resources including experiences, stories, tools, and ways of addressing problems, in short, shared practice (Wenger, 1998?).

Even though the concept of community of practice is located primarily in the context of organizational development theory, I found it to be relevant for potentially explaining the learning in the practice of mapping. In the case of participatory mapping, the domain is the participatory mapping itself. It is what brought members of the two communities together in the first place. In the 3-D modeling process, communities, who never knew one another, came from afar and constructed a model of the bigger landscape together. So the practice of mapping seemed to give them an identity as those who participated in mapping and who know how to do it. In the case of sketch mapping, it is a smaller community that is involved with a different domain and a new repertoire to share and practice.

The participatory mapping experience is embedded in the community. It is the community's history, both past and contemporary that is depicted on paper or through a model. It is the experience of the community, which is mapped, and the process happens in the community, as explained in Section 3.3. Previous research in this area has shown that members of the community potentially create and recreate themselves in the process through the discussions and arguments that they have

during the participatory mapping process. Through this telling and retelling, individuals do more than pass on knowledge. The potential therefore exists for them to contribute to the construction of their own identity in relationship to the community of practice and, reciprocally, to the construction and development of the community of which they are a part (Brown & Duguid, 1991; Barab & Duffy, 2000).

In the context of the study I will use the concept 'community' to refer to those members of the two communities who participated in the participatory mapping activities (as a common (shorter term) practice); and also as way of talking about the larger community within which the participatory mapping practice locates. As mentioned in Chapter 1.4, the participatory mapping is located within larger communities of practice of farming; livestock husbandry and natural resources management, and it is those who are selected by the wider community who participate in the participatory mapping process. A few have to represent the whole community, but what they are doing is for the whole or larger community. On this point Barab and Duffy (2000) say that members of a community of practice must feel that they belong to the larger group. It is this part of something larger that allows the various members to form a collective whole as they work towards the joint goals of the community and its members. Barab and Duffy (2008, p. 38) note further that a community is an "interdependent system in terms of the collaborative efforts of its members", as well as in terms of "… the greater societal systems in which it is nested". They go on to say that "when learning as part of a community of practice, the learner has access to this history of previous negotiations as well as responsiveness from the current context on the functional value of a particular meaning" (ibid.).

Wenger (1998, p. 73) talks further about three characteristics that define community in communities of practice: (1) community as mutual engagement of people in action whose meaning they negotiate with one another. This can refer to the discussion, argument and negotiation during the mapping exercise; (2) joint enterprise which is the result of a collective process of negotiation and defined by the participants and which creates mutual accountability. This can refer to the practices that they will be engaged with as a result of their decision after the

mapping process; (3) shared repertoire which are a source for negotiation of meaning and which includes symbols, stories, gestures and actions. This may refer to the documents that they produce, the photos that they may have, the stories that they will build as a result of their work, the maps that they can continually update, and so forth.

- ***Meaning making in the context of Communities of Practice***

Wenger (1998, pp. 51-55) talks about how our daily practice or interaction, however routine, gives meaning. He says it is not the experience that matters but the meaning that we make out of it. Applied to this study, it is not so much participating in the mapping activities, but the meaning that we make out of the experience that matters. Practice is about meaning as experience of everyday life, Wenger continues. Living is a continuous process of producing meaning. This means meaning making is a continuous process of adjusting and re-adjusting our interpretation of the world. This implies that the mediation power of participatory mapping may be to help in adjusting and re-adjusting interpretations of the world in the communities concerned. He considers meaning-making as a continuous process of negotiation and says that living meaningfully (or in the case of the study engaging in the process of mapping meaningfully) implies:

> - an active process of producing meaning that is both dynamic and historical
> - a world of both resistance and malleability
> - the mutual ability to affect and be affected
> - the engagement of multiplicity of factors and perspectives
> - the production of new resolution to the convergence of these factors and perspectives
> - the incompleteness of this resolution, which can be partial, tentative, ephemeral, and specific to situation. (p. 53)

In the context of the study this would mean that the negotiated meaning during the mapping process would potentially be dynamic, historical, contextual and unique. The meaning making process that may come out of a newcomers and old-timers interaction among the participants may be characterized by resistance and agreements. As the two communities concerned are heterogeneous groupings (see section 1.4), it also means there may be a complex and multilayered engagement

among them that is produced through their mutual ability to engage with and affect each other. The map may also highlight divergence, and a multiplicity of factors and meanings, and the process may bring consensus amongst community members in such a way that action could follow in ways that may become more meaningful, as has been discussed by Corbett et al. 2006 and Rambaldi (2010) (see Section 3.3). Meaning is expressed as a dual interaction between participation and reification; this is discussed next.

Participation: As mentioned in Section 3.4 participation is a significant concept in participatory mapping. I have already devoted a section in Chapter 3 (Section 3.4) to discuss the issues and the meaning involved. I also mentioned there that understanding participation in the context of learning is necessary to explain participation in the context of the participatory mapping work in this study (see Section 3.1.1).

Wood (2010) talks about how easy it is to understand what participation means. He defines it as "taking an active part in activities with others: (p. 160), and explains that the concept 'part' has to do with 'portion'; and its deep root is associated with 'grant' or 'allotment'; the 'cip' part – *ceps* – with …grasping, with taking, capturing, catching'. Linked together they are about "… taking one's portion, about getting one's share" (ibid.). The implication of Wood's definition is that there has to be something for those who participate. Sfard's (1998) reference to participation holds similar meaning to that of Wood. Wenger (1998) adds that participation implies both action and connection. In the case of communities of practice and legitimate peripheral participation, it is the learning, or the being part of the larger community, or the accessing of the historical and contemporary knowledge and the co-creation of history, that the individuals are getting from participating. For the elders, this may mean a new respect for their knowledge. The knowledge of elders is increasingly marginalized and they even consider their experiences and repertoires as no longer important (see Section 2.6 and Chapter 6). Therefore, participation renews social position in the community and this may be what they take away from participating.

According to Lave (2008), there are two kinds of participation in legitimate peripheral participation: participation as a person, and participation as a practice. This is the core to understanding how participation is referred to in legitimate peripheral participation: this implies the individual as a participant in the community and the practice to be participated in. On this point Lemek (1997, p. 38) says:

> Our activity, our participation, our "cognition" is always bound up with, codependent with, the participation and the activity of others, be they persons, tools, symbols, processes, or things. How we participate, what practices we come to engage in, is a function of the whole community ecology... As we participate, we change. Our identity-in-practice develops, for we are no longer autonomous Persons in this model, but Persons-in-Activity.

As mentioned several times already, participation is central to community of practice theory. It is also central to the process of participatory mapping. It means the participants build a relationship with each other in the process of building the map. Active participation in practice creates identity through mutual recognition and ability to negotiate meaning. But it does not mean equality, as communities are heterogeneous. Age, gender, history, social position and economic position, among others, affect the level of participation and whose idea is heard. So participation does not entail equality or even respect for each other. As shall be shown later in this section which discusses the limitations of communities of practice theory, participation that is characterized by high levels of inequality can impede the learning process (Handley, 2006). This is one of the issues that is not well covered in the first discussion of Lave and Wenger (1991) about legitimate peripheral participation.

One thing observed in previous processes of participatory mapping that I have encountered (see Section 1.2), is that there are normally some who participate actively in the 'doing' of the mapping, and others who watch closely what is being done, periodically intervening and correcting here and there. Mostly, at least in my previous observations, this is because the number of participants is often more than the space and technical production of the maps can accommodate. I have also noticed that this does not mean that those on the margin do not participate or are not interested in the process. Their apparent 'inaction' (Chambers, 2006, p. 6) does not mean that they are not learning. They are learning through observation and

through listening to discussions, or what Rogoff, Paradise, Arauz, Correa-Chavez, Angelillo (2003 p. 178) would refer to as "participating with intent to listen and learn". Ibarra (1999) for example, has shown how individuals develop practices by observing others, imitating them, and then adapting and developing their own particular practices in ways which match not only the wider community's norms, but also their own individual sense of integrity and self. Therefore, learning through participation does not necessarily mean going to the centre in a particular kind of legitimate peripheral participation. It may entail other learning trajectories (Lave, 2008). That is why I do not agree with Handley et al. (2006) when they assert that "indeed, we suggest that only those individuals who successfully navigate a path from peripheral to full participation (in the eyes of the community 'masters') can be categorized as 'participating' in the sense outlined in Situated Learning Legitimate Peripheral Participation" (Lave & Wenger, 1991). Their assertion might work in the case of training for an apprentice but not necessarily in the participatory mapping processes.

Wenger links participation with reification and claims that they work in duality and one completes the inherent incompleteness of the other, which will be discussed next.

Reification in Communities of Practice: Wenger's (1998) discussion (pp. 57-71) on reification is useful for developing an understanding of the knowledge and learning processes in participatory mapping; and helps to differentiate the maps as products from the learning in and through the map making process (see Section 3.4 where this is raised as an important element of understanding participatory mapping). Wenger uses the concept of reification to refer to "…the process of giving form to experience by producing objects that congeal this experience into 'thingness'. This creates a point of focus around which the negotiating of focus becomes organized" (ibid., p. 58). Maps can be considered as reified meanings of the process of participatory mapping. Reification, Wenger continues, "… shapes our experience and helps us to abstract our ideas" (p. 59). Reification of tools changes the nature of the activity and the process and the product imply each other; as the map making and the map imply each other (Chapin, 2005; Pain, 2004). But reified objects do not tell the whole

contextual histories of what is reified, just as a map cannot tell the whole history of the landscape or the history of the people (see Chapter 3.2.4). Wenger goes on to say that reification has a double edge:

> … the power of reification – its succinctness, its portability, its potential physical persistence, its focusing effect – is also its danger. As it helps to give focus to the negotiation of meaning, it can also hide the broader meaning and can be a discontented thing 'frozen in the context' that cannot capture the lived experience. (p. 61)

In the context of the study, I will explore whether the maps as reified objects of people's participation both help to establish a meaningful 'focusing effect', but also whether they hold the danger of freezing people's 'lived experiences'. As mentioned in Chapter 3, maps, especially 3D models, can easily fall prey to the pitfalls of reification if the ultimate goal is the production of the map and if there is no clear strategy for their use upon completion. As indicated in Chapter 3, 3D models are difficult to transport, and one of the ways of reducing the reification problem, is to digitize them and process them as a GIS products to make them more 'portable' and 'flexible' in use (Rambaldi, 2010).

In the community of practice context, the knowledge of the community is much more emphasized than the knowledge of the individual participants in the knowledge-making process (Sfard, 1998; also see Section 4.3.2 above). As mentioned above, communities of practice involve peer interaction and the interaction of apprentices and experts. Peer-to-peer interaction involves negotiation and co-construction of experience. Collaboration amongst participants is also transformed into artefacts including symbols, rules and procedures, products, etc. (Wenger 1998; Lave, 2008). In participatory mapping, artefacts, symbols and products include legends and the maps themselves (see Section 3.3). In Communities of Practice, common histories are constructed through negotiated meaning (Wenger, 1998), a process that is also unique to participatory mapping (see Section 3.5).

Duality of meaning: Wenger's (1998) discussion on the duality of reification and participation is also helpful for developing an understanding of learning in the context of participatory mapping. He uses a metaphor of constitution and people to illustrate his argument in which he states that constitution is not equivalent to

citizenry; and yet it is meaningless without the participation of people. Yet people need a reified object, the constitution, as it is necessary for negotiation to bring together the multiple perspectives, interests, and interpretations that participation entails. Even though separate, they exist together. The presence of one implies the other. It is through their various combinations that they give meaning to experience. In the same way, participation and reification are so strongly interwoven that they constitute the basis of meaning making (ibid.). The two are complementary. Participation makes up for the inherent limitations of reification and vice versa. Participation can rescue the stiffness, distantness and mute ambiguity of reification while reification can help to mitigate the informality, the confusing looseness and fluidity which characterize and impede coordination of participation. He argues that if participation only prevails, "… there will not be enough material to anchor the specificities of coordination to uncover the diverging assumptions" (p. 65), and if reification prevails, "… there will not be enough overlap in participation to recover coordinated, relevant or generative meaning" (ibid.). Furthermore, he argues that "it takes our participation to produce, interpret and use reification and it takes reification to generate short cuts to coordinated meanings" (p. 66). It is in this sense that participation and reification work together.

- ***Identity as a result of participating in communities of practice***

Identity is a critical concept in communities of practice theory. It is said by Wenger (1998) that individuals exist in relationship with each other. Other theorists that adopt this socio-cultural view of identity include Sfard and Prusak (2005). Wenger (1998), along with similar theorists, holds that people are engaged in doing things together and in the process they develop their identity.

Lave and Wenger (1991), in their discussion on legitimate peripheral participation, say that the primary motivation for learning involves participating in authentic activities and creating an identity that moves the individual toward becoming more centripetal to a community of practice. Learning is described as an "integral and inseparable aspect of social practice" which involves the construction of identity (p. 53) through changing forms of participation in communities of practice. In this line of thinking, developing an identity as a member of the community and becoming

able to engage in the practices of the community is one and the same thing (Lave & Wenger, 1991; Lave, 2008; Wenger, 1998).

In the context of participatory mapping and resilience, participants in the workshop on resilience in Kenya (see Section 1.2) identified identity building as one of the outcomes of participating in participatory mapping (ABN, 2011). When local communities come together and map the past, including the origins of their practices, a unifying story may emerge and artefacts may be built which may have a bearing in creating cohesiveness among community members. The dynamics of understanding the relationship between participation, learning and identity is therefore an important dynamic of this study. Handley et al. (2006) argues that identity building is the process of understanding who we are and where we belong; and it is through active participation in communities that individuals develop and possibly adapt and thereby reconstruct their identities and practice. The centrality of 'participation' in situated learning theory is related to the emergence of identities and practice through participation in communities of practice (ibid.).

Barab and Duffy (2000) add that:

> … from an anthropological perspective, it is not only meanings that are produced but also entire identities that are shaped by and shape the experience. In other words, the interaction constitutes and is constituted by all of the components of individual, content, and context. There are no clear boundaries between the development of knowledgeable skills and the development of identities; both arise as individuals participate and both become central to the community of practice. However, through participation in the community over time, an individual comes to accept the historical context and the importance of socially negotiated norms for defining community and his or her own identity. (p. 30)

- ***Practice as a basis for communities of practice***

It is the practice aspect which makes a community of practice a community of practice. Not any community is a community of practice. Duguid (2005) laments that those who are working with communities of practice theory have forgotten the 'practice' and are emphasizing 'community'. In the context of this study, it is therefore the building of the 3D model and the doing of the sketch-mapping and ecological calendars that constitutes the communities of practice. As noted above, in

the context of legitimate peripheral participation, that it is through participation in the practices of the communities, newcomers move from the periphery to the centre. Handley et al. (2006, p. 645) state that:

> By participating in a community, a newcomer develops an awareness of that community's practice and thus comes to understand and engage with (or adapt and transform) various tools, language, role-definitions and other explicit artifacts as well as various implicit relations, tacit conventions, and underlying assumptions and values. Thus, it is through participation in communities that individuals develop and possibly adapt and thereby reconstruct their identities and practice.

Significant too for social-ecological change and resilience building in the face of environmental degradation responses and the emergence of social change, is the point made by Wenger, McDermott and Snyder (2002) that communities of practice can be cultivated or established around the introduction of new practices, such as participatory mapping. As discussed in Chapter 1, participatory mapping is an introduced and facilitated practice (by MELCA-Ethiopia) in the context of the two communities involved in this study. In this regard, Wenger, McDermott and Snyder (2002, p. 12) argue that communities of practice have the "ability to steward knowledge as a living process", and they argue that it is possible to *cultivate* communities of practice actively and systematically. They clarify their analogy of cultivation as follows:

> Cultivate is an apt analogy. A plant does its own growing, whether its seed was carefully planted or blown into place by the wind. You cannot pull the stem, leaves or petals to make a plant grow faster or taller. However, you can do much to encourage healthy plants: till the soil, ensure they have enough nutrients, supply water, secure the right amount of sun exposure, and protect them from pests and weeds … Similarly, some communities of practice grow spontaneously while others may require careful seeding … communities of practice may exist, but [without cultivation] may not reach their full potential… *(*ibid., p. 13*)*

Wenger et al. (2002, p. 13) go on to explain that you cannot cultivate communities of practice in the same way that you develop traditional organizational structures since cultivating communities of practice is more about "*eliciting and fostering participation* than planning, directing and organizing their activities".

4.3.2.3 Critiques of legitimate peripheral participation and communities of practice theory

This section briefly discusses some of the main critiques of Legitimate Peripheral Participation and communities of practice theory, and outlines how these were dealt with in this study. One of the main critiques of communities of practice theory is its focus on the participation metaphor alone at the expense of the acquisition metaphor (Smith, 2003), an issue that I have already discussed and addressed above (see Section 4.3.2). Additionally, it is said that communities of practice theory neglects to take full account of the predisposition that participants bring to the participation process (Roberts, 2006), the power differences at play in participatory processes which may impede the engagement of those with limited power (Lave, 2008; Roberts, 2006; Hogan, 2002) and the problem of assigning communities of practice concepts to every kind of group activity or participatory action (Amin & Roberts, 2008).

Lave (2008), reflecting on their seminal book on legitimate peripheral participation (Lave & Wenger, 1991), recognizes two problems of legitimate peripheral participation that were not adequately dealt with in their earlier theorizing. One is that it did not emphasize enough masters as co-producers of (new) knowledge with the apprentice or with the newcomers. They focused, she said, on newcomers becoming masters, and not as masters involved in co-production of knowledge, thus neglecting the possibility that masters may well learn from newcomers, as newcomers learn from them. The second critique raised of their earlier work, is the neglect of political, economic and institutional structuring and its effects on participation. Lave (2008) comments that their earlier work did not give enough emphasis to the way in which the political and economic environment can influence the participation of the learner (p. 287). As mentioned in Chapter 1, issues of political enfranchisement and poverty (access to economic power) have been identified as being critical issues in the Ethiopian context. Given the focus of this study on the social-ecological, it is also possible to note that Lave (2008), even in her later work, neglects the human-environment relationship, or the influence of nature on culture and vice versa. Mukute (2010) who researched sustainable agricultural

practices and expansive learning in southern African countries, noted that expansive learning theories and cultural historical activity theory also neglect the influence of ecological conditions (e.g. drought, flooding, climate change, soil condition etc.) on people's learning and agency. This would seem to be a broader problem with socio-cultural [learning] theory i.e. that it tends to neglect the influence of nature on culture and social practices.

In this regard, it is telling that even in environmental studies, this neglect is perpetuated. For example, in an ethnographic study of the experiences of 14 high school students who worked for an environmental management organisation which was run by the Institute of Ecosystem Studies in America, indicated that the power dynamics between the novice and the experienced members hindered the learning of the newcomers (Hogan, 2002), while little was said on how the environment influences their learning and action. Another study carried out in the UK on the experiences of doctors that were training to become general practitioners, also indicated that being on the periphery was not necessarily conducive to learning (Cornford & Carrington, 2006), a point which emphasizes the centrality of direct experience as being significant to learning.

After an extensive review of literature on communities of practice theory and its applications, Amin and Roberts (2008) criticize the way communities of practice theory is used to analyze all mannerisms of learning based on activity. They say the usage of the word communities of practice in the literature is imprecise, there is loss of awareness of context in its usage, the word 'community' is used carelessly and there is a speculation between situated practice and learning or innovation outcome (p. 355). They add that this homogenization or using of communities of practice as a proxy to every form of learning is unhelpful. They call for another heterogeneous lexicon which will help to reiterate that knowing in action, always defies easy codification and standardization in being a situated, embodied, practised, experimental, and always-provisional activity, but which will also allow the process of naming the many shapes and sizes of knowing in action to begin (p. 365). In a recent literature review on social learning in the context of natural resource management Cundill and Rodela (2011) also identify the problem of 'surface

marking' or superficial use of the concepts associated with community of practice literature in descriptions of social learning. Through careful unpacking of the concepts associated with communities of practice literature, I have tried to avoid such problems in this study.

The study furthermore seeks to avoid the pitfalls outlined above by using the concept of communities of practice to talk about the participatory mapping community of practice within wider communities of practice; and by working with both the acquisition metaphor and the participation metaphor in theorizing and analyzing the learning taking place. The study also considers issues such as power relations, and structural factors (political, economic *and ecological*) as being influential in the learning and change processes (as discussed in Chapters 1, 2 and 3) Critical realist theory, as underlabouring philosophy to the learning theory deployed in this study, also helps to make the structural mechanisms (political, social, economic and ecological) visible as shaping forces in the learning and change process.

4.4 Critical realism

Critical Realism a philosophy of reality developed in three main phases[13]mainly through the work of Roy Bhaskar (1978), is ontologically realist, empirically relativist, judgementally rational, and is critical, i.e. it has an interest in emancipation (Norrie, 2010). Being real refers to two concepts: first, it considers the world as structured, differentiated and changing; and second, it is stratified into structure/context and agency. Critical realism proposes that structures are not reducible to the events and discourses (empirical experiences) that created them; and that reality can therefore be stratified into the real, the actual and the empirical. It also believes that the world is both intransitive (realities that are not simply constructed) and transitive (our constructed experiences of intransitive reality). It is intransitive in that it does not change even if our (transitive) view of it changes. The basic thesis of critical realism

[13] In this study I draw mainly on the first phase of critical realism, which focuses on ontological differentiation, and emergence of structure and agency (Norrie, 2010). Phase two of critical realism, named dialectical critical realism (Bhaskar & Norrie, 1998) provides a complex and nuanced theory of transformative praxis through absenting absences, but I have worked instead with Archer's social realist theory of morphogenesis to theorise change in this study.

is, then, that a world exists outside of our knowledge of it; and that our knowledge of the world (because of its constructed, transitive nature) can and does change (Bates, 2006; Sayer, 2000).

It is also critical in two ways. One is methodological and the other is political. Methodologically critical realists reject the downward, upward and central conflation of structure and agency. Critical realists (Bhaskar, 1978; 1998) and social realists working with critical realism as foundational philosophy (Archer, 1995; 1998) put forward a concept called **emergence** which proposes that structure and agency are linked, or emergent from each other; and that one influences the other but one cannot be reducible to the other. It is also political in that it is emancipatory in its approach. It is based on understanding and changing structures through transformative praxis or transformative social action via the agency of people (Bhaskar, 1998 Archer, 2000). Change or morphogenesis (Archer's term for social change) is then a critical component of critical realism (Bates, 2006).

I found critical realism to be of significance to this study in two ways. One is that it provides a carefully constructed theory of morphogenesis or change, which provides a language of description that can provide tools for describing change processes that do or don't emerge in and through the learning and participatory mapping work. It provides a way of examining agents (members of the two communities involved in the mapping processes); and the structural factors (which are social, cultural and ecological), separately (using Archer's strategy of analytical dualism discussed below), in order to analyze their interaction through time and explore whether the mapping project has contributed to change or not. The declared emancipatory nature of critical realism also aligns with the interests of MELCA-Ethiopia, who in the tradition of 'counter mapping' (see Section 1.3), seeks to make use of mapping for mobilizing local actors to change aspects of their socio-ecological system in response to ongoing degradation and loss of resources and diversity.

I will discuss morphogenesis in more detail in Section 4.6 but first I discuss in brief the stratified ontology of critical realism in more detail, and the concept of emergence, which are relevant to the section on morphogenesis.

4.4.1 The real, the actual and the empirical

As indicated above, critical realism's stratification of ontology into the 'real', the 'actual' and the 'empirical' offers a more nuanced way of analysing structural influences on people's experiences of learning; and it helps to deal directly with one of the critiques of community of practice theory as noted in Section 4.3.2.3 above. According to Sayer (2000), the 'real' refers to whatever exists regardless of our experience or adequate understanding of it. The 'real' refers to structures and powers of objects, which may exist in either activated or dormant forms; and the potential of such objects or structures to be activated. For example, power relations in a community of practice context may exist, but may not be fully activated. Even though they are not experienced by participants in the community of practice, they still exist. Climate change is another example of a structural mechanism which may exist, but which may not be fully activated in influencing people's learning and experiences in communities of practice. Cartography theorists claim that one of the functions of mapping as a project is to *reveal* and *realize hidden potential* (Corner, 1999, p. 213, emphasis mine) and, in the case of sketch mapping, to *externalize ideas* and make internal thinking *explicit* (Tversky, 2002 p. 2, emphasis mine). In the case of the study, it may suggest that mapping could make more visible some of the 'hidden' or underlying structural forces that may or may not influence actions and experience; and thus the potential of the local community for action to change the status of their landscape. These may not be obvious to observations at first glance, but could become activated or made more visible using the appropriate tools, which in the case of this study are associated with participatory mapping activities.

The 'actual' is what happens when what is lying dormant or latent is activated. In the case of this study this might imply the learning that has happened, the maps produced and the change that has come about as a result of the interaction between the participants, the mapping tools and the underlying social-ecological contextual conditions and influences.

The 'empirical' is the experience of the people in the process; it is what they say they learned, or what they got out of the experience. It is what is observable from outside

and can be captured in interviews, or reflections, or in the legend, and the social interactions that occur in and through the mapping process.

Sayer (2000) says:

> …a crucial implication of this ontology is the recognition of the possibility that powers may exist unexercised, and hence that what has happened or been known to have happened does not exhaust what could happen or have happened. (p. 12)

In the context of the study, the communities in the research area live in a highly vulnerable socio-ecological system, which is characterized by a degraded environment and challenged social and cultural systems (discussed in Chapter 1). The implication of critical realism for this is that there are numerous structural conditions and factors that shape this situation that need to be 'uncovered' or mobilized for emancipatory practices to emerge. Critical realism also posits that it is possible to activate the latent power of people so that they can transform their socio-ecological systems through transformative praxis. One of the purposes of the study is to explore whether participatory mapping can facilitate such changes through mobilisation of learning and agency (see Section 1.10.2).

Sayers' assertion that "the nature of the real objects present at a given time constrains and enables what can happen but does not pre-determine what will happen"(p. 12) underscores this point (see also Section 4.6).

4.4.2 Emergence

The theory of critical realism proposes that two or more features in a world come together (often in unpredictable relations) to create new phenomena or to generate new properties; but that the new phenomena cannot simply be explained by or reduced to the constituent parts of the interaction. This notion of emergence that is irreducible to constituent parts, is one of the key concepts on which Archer's (1995) notion of morphogenesis rests. With this in mind, she argues that the structural elaboration (change) that results from social interaction cannot be reduced to the agency and/or the structures involved in the interaction that creates the change. In the case of this study, this may imply that the learning and change that can happen during the mapping exercise cannot be reduced or attributed to the mapping

technologies or the social and cultural structures that exist prior to the mapping process; nor can they be attributed to the features or characteristics of the agents. Rather that the explanations for the learning and changes should be sought by examining the interactions that emerge between structural pre-conditions, and social interactions in and through the mapping processes. The unit of analysis would be what emerges at the interface of structural pre-conditions and new social interactions; which is explored in more depth in Chapter 7, in reflections and interpretations of the data. Archer explains this process of emergence as taking place within a 'morphogenetic cycle' which I discuss next.

4.5 The morphogenetic cycle

As indicated above, critical realism works with a concept of emergence to explain structure-agency relations and interactions, and the emergence of social change. Core to this, is the irreducibility of structure and agency, a process which Archer proposes can only be studied through using the methodological strategy of analytical dualism, which is the backbone of the morphogenesis approach (described in more detail below). Within this methodological strategy is a time factor, which is critical for the separation of structure and agency for analytical purposes. Archer makes the important point that analytical dualism is a *methodological strategy*, and not an ontological reality (i.e. things are more messily inter-twined in the 'real world', but that they can be analytically separated out to understand that reality better for research or other social purposes).

I have undertaken historical, ecological and cultural analyses of the two study areas (see Chapter 1, Chapter 6 and Appendix 6 on eco-cultural calendar) in order to gain a fuller understanding of the change that may have happened and may still happen from the learning that took place in the participatory mapping processes. This is to provide perspective on what has or may be changing and how. To interpret these changes in learning and action, I draw on critical social realist theory, especially Archer's morphogenetic analysis (Archer, 1995), as this provides a language of description for analyzing the causal powers that influence agents' (in this case local community members) capacity to reinterpret their socio-ecological environment and mobilize an array of resources in terms of cultural schema (norms) to effect change

on structures (schemas and resources, both human and non human) to produce the resulting structural elaboration or new action and learning system. In the case of this study, the morphogenetic analysis will provide further insight into how learning related to landscape came about or emerged, how it has changed over time and why; as well as what change oriented results emerged from the learning interactions.

As the concept of analytical dualism is key to understand Archer's morphogenesis, I will describe it briefly and then go on to discuss morphogenesis and how I will be using it.

4.5.1 Analytical dualism

Analytical dualism provides a methodological strategy for analysing the interplay between Agency and Structure. Agency refers to the capacity of individuals to act independently and to make their own free choices. Structure by contrast refers to the recurrent patterned arrangement, which influence or limit the choices and opportunities available. Structure may refer to something both material and cultural. Critiquing the way Structure and Agency are understood in sociology, Archer (1995) talks about *upward conflation* where causal efficacy is granted to Agency, which deprives structure of causal autonomy; and *downward conflation* where causal autonomy is denied to agency and given to structure. She also critiques *central conflation* where Agency and Structure are seen are as co-constituting each other at the same time (ibid., pp. 81-87). In correcting these conflations, she comes up with the strategy of analytical dualism, which recognizes the interdependence of Structure and Agency but separates them as they operate in different timescales. Structures predate Agency and Agency is either constrained or enabled by Structure. The interaction between agents and structures leads to structural elaboration or stasis, and either the reproduction or transformation of the initial structure (morphogenesis or morphostasis). The resulting structure then provides a similar context of action for future agents; whose social interactions can either reproduce the structures, or elaborate, transform or change them. Likewise the initial antecedently existing structure was itself the outcome of structural elaboration resulting from the action of prior agents (pp. 90-91).

The two key features of analytical dualism are the acknowledgment that structure and agency are analytically separable and temporally sequenced. While structure and agency are interdependent, Archer (1995) argues, it is possible to unpack them analytically. By isolating structural and/or cultural factors that provide a context of action for agents, it is possible to investigate how those factors shape the subsequent interactions of agents and how those interactions in turn reproduce or transform the initial context. Archer calls this a morphogenetic sequence. Social processes are constituted through an endless array of such sequences but, as a consequence of their temporal ordering, it is possible to disengage any such sequence in order to investigate its internal causal dynamics. She talks about a theoretical approach, which is capable of linking structure and agency rather than sinking one into the other. Her central argument for analytical dualism is that "… structure and agency can only be de-linked by examining the *interplay between them overtime,* and that without the proper incorporation of time the problem of structure and agency can never be satisfactorily resolved" (p. 65, original emphasis).

In this study, Archer's analytical dualism will be used as a methodological device to differentiate between structure or the reasons for the mapping and the learning interaction that has taken place among agents, including the staff of MELCA, to bring about structural elaboration and/or structural reproduction (see Chapter 7). This is to investigate and discuss how learning and action emerged due to the interaction in time between agents and structure. This is particularly useful in this research as it deepens the analysis of the learning–change relationship at a broader sociological and social-ecological level.

4.5.2 Morphogenesis

Archers' account of social structure was influenced by Buckley's (1967) concept of morphostasis and morphogenesis and Lockwood's (1964) concept of social and system integration (Elder-Vass, 2007; King, 1999). Buckley (1967) used morphostasis to refer to those processes in complex system environment exchanges that tend to preserve or maintain a system's given form, organization or state; and morphogenesis to refer to those processes which tend to elaborate or change a system's given form, structure or state. The major theoretical claim for separating

agency or individual action and structure rests, though, on Lockwood's temporal argument since it enables a visualization of the temporal interplay between agency and structure and their close interrelationships (King; 1999; Elder-Vass, 2007). Archer says:

> Fundamentally the morphogenetic argument that structure and agency operate over different time periods is based on two simple propositions: that structure necessarily pre-dates the action(s) which transform it; and that structural elaboration necessarily post-dates those actions. (p. 76)

The morphogenetic cycle breaks down the structure and agency interactions into three temporal phases: structural conditioning (i.e. the context in which individuals find themselves), socio-cultural interaction (i.e. what individuals do), and the resulting structural elaboration (morphogenesis or change) or structural reproduction (morphostasis or continuity).

Archer explains structural conditionings, social interaction and structural elaboration in the following way (summarised and adapted from Archer, 1995, pp. 90-91):

- ***Structural conditioning*** means the influence of past actions on subsequent interaction. They have this influence by shaping situations in which later generations of actors find themselves. In the context of the study, these are the contextual elements (e.g. history, biocultural diversity, and socio-economic environment).
- ***Social interaction*** implies interaction that people have among themselves and with structure. Social interaction is structurally conditioned but not structurally determined (since agents have their irreducible powers). In any society there are members who benefit from the system and who want the system to be changed because it is not worthwhile to them. Groups experiencing exigencies want to eradicate the structure, and so pursue structural change, and groups who benefit from it want to maintain its stability. So social interaction can mean the interaction between these groups. In the context of this study this could involve interaction between communities, NGOs and government agents, and amongst homogenous or heterogeneous members of communities themselves (amongst others)
- ***Structural elaboration*** results from social interaction in the context of pre-existing structures, and is a largely unintended consequence. This is because the outcome is the combined product of those who want to maintain the stability of the previous structure and those who want to change it. Archer says this is what separates the morphogenetic approach from simple cybernetic models, as the outcome is more open-ended than the simple models imply. Structural elaboration can potentially be enhanced by learning and agency, and in later work Archer (2003) explains that reflexivity of persons and communities can enhance agency that brings about structural

> elaboration. She explains too that education and learning interactions can potentially enhance the agency of individuals and communities, a point which is of particular interest to this study. If structural elaboration does not take place, stasis or reproduction of existing structures occurs.

In the context of this study, the contextual profile in Chapter 1 provides some insight into the pre-existing structural conditions that existed prior to the mapping interactions. This may help to explain what influences the learning and agency of members of the communities involved in the mapping. The study will also describe the social interactions at play during the mapping process (mainly presented in Chapter 6) that may or may not contribute to structural elaboration (morphogenesis) or reproduction (morphostasis) emerging from the interaction between the structural conditions, and the learning interactions associated with the mapping process.

The analysis of the study is fixed over a short period of time, notably the mapping process. Thus, full and longer term analysis of the structural elaboration may not be possible, and will be limited to the change that can be observed due to the participatory mapping process, mainly the learning. It may not be able to provide insight into wider changes in the political, economic or ecological structural features of the system. If nothing has happened as a result of the mapping practice, then the study will conclude that the mapping activities and learning associated with these have led mainly to structural reproduction or morphostasis. If change in learning has come about, and if members of the communities have taken action as a result of the mapping practice, then the conclusion will be that structural elaboration or morphostasis has come about. Such an analysis is presented in Chapter 7.

4.6 Community of practice and morphogenesis

As discussed in this chapter and elsewhere, this study employs social learning theory, and situated learning theory in particular, and morphogenesis theory to provide in-depth insight into the question on the role of participatory mapping for learning and change. In previous sections in this Chapter, I carefully explained how Vygotsky's semiotic mediation and zone of proximal development; and Lave and Wenger's concepts of legitimate peripheral participation and communities of practice provide

the languages of description for analyzing the learning processes. I have also explained how critical realism, and the theory of morphogenesis in particular, provides a language of description to analyse the change that may or may not have occurred in and through the mapping practice. In this section, I consider briefly in more depth how the use of morphogenesis helps to address a further critique of communities of practice theory, which tends to conflate agency and structure.

Sawyer (2002) includes both Vygotskian and post-Vygotksian educational theorists; and Lave and Wenger (1991) in the socio-cultural theory category. He does this because they both draw on two foundational theoretical assumptions:

> … the emphasis on a process ontology and methodology, and the claim that the individual and the social are inseparable both in reality, or ontologically (distinct entities do not really exist) and in practice, or methodologically (the analyst cannot meaningfully distinguish between what is internal to the individual and what is external context). (p. 4)

Communities of practice is a socio-cultural theory, because its basic premise is that learning is becoming and learning is participating in a community activity; and the result of the learning cannot be reduced to the individuals involved (Lave &Wenger, 1991).

According to Sawyer (2002) socio-culturalists basically reject methodological individualism and avoid reducing the individual to the social. They also reject the notion that individuals are influenced by only by external environments. This is because this will imply that methodologically it is possible to study the context and the individual separately. Their objectives of study, he says, are “events, activity, and practice, and these are considered irreducible to properties of individuals” (p. 4).

Both communities of practice, and legitimate peripheral participation have similarities to Giddens’ theory of structuration which Archer (1995) critiques for central conflation (see above). Giddens (1979, p. 53, cited by Sawyer, 2002) says that “individual and group cannot be separated because the notion of action and structure presuppose each other”. He rejects any claims that maintain that the individual and social are two distinct ontological realms that causally interact with each other.

Lave and Wenger (1991), in support of Giddens, claim that:

> … a theory of social practice emphasizes the relational interdependency of agent and world, activity, meaning, cognition, learning and knowing. It emphasizes the inherently socially negotiated character of meaning and the interested, concerned character of the thought and action of persons-in-activity. This view also claims that learning, thinking, and knowing are relations among people in activity in, with, and arising from the socially and culturally structured world. This world is socially constituted; objective forms and systems of activity, on the one hand, and agents' subjective and inter-subjective understandings of them on the other, mutually constitute both the world and its experienced form. (pp. 50-51)

Archer (1995) as noted above, criticizes Giddens' assertion as falling prey to 'central conflation'. She says:

> Now the general principle of mutual constitution is entirely unobjectionable, what I resist is the representation of their bonding as contact adhesion such that structure and agency are effectively defined in terms of one another. For the net result of this is that mutual constitution ultimately implies temporal conjunction between the two elements. Thus, structural properties (defined reductively as rules and resources) are held to be outside time, having a 'virtual existence' only when instantiated by actors. In exact parallel, when actors produce social practices they necessarily draw upon rules and resources and thus inevitably invoke the whole matrix of structural properties at that instant. (p. 87)

It is to avoid this temporal conjunction present in theories of legitimate peripheral participation and communities of practice (although less so in the former than the latter) that I drew on morphogenesis. As Chapters 1 and 3 explain (see also Chapters 6 and 7), the process of mapping is the result of series of processes happening at different timescales. The influence started with the ABN training process on participatory mapping for its partners including MELCA-Ethiopia (see Section 1.2). The mapping process was subsequently taken up by MELCA-Ethiopia, and later contributed to the learning and some structural elaborations at the community level (Chapter 7 and Section 1.5), locating this learning and change process within a temporal frame that helps to avoid central conflation.

To provide further insight into the learning outcomes or the processes of morphogenesis, and to interpret the direction of the change processes in relation to the biocultural diversity and social-ecological change interest of the study, I have drawn on resilience theory, which I turn to next, before concluding the chapter.

4.7 Resilience

In resilience literature, the phrase socio-ecological system (SES) is used to indicate the interaction between people and their natural and human-made resources (Folke, Hahn, Olsson & Norberg, 2005, and see Section 1.10.3 where this concept is briefly introduced). On this point and in the context of resilience thinking, Folke et al. (2005) say:

> … many of the serious, recurring problems in natural resource use and management stem precisely from the lack of recognition that ecosystems and the social systems that depend on them are inextricably linked. It is the feedback loops among them, as interdependent social–ecological systems, that determine their overall dynamics. (unpaged)

The purpose of the review of the concept on resilience here is provide interpretive tools, or a language of description for analysing how participatory maps may or may not facilitate resilience through their mediation role of surfacing the past and the present, creating the will to change; and creating cohesion among community members for addressing social-ecological challenges. Resilience thinking will also hopefully help me raise more questions for future research.

4.7.1 Resilience thinking

Resilience thinking is a new body of theory being used in social-ecological studies as it helps researchers (such as myself) understand the implications of changes in the social-ecological condition, in the landscape, and in associated social systems that are of potential value to the future of communities in a context of rapid environmental change (Folke et al. (2005), Gunderson, Holling & Light, 1995; Holling, 1973 see Section 1.4). In the context of this study, I found resilience thinking, especially as it is related to learning and change, useful for explaining how learning and social change will affect the future resilience of the study areas. This exploration is aligned to the third research question, which seeks to investigate the implications of the learning and the agency that emerged during participatory mapping for the resilience of the community.

Resilience thinking is described by Carpenter and Brock (2008) as a dynamic cluster of loosely organized concepts or frameworks to systematically think about the dynamics of social-ecological systems. Folke (2006) says it is an approach or a way of thinking to guide or help us organize our thoughts or to help us analyze social-ecological systems.

In Section 4.2 of this chapter I described how Wals (2007) emphasizes the importance of dissonance in environmental/sustainability oriented learning processes. I surmised that part of the value of participatory maps may be that they create an environment where dissonance is created when communities are able to compare maps of the past and the present. In support of this point, Folke et al. (2010) claim that getting beyond a state of denial, particularly in social-ecological systems with strongly established identities or cultural beliefs, is not easy and often requires a shock; dissonance or at least a perceived crisis. Resilience thinking suggests that such events may open up opportunities for re-evaluating the current situation, triggering social mobilization and new learning and innovation (ibid.). As Folke et al. (2005) state in their review of social-ecological resilience and adaptation research that

> General resilience is about coping with *uncertainty* in all ways ... [there is a need for] recombining sources of experience and knowledge for learning and to spark novelty and innovation ... It may lead to new kinds of adaptability or possibilities for transformational change (unpaged).

Blackmore et al. (2011) state in relation to this, that research on knowledge, learning and societal change

> ... should therefore be concerned with the *way in which models [or maps] allow societies to recombine sources of experience and knowledge with new possibilities for novelty and innovation.* Herein lies their power and potential in knowledge, learning and societal change research [and in social-ecological systems research]. (p. 36)

Changing the landscape from an undesirable to desirable state is a capacity that partly resides within local communities. They can reduce soil erosion through soil and water conservation activities, plant trees, and stop agricultural activities that kill their soil. As described in Chapter 1, there is a need to activate these capacities in the two communities under study. This may partially be done through bringing the community together and strengthening their adaptive capacity. Based on the literature review presented in Chapter 3, and previous experience and observations of participatory mapping activities, it would seem that participatory mapping seems to have the capacity of doing that (Rambaldi, 2010; Gaillard & Maceda, 2009; Rowley & Terfa, 2008).

Folke et al. (2010, unpaged), extending resilience thinking to social-ecological systems, says that it will allow us to ask questions including:

i) Are there deep and slower variables in social systems, for example identity, core values and worldviews that constrain adaptability? In the context of the study this would mean exploring the reasons for the absence of collective action to rehabilitate degraded land prior to the mapping exercise.

ii) What are the agential factors, actor groups, social learning networks, organizations, institutions, governance structures, incentives and political relations that enhance or constrain social-ecological resilience? Again it will mean, in the context of the study, exploring for the context that enables or constrains the ability of local communities involved in the study to change the *status quo*.

Asking the questions above will help to broaden perspectives; from looking at the relationship of people with natural resources at local levels; to multilevel collaborative societal responses; to broader set of feedbacks and thresholds in social-ecological systems (ibid.). The need for knowledge, learning and societal change research of this nature has also been put forward by the International Human Dynamics Programme on Global Environmental Change in a recently authored and approved large scale international scientific plan for such a research programme (Blackmore et al., 2011). While this study will focus mainly at the more local level, resilience theory can help to broaden the potential value of the study within the emerging field of social-ecological systems and knowledge, learning and societal change research as put forward by these authors.

As noted in Chapter 2, the concept of biocultural diversity starts with the notion that there is both historical and present adaptive capability in the local community that could be accessed in times of adverse changes in their environment.

Berkes, Colding and Folke (2000), after surveying international literature focusing on the role or Traditional Ecological Knowledge in monitoring, responding to, and managing ecosystem processes and functions, with special attention to ecological resilience, say that:

> Case studies revealed that there exists a diversity of local or traditional practices for ecosystem management. These include multiple species management, resource rotation, succession management, landscape patchiness management, and other ways of responding to and managing

> pulses and ecological surprises. Social mechanisms behind these traditional practices include a number of adaptations for the generation, accumulation, and transmission of knowledge; the use of local institutions to provide leaders/stewards and rules for social regulation; mechanisms for cultural internalization of traditional practices; and the development of appropriate worldviews and cultural values. Some traditional knowledge and management systems were characterized by the use of local ecological knowledge to interpret and respond to feedbacks from the environment to guide the direction of resource management. These traditional systems had certain similarities to adaptive management with its emphasis on feedback learning, and its treatment of uncertainty and unpredictability intrinsic to all ecosystems. (p. 1251)

Berkes et al. (2000) continue to state that many of the prescriptions of traditional knowledge and practice are generally consistent with adaptive management as an integrated method for resource and ecosystem management. They call it adaptive because it acknowledges that environmental conditions will always change, requiring societies to respond by adjusting and evolving. Participatory mapping may help to trace these changes and to ask when exactly have the changes happened or when things went wrong and why (see Chapter 3). Through the discussion that follows, which historicizes the problem, community members may have the opportunity to investigate the cause and take remedial action.

Adaptive management, like some traditional knowledge systems, emphasizes processes (including resource use) that are part of ecological cycles of renewability. Similarly, adaptive management, like many traditional knowledge systems, assumes that nature cannot be controlled and yields cannot be predicted:

> Uncertainty and unpredictability are characteristics of all ecosystems, including managed ones. In both cases, social learning appears to be the way in which societies respond to uncertainty. Often this involves learning, not at the level of the individual, but social learning at the level of society or institutions. Adaptive management is designed to improve on trial-and-error learning. (Berkes et al., 2000, p. 1260)

The unpredictability of the changes is also what resilience thinkers emphasize about social-ecological systems; and what social learning theorists such as Wals (2007) and Glasser (2007) emphasise in contemporary environmental [social] learning processes.

4.7.2 Properties of resilience and their relation to learning and change

There are five heuristics or metaphors used to describe models of change in resilience thinking. Two of them, adaptive cycle and panarchy "… describe the *dynamics* of change" whereas three of them, resilience, adaptability and transformability "… describe the *properties* which influence change" (Plummer, 2010, p. 497, emphasis mine).

4.7.2.1 Adaptive cycle

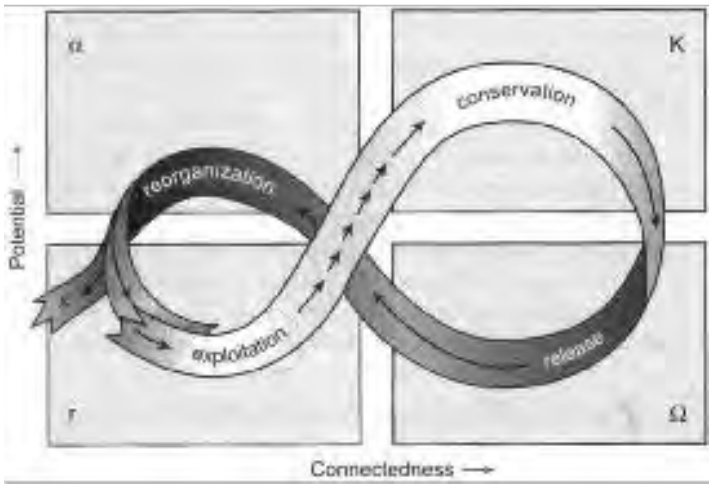

Figure 4.3: *Adaptive cycle*
(Source: Gunderson and Holling, 2002, cited by Plummer, 2010, p. 495).

Folke et al. (2010) define the adaptive cycle as:

> A heuristic model that portrays an endogenously driven four-phase cycle of social-ecological systems and other complex adaptive systems. The common trajectory is from a phase of rapid growth where resources are freely available and there is high resilience (r phase), through capital accumulation into a gradually rigidifying phase where most resources are locked up and there is little flexibility or novelty, and low resilience (K phase), thence via a sudden collapse into a release phase of chaotic dynamics in which relationships and structures are undone (!), into a phase of re-organization where novelty can prevail ("). The r-K dynamics reflect a more-or-less predictable, relatively slow "foreloop" and the !-" dynamics represent a chaotic, fast "backloop" that strongly influences the nature of the next foreloop. External or higher-scale influences can cause a move from any phase to any other phase. (unpaged)

4.7.2.2 Panarchy

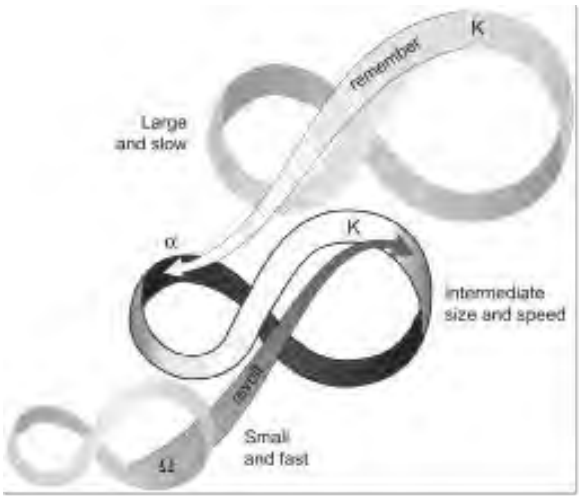

Figure 4.4: *Panarchical connections* (Source: Gunderson and Holling, 2002; cited by Plummer, 2010, p. 496).

About panarchy, Plummer (2010) adds that:

> A second key feature associated with the resilience schema is the manner in which adaptive cycles nest in a space–time hierarchy, as shown in Figure 2 (Holling, Gunderson & Peterson 2002). In an effort to move away from the rigid and top-down connotations associated with the term hierarchy, Holling, Gunderson, and Peterson (2002) invented the term panarchy to capture the adaptive and evolutionary spirit of these nested cycles. They draw particular attention to the significance of connections between levels and demonstrate how during the 'creative destructive phase' critical changes can cascade up (revolt) and, in situations where the resilience of the larger and slower cycle is low, overwhelm large and slow events. The second connection (remember) works in the opposite way as changes move downwards across scales and draw upon potential accumulations at larger and slower cycles during times of reorganization. (p. 496)

In the context of the study, this may imply that changes that are happening at the local community level may have an impact at the higher level. This may include the successful reintroduction of farmers' varieties, or successful rehabilitation of degraded ecosystems or using traditional ecological knowledge, in combination with modern knowledge, to meet social ecological challenges. The temporal scope of this study is, however, probably too short for such an analysis; but may well be worth following up on in post-doctoral studies; or in wider research programming such as that proposed by Blackmore et al. (2011). For the purpose of this study, I will focus on the three heuristics that explain properties of change from the perspective of the

social-ecological systems and learning; which may provide starting points for wider forms of system change resilience studies linked to mapping activities.

4.7.2.3 Resilience

Resilience as a metaphor across multiple levels of organisation brings to mind the ability not only to withstand or adapt to hardship but also to transform into something stronger (Folke et al., 2010). Resilience is also understood as persistence and can be understood in conservative terms as reproduction or morphostasis, or in change oriented and emancipatory terms as positive morphogenesis. This understanding helps to stretch the concept of resilience from a focus on retaining basic structure, functions, identities and feedback; to learning and change which can result from dissonance or shock (Walker & Lawson, 2006) in ways that lead to emergence and new forms of action and re-orientation of the status quo, as discussed above in the context of the emancipatory interests of critical and social realism.

In the context of social-ecological systems, Plummer (2010) introduces the definition of resilience as:

> (1) the amount of change the system can undergo (and implicitly, therefore, the amount of extrinsic force the system can sustain) and still remain within the same domain of attraction (i.e., retain the same controls on structure and function);
>
> (2) the degree to which the system is capable of self-organization (versus lack of organization, or organization forced by external factors); and
>
> (3) the degree to which the system can build the capacity to learn and adapt (p. 497).

In the context of the study, it will mean the capacity of the local communities in the study area to undergo change but still retain their biocultural diversity. This may mean retaining structure and function of the ecological system, but may also require fundamental shifts or changes in the social structures and functions. In this sense, Plummer (2010) appears to be under-theorising change in structure and function, and seems to be mainly approaching it from an ecological perspective. He is therefore mainly directing his thinking on learning and change in relation to ecological system maintenance, rather than social structural changes. Thus, it could

also mean that communities could mobilize their capability in coming together to take control of the unwanted change that is happening through morphogenesis of structures. It would also mean the capacity for learning and the ability to take this learning forward and improve their situation. In addition to Plummer (2010) who emphasizes the system's capacity for enabling learning, I would add that learning can potentially also help build the system capability for adaptation, and that there is an iterative relation between learning and system capacity for adaptation. All of these will be aspects worth examining in the mapping process insofar the limited temporal scope of the study allows.

Gooch and Warburton (2009) wanted to find out what attributes of individuals and groups help community-based natural resource management groups adapt and respond proactively to change. They studied volunteer natural resource management groups across Australia and reported that resilience in this case means: sense of purpose, access to resources, including committed volunteers, effective leadership and ability to deal with the political nature of natural resources management. This understanding stretches the concept of resilience presented by Folke et al. (2010) and Plummer (2010) to include values in a community including sense of purpose and effective leadership, which I will also explore in reflections on the process of process of participatory mapping in the context of resilience thinking (See Chapter 7). The issue of values and ethics in environmental learning and change is similarly emphasized by many educators and researchers involved in supporting and facilitating social learning including Glasser (2007); Wals (2007); Blackmore et al. (2011) and Jickling (2007) amongst others. It is also a key element of Bhaskar's (1998) thinking on emancipatory transformative praxis, when he argues that critical realism involves judgmental rationality, and ethical choices.

In a workshop that was organized by the African Biodiversity Network for its members from 18-21 May 2011 to discuss how they understood resilience in relation to African local communities, they suggested various attributes including social cohesiveness, strong intergenerational links, support among the community, flexibility, generosity, reciprocity, ability to read the environment and respond, looking at options before decision making, presence of collective memory in the

group, holistic food and health systems, knowing the story of origin of the community, strong governance, strong cultural roots, localized economy, continuously seeking alternatives and appreciation of diversity (ABN, 2011). Most of the elements mentioned, including reciprocity, intergenerational learning and the ability to read the environment and respond, were also mentioned in Berkes et al. (2000).

Socio-cultural institutions are one of the four links discussed as a link between biodiversity and cultural diversity (see Chapter 1, Section 1.3.4). Participatory maps reveal the institutional structures and norms that are present in local communities involved in mapping practices (see Chapter 6) and this visualization may also help to develop the discussion around resilience. Local communities have socio-cultural structures to guide their practices, some of which may be significant for adaptive resilience. In discussing governance and resilience in socio-cultural institutions, Brockington and Vira (2008) say that resilience is an essential property of strong resource management institutions because they have to cope with changing environmental circumstances and with changing user needs and preferences. Resource management institutions are continually adapting to changing circumstances. Resilience refers to the persistence of rules, outcomes and properties despite stress, tension and pressure. As such it is the very stuff of healthy common property regimes (Berkes & Folke, 1998). As indicated in Chapter 1, this study will consider how the socio-cultural institutions of the two study communities have historically fared in relation to the changes that they have experienced from both outside pressures and inside dynamics, and how this influences the learning and change possibilities and processes.

During the workshop on resilience organized by ABN, one of the discussions was on the value of participatory mapping in fostering resilience. After reflecting on the participatory mapping experiences of members in Ethiopia, Kenya and South Africa, the participants said that, in the context of resilience, participatory mapping:

i) helps communities to remember the past - the origin; and origin is, they said, a unifying element;
ii) links the past, the present and the future through dialogue;
iii) encourages the community to analyse itself, leading to the exploration of what went wrong and where the links were broken;

iv) visualizes the norms and values of the past, opening an opportunity to possibly take them forward;
v) stimulates intergenerational learning. Elders are given a space and this creates dialogue among generations and fosters unity, identity and cohesion in the community; this revives traditional knowledge and practices so that the good and the positive will be carried forward;
vi) helps recollect memories and document community knowledge systems which will be used to chart a better future;
vii) encourages shared decision making;
viii) creates cohesion among community members; seeing themselves as part of the community;
ix) create alliances at all levels – local, national, international and engagement – policy level, legal level, and education system. (ABN, 2011, pp. 6-8)

They also said, if well utilized, maps can be used to claim community rights to ecosystem services and help in identifying ecosystem challenges and hence in informing the community on the urgency to undertake action (ABN, 2011).

The concept of resilience also assumes adaptability, which is discussed in the next section.

4.7.2.4 Adaptability

The other heuristic in resilience thinking, which is also helpful for examining the outcomes of the learning proceses, is adaptability. Adaptability is described as "… the capacity of individuals within a social-ecological system to manage resilience with *intent*, so that the system does not change into an undesirable regime, or so that the system can move into a more desirable state" (Walker, Holling, Carpenter & Kinzig, 2004, unpaged; emphasis mine). In the context of the study, this would mean the capacity of community members, either as a group or some individuals, to learn from the change that has happened and manage to act as leaders so that the community persists without losing its social-ecological condition and resources, assuming that this condition is what the community would like or need to sustain. Folke et al. (2010) agree and say that adaptability is part of resilience: "It represents the capacity to adjust responses to changing external drivers and internal processes and thereby allow for development along the current trajectory (stability domain)" (ibid., unpaged), assuming that resilience is not conceptualized within a conservative framework as discussed above.

In the study of Australian volunteers mentioned above, Gooch and Warburton (2009) express the adaptability of the groups as the ability of individuals in the group to learn and communicate their learning. They say important factors identified for adaptability include: social memory; institutional and management diversity, redundancy and flexibility; access to resources and information; and the capacity to interpret, monitor and respond to ecosystem feedbacks. Combinations of different groups of actors such as knowledge generators, stewards, visionaries, brokers, interpreters, innovators, experimenters and knowledge retainers, leadership, personal traits, social networks, trust and cross-scale networks in terms of bonding and bridging organisations are further identified as key prerequisites for adaptability by these researchers (ibid.).

As mentioned in Chapter 3, the presence of social memory is a critical factor in the process of participatory mapping (see Section 3.3). Those who have memory or the history of the landscape are at the centre of the mapping process. During the Participatory 3DMappingprocess the past is reawakened and discussed and taken forward in discussions about the future (see Section 3.5.2). Memory can therefore be viewed as critically important to both maintain and build the resilience of the community in a positive, emancipatory sense. Talking about memory Adgar, Hughes, Folkie, Carpenter and Rockström (2005) say that social memory comes from the diversity of individuals and institutions that draw on reservoirs of practices, knowledge, values, and worldviews and is crucial for preparing the system for change, building resilience, and for coping with surprises. Folke et al. (2010) add that it is from the memory and the experience of the resilient system that adaptability comes in times of change.

In terms of the importance of memory for the adaptability of local communities and for the internalization of that memory into the cultural system, Berkes, Colding and Folke (2000) give emphasis to ritual, ceremonies, and other traditions.

Again the citation above, much like Plummer's comment on structure and function maintenance, tends to under-theorise the social dimensions of social-ecological resilience, as social-ecological resilience may well require challenges to the

traditional, or to some forms of regulation (as mentioned in Chapters 1 and 2). Biocultural diversity management regimes pass through an iterative process of learning and adaptation and they continually deal with changes coming from outside and adjusting themselves (Berkes, 1999; Oström, 1990).

Brockington and Vira (2008) say that socio-cultural institutions can also be resilient in the sense that they reappear after many years of absence. Berkes (1999) has documented precisely this happening with the establishment of rules for caribou hunting among groups in Canada, which had not required them because caribou had not visited their hunting grounds for decades. Their reappearance was initially met with a chaotic and messy hunting season. But the former rules were still remembered, and revived in the subsequent season (Berkes, 1999). Similarly, Pesanayi (2008) writing about farmers' social learning in declining economic and ecological conditions in Zimbabwe, noted the return of indigenous knowledge practices in times of increased drought and risk. Folke et al. (2010) stress the importance of such 'latent functionality' for the resilience of institutions, but also point to the need for research that examines the role of cultural (collective and social) memory in sustaining such functionality in the context of ecosystem management. It is also important to realize that maintenance of all traditional systems is not necessarily 'the answer' and that some of these may well need challenging in changing social-ecological conditions, as for example, Mukute (2010) pointed out in relation to the way in which women remain marginalized in rural agricultural practices in southern Africa.

Discussions during participatory maps typically surfaces historical narratives where resource management regimes were used to include and exclude members of the community members and how this is enforced (Flintan et al., 2008; Aynekulu et al., 2006) This resurfacing of the past management regimes can be taken forward in subsequent decision making processes after map making. This study will explore whether this has happened or whether there is a possibility of this happening (see Chapter 7).

4.7.2.5 Transformability

The third heuristic, which is used to describe radical change in social-ecological systems, is transformability. Transformability has been defined as "the capacity to create a fundamentally new system when ecological, economic, or social structures make the existing system untenable" (Walker et al., 2004, p. 5). Sometimes a social-ecological system can become very resilient, but undesirable—for example, when a rogue government dominates and persists, or when ecosystems collapse or when water sources dry out. Deliberate interventions may be required to bring about a ''regime shift'' to transform the social-ecological system into a more desirable state. Such changes may occur in response to policy changes and natural resources depletion (Gooch & Warburton, 2009).

As mentioned numerous times already, this study involves exploration of the learning and agential role of participatory mapping for change. In this context, though, it may be difficult to say that the community will opt for a complete transformational change following mapping given the temporal scope limitations of the study; the study may be able to explore whether or not there are indications of this happening. Folke et al. (2010) refer to the presence of collective action, learning platforms, and support from high scale in the governance structures as some of the attributes of transformability. As mentioned in Chapter 3, participatory maps create cohesion among local communities, which may translate into collective action (Di Gessa et al., 2008; IFAD, 2009). As the mapping process in this study also involved government stakeholders, I will explore whether there is a possibility of support from a high level structure for the initiatives of the community.

On this point Folke et al. (2010) say that the attributes of transformability have much in common with those of general resilience, including high levels of all forms of capital, diversity in landscapes and seascapes and of institutions, actor groups, and networks, learning platforms, collective action, and support from higher scales in the governance structure. Transformational change often involves shifts in perception and meaning, social network configurations, patterns of interactions among actors including leadership and political and power relations, and associated organizational and institutional arrangements.

It is hoped that this perspective will help in describing whether or not there are attributes in the communities under study which would allow a radical change to a new regime, should this be needed, or if there is sufficient ground for shifts to occur so that a deliberate transformational change can be initiated at the study area level and expanded beyond that inspired by the participatory mapping process.

Deliberate transformational change can be initiated at multiple scales, and perhaps gradual transformational changes at lower scales, which, in a sequential way may lead to feedback effects at the catchment scale. This, as explained by Olsson et al. (2004) and by Folke et al. (2010) is a learning process, which may facilitate eventual catchment-scale transformational change. Actors and organizations that bridge the local to higher social–ecological scales (such as NGOs or government organizations) are often involved in such processes (Olsson, Folke & Hahn, 2004). Case studies of social-ecological system transformations suggest that transformations consist of three phases: being prepared for or even preparing the social-ecological systems for change, navigating the transition by making use of a crisis as a window of opportunity for change, and building resilience of the new social-ecological regime (Folke, 2010).

As mentioned in Chapter 1, the participatory mapping activities are primarily conducted at two *kebeles* (the lowest administrative unit in Ethiopia), which are low-scale activities at the level of the watershed. However, one of the principal actors involved in this process is the organization that I belong to, MELCA-Ethiopia, a national NGO that has links to government and to African and other international networks (see Section 1.3.2). With the concept of resilience dynamics in mind, it is possible that the activities that start at the local level may be expanded to the catchment level and beyond. I will discuss the possibility of this in the forthcoming chapters.

Most of the attributes given to the value of participatory mapping for resilience, adaptability and transformability, including creating community cohesion, intergenerational learning, memory building, planning and problem analysis, resurfacing the past to understand the present are also attributes mentioned for

resilience creation in the resilience literature (Berkes et al. 2000, Lundholm & Plummer, 2010, Shava et al. 2010)

4.8 Conclusion

This chapter discussed learning frameworks and theories, showing how the study will draw on social learning and associated socio-cultural learning theories to interpret and understand how members of community involved in the participatory mapping processes may have acquired knowledge through their participation in the process. It has also drawn attention to how participants in the mapping practice may be involved in renegotiating their identities and how meaning making and change related to the biocultural landscape may emerge through their participation in the practice of mapping. It also showed how, to avoid the conflation of agency and structure implied in communities of practice theory, and to explain the change, how morphogenesis may occur, and how this can be observed through the methodological strategy of analytical dualism which conceptualizes structural change within a temporal frame that also involves social interaction in relation to existing structures. The last part of this chapter focused on learning for resilience in the context of social-ecological change. It shows the importance of resilience thinking for developing a deeper understanding of change in the context of social-ecological studies, and outlines five heuristics, which may be useful for interpreting the outcomes of the learning processes associated with participatory mapping, when the data is scrutinized for this purpose in forthcoming chapters. The chapter has also highlighted critiques of legitimate peripheral participation, and community of practice learning theories, and has indicated how these are addressed in this study. It also points to some of the limitations of current resilience theorizing, particularly its failure to thoroughly theorise changes in social structure and functioning, and its failure to consider the possibility that some conceptualizations of resilience may also be conservative, paradoxically lacking emancipatory intent.

Chapter 5: METHODOLOGY, METHODS AND THE RESEARCH PROCESS

5.1 Introduction

This chapter details the research methodology and process. It starts with a discussion on the main methodological approach used, namely case study. This methodology was chosen as it seemed best suited to provide the depth of insight that was required to address the research questions, as outlined in Chapter 1, (Section 1.8).

The research journey was both exploratory and interventionist. It was exploratory because I intended to investigate how participatory mapping facilitated learning and change in the communities where the mapping took place. It was interventionist (Mukute, 2010) and emancipatory (Wals, 2007) because the intention in introducing this particular tool was to enhance social learning as a vehicle for change.

This chapter also explains how the journey was reflexive throughout the process; and I will explain how I acted both as a researcher and a facilitator (see Section 5.12 below). As explained in Chapter 1, MELCA-Ethiopia, the NGO of which I am the director, already had a relationship with the two communities where the research was conducted. This relationship provided both an opportunity and a challenge. It was an opportunity because the costly activity of organizing a Participatory 3D Modeling (P3DM) workshop was handled by the NGO and the relationship that we had with the community meant that I was trusted, which is a critical aspect of participatory mapping processes (Corbett & Keller, 2005). It was a challenge because as a researcher I had to devise ways of keeping a reflexive 'distance' or stance, which I did through various strategies detailed in Section 5.6 of this chapter, which considers this issue as significant to ensuring trustworthiness or validity of the case. In general I drew on other facilitators, including members of community, and did extensive individual interviews with those who participated. These two strategies strengthened the research process.

The chapter explains why a multiple case study methodology was best suited to the research questions and interest. It also elaborates why I chose the Horo Soba village

in Bale and the Telecho village in Foata Mountains Complex for analysis, from the four places where I had facilitated the Participatory 3 Dimensional Models (in addition to the ones chosen I worked at the Wechecha Mountain Complex and the Masha *wereda* - see Section 5.3 below).

The chapter furthermore discusses issues of research quality, namely the maintenance of research ethics, and validity, or trustworthiness of the case. Validity concerns the justification of knowledge claims (Kvale, 1989). It is a continual questioning of the subject matter under investigation. In particular, I discuss how I used the measures put forward by Rambaldi, Chambers, McCall and Fox (2006) in the context of participatory mapping (see Section 3.7), to ensure that I did not leave the community more disempowered and impoverished than I found them (see Section 5.10 below).

Wals et al. (2009, p. 17) talk about how the success of learning processes depends on the capability of the facilitator. He advises the facilitator to use others from the participating group to help facilitate the process. I involved different co-facilitators assisting with facilitation during different part of the process (see Section 5.4 below).

This chapter also explains how reflexivity was enhanced through ongoing reflections on the research, an activity which I undertook on my own, and also with research colleagues. Colleagues included those at the workplace and those at Rhodes University Environmental Learning Research Centre. I found these exercises very useful and they helped refine the research approach and provided an ongoing means of self-reflection. The process of reflexivity is reported in Section 5.9 of this chapter.

5.2 Case study as a methodological framework

The methodological framework for the study was framed by the research goal (see Section 1.7), the context and history of the research (Chapter 1), as well as the conceptual and theoretical frameworks described in detail in Chapters 2, 3 and 4. . As stated already numerous times, the aim of this research was to investigate the learning and change that emerges in and through participatory mapping in the context of biocultural diversity and resilience in rural Ethiopia. This means that it has both an emancipatory and an exploratory angle.

To fully understand the relationship between biocultural diversity knowledge and practices and how they are communicated both laterally and intergenerationally in the context of participatory mapping, and to analyze learning possibilities and changes that emerge from this learning, I have undertaken artefact-mediated contemporary and historical analyses of the landscape shown on the participatory maps. This is to establish what knowledge is visualized or elicited in the context of biocultural diversity and what kind of learning occurred, and whether that learning has contributed to the emergence of agency or actions. This is done using a case study approach and methods which include group reflection, participant observation, interviews and mediated building of P3DM, 2D scale maps, and eco-cultural calendars (see Section 5.5 for detailed description of these tools and how they were used in this study).

Case study is one of several ways of doing social science research (Yin, 2009). Rather than using large samples and following a rigid protocol to examine a limited number of variables, case study methods involve an in-depth, longitudinal examination of a single instance or event – a case. They provide a systematic way of looking at events, collecting data, analyzing information, and reporting the results. As a result the researcher may gain an enhanced understanding of why the instance happened as it did, and what might become important to look at more extensively in future research (Flyvbjerg, 2006).

Case study research also allowed for deeper engagement with people in their social context, and allowed me, and other staff at MELCA-Ethiopia to learn more about the local communities that we work with. Thus case studies can facilitate the improvement of relationship building, and engagement with the social, environmental and economic life of people in particular social contexts (in the case of this study, the Horo Soba and Telecho community contexts). Flyvbjerg (2006, p. 206) says:

> If one assumes that the goal of the researcher's work is to understand and learn about the phenomena being studied, then research is simply a form of learning. If one assumes that research, like other learning processes, can be described by the phenomenology for human learning, it then becomes clear that the most advanced form of understanding is achieved when researchers

> place themselves within the context being studied. Only in this way can researchers understand the viewpoints and the behavior, which characterizes social actors. From this point of view, the proximity to reality, which the case study entails, and the learning process that it generates for the researcher will often constitute a prerequisite for advanced understanding.

As explained in Chapter 1 (Section 1.2) my personal goal is to explore methodologies that can aid learning and mobilize local action. I wanted also to have a deeper understating of the mapping process as it declares itself, and to explore how and if it can achieve both learning and action (IFAD, 2009; Di Gessa, 2009). The case study approach has provided a methodological process that allows for gaining such in-depth understanding of how local communities learn and how the linkage between cultural diversity and biodiversity manifests at community level.

5.2.1 Multiple case study approach

To increase the robustness of the study and make the conclusion more compelling (Yin, 2009, p. 53), I chose a multiple case design approach. I had a fair expectation of what the outcomes would be in the case of Foata Mountain, Telecho *kebele* included, as I had already worked on development of three other models involving the Bale Mountains, Horo Soba *kebele* included, the Masha *wereda* and Wechecha Mountain Complex. While I was familiar with the production of the models, I had not examined the processes associated with them in great depth, thus, the opportunity of producing in-depth cases of two *kebeles*, allowed me to comprehend the outcomes in the two different contexts in a detailed manner.

Yin (2009, p. 59) says:

> The rational for multiple case designs derives directly from our understanding of literal and theoretical replications. The simplest multiple case study would be the selection of two or more cases that are believed to be literal replications. Selecting such cases would require prior knowledge of the outcomes with the multiple case enquirer focusing on how and why the exemplary outcomes might have occurred and hoping or literal replication of these conditions from case to case.

I was also fortunate have enough resources for more than one case study. As indicated in Chapter 3, P3DM is one of the more expensive participatory mapping applications, especially if the mapping involves the modeling of a bigger landscape, which was the case in both of the cases under study.

5.2.2 Type of questions that case studies answer

Case studies are best used when one intends to answer 'how' and 'why' questions (Yin, 2003, 2009). As indicated in Chapter 1, 'what', 'how' and 'why' questions dominated this research. The study purposefully asked questions about 'what' was there, and 'what' had changed in terms of biocultural diversity, as well as 'why' things had changed and 'how' they could be addressed. In general case studies are the preferred methods when (a) 'how' or 'why' questions are being posed (b) the researcher has little control over events, and (c) the focus is on a contemporary phenomenon within a real life context (Yin, 2009, p. 2). Yin went on to say that research methods are chosen to address one of the following purposes, exploratory, descriptive and explanatory. The 'what' question addresses the exploratory matters in studies while the 'why' and 'how' questions seek out explanations. Mukute (2010) contends that this explanation misses the 'so what' questions beyond the exploring, understanding and explaining. As indicated above, this research is descriptive and exploratory. It also responds to the 'so what' question that Mukute (ibid.) alluded to, as the research itself is also constituted as a change oriented process in addition to being an investigation into this change oriented process.

5.2.3 Case study protocol

As part of the case study design process, I developed a case study protocol following the recommended format provided by Yin (2009). A case study protocol is a guide or a procedure to research outlining: the broad study questions that the researcher should focus on while he is collecting data, the data collection procedure, the expected preparations and case study interview guides (ibid.).

I developed a case study protocol for the two phases (see Appendix 1 and 2). This guided the interaction that I had with the two local communities and formed a core dimension of the data analysis.

Before the second data collection process, I sent the protocol to those MELCA staff members who had actively participated in the first data collection process and who would assist with participating in the data collection and member checking process (their roles are discussed in Section 5.3 below).

I used the second phase to check the initial data analysis that I undertook after the first data collection phase. This proved to be critical for identifying the correct names of places and people and to correct interpretations based on the response of the interviewees. It was also important to do this as most of the interviewing was originally done in Oromifa, a dialect of which I only have basic knowledge. MELCA staff assisted me in translating the language from Oromifa to Amharic. I have a broad understanding of this language and this has improved as the data collection process progressed. Some subtle meanings and understandings were, however, able to be corrected during this process.

5.2.4 Compiling a case record (CD Rom attached)

In order to ensure that data gathered on each case was properly kept for future use in the analysis, and in the writing of the thesis and for evidence of engagement with research participants, I compiled a record for each case study. In each case record, I kept:

- Samples of key communications with research participants (discussions and focus group discussions);
- Samples of interview records;
- Photographs taken of the mapping processes focusing on the learning interactions; aspects of the landscape; and the maps themselves;
- Graphic versions of the models which were digitized afterwards;
- Reports and records of interactions (e.g. documents produced such as video data or film; or post-mapping written reports)

Keeping the data together within case records was very helpful in the analysis phase, and for writing up this research. The case record is attached to this thesis in CD Rom format. Table 5.1 provides an inventory of all of the data sources contained in the case record.

Table 5.1: *Case Record Data Inventory*

Case record inventory	**The data and status of processing**
Photographs	- Bale 1-60 *(numbers indicate there were 60 photographs)* - Telecho 1-86
Audio recordings	**Bale audio recordings** - Discussion after model building - Discussion on eco-calendar 1-3 *(numbers indicate 3 discussions were held)* - Discussion on the history of the community 1- 3 - Discussion with Bale leaders - In-depth discussion around the history of the landscape with Aba Misa - Discussion around household of Aba Misa - Bale member checking 1 - Bale member checking with community 1 – 2 - Bale students - Bale discussion with Agency 1 – 7 - Participatory mapping workshop 1 – 5 **Telecho audio recordings** - P3DM interviews ○ Local community 1 – 56 ○ Trainee 1 – 5 - Member checking 1 – 3 - Ecological calendar discussion 1 – 2 - Discussion with students Interview with Degelo Sendebo Interview with Geography department staff 1 – 3
Indexed interviews	Bale - Interview on sketch mapping - Focus group discussion with students - Focus group discussion on Agency - Focus group discussion 2D scale Telecho - Transcription on Agency - Interview by Jess Philimore, involving local communities - Interview member checking - Interview with students - Interview with government and staff - Interview with participants after the P3DMbuilding Interview with Degelo Sendebo
Processed data (1st draft narratives)	Bale - Legend making and presentation - Bale putting cognition mapping - Discussion after model building - Legend photo analysis Telecho - Legend presentation - Eco-calendar description - Interview transcript of member checking

Reports (processed data)	- Report on the P3DM in Bale and Telecho - Report on sketch mapping in Bale and Telecho - Report on the seed workshop of ABN - Report on the resilience meeting of ABN - Proceedings of the workshop on participatory mapping for sustainable life - Socio economic data of Horo Soba *kebele* - Socio-economic data of Telecho *kebele*
Film data	- Mapping for change: the experience of farmers in rural Ethiopia

As indicated above, the case record contains rich data, all of which was used to provide a description of the cases (see Chapter 6), which I did using the strategy of carefully narrating representative photographs, educational interactions, learning interactions and insights into biocultural diversity (see Section 5.6 below where I discuss data analysis in more detail).

5.3 Criteria for case selection

As indicated above, I was involved in leading and supporting the development of P3DMs in four places: the Bale Mountains (which includes the Horo Soba *kebele*), the Wechecha Mountain Complex, the Masha *wereda* in Sheka and the Foata Mountain complex (which includes the Telecho *kebele*). I had basic data on all four of these. After hours of looking at the data collected for all four cases, I finally decided on Bale and Telecho: four cases would have been too extensive for the purposes of this study as there was much to report and reflect on in each case. This section explains why I decided to select Bale and Telecho out of the four mapping sites.

5.3.1 Choice of Bale as a case study

Since its inception in 2004, MELCA-Ethiopia has been working in the Bale Mountains. As such, the NGO has a strong connection with the local community and we have staff working full time on a range of activities in the area, including environmental education and rehabilitation of degraded areas. The culture of the community is largely marginalized in conservation and development activities, and hence presented an interesting case study site for engaging with the question of biocultural diversity and learning. The communities in this area had previously mainly been described as problem to conservation interests (Hillman, 1986). Research on the fauna and flora of the Bale Mountains abounds but, as mentioned in Chapter 1, little

research has been done on biocultural diversity. Since this case study site had these features, with high potential for engaging the processes of P3DM, I approached one conservation organization, the Frankfurt Zoological Society, and another development organization, SOS Sahel and Farm Africa, for funding for the building of the model. They agreed and through this, the first Participatory 3 Dimensional Model was produced in Ethiopia. As MELCA-Ethiopa staff are present in the area, both the coordination and the facilitation of the processes were relatively easy. As we had already started working with the local community, it was relatively easy to get their honest reflections and commitment. MELCA-Ethiopia is also registered to work at Bale so there was no need to ask for permission from the relevant government authorities. Therefore, selection of this case was based both on the richness of the case in terms of the biocultural diversity of the area and convenience, related to the existing relationship and practices of MELCA-Ethiopia in the area.

Flyvbjerg (2006) concedes that this is a valid way of selecting cases. He states:

> When the objective is to achieve the greatest possible amount of information on a given problem or phenomenon, a representative case or a random sample may not be the most appropriate strategy. This is because the typical or average case is often not the richest in information. Atypical or extreme cases often reveal more information because they activate more actors and more basic mechanisms in the situation studied. (p. 229)

5.3.2 Choice of Telecho as a case study

The second case study involved the Telecho community, which is agricultural. They also rear livestock. There is virtually no research done in Telecho. Working with Telecho as a case study site was shaped by various factors, including the fact that the African Biodiversity Network requested MELCA-Ethiopia to organize a learning experience for its partners on community and farmers' variety of seeds in Ethiopia. As the budget was tight, it was only possible to identify a community near Addis Ababa. Based on this, staff of MELCA-Ethiopia sought out communities who were known for having a rich variety of seeds and who were willing to host the visitors. The local government set up a committee to select suitable communities and, with Shimeles Tegegn of MELCA, presented three possible choices. Based on a recommendation from Shimeles, I visited the place, and found it to be extremely interesting from a variety of points of view, relevant to this research. It has a

beautiful landscape, and rural cultures of practice are still largely intact. Following this, the ABN workshop group stayed with the community for a week, developed various participatory sketch maps with them, and discussed seeds and seed use and management. The mapping revealed very interesting issues including erosion of culture, land and forest degradation, degradation and loss of farmers' varieties of seeds. The community was motivated to organize itself to continue improving their area. They formed an association and started working on rehabilitating their land.

When later we were asked by the Netherlands based organization called Technical Centre for Rural and Agricultural Cooperation (CTA) to host a regional training workshop on Participatory 3 Dimensional Modeling, we chose this same community and the surrounding area for modeling, based on this prior experience and knowledge of the community. Therefore, I decided to look into this case more deeply, and to make it part of the study to help me gain a cross community perspective of what participatory maps can do for learning and agency in the context of an agricultural community. The Telecho community differed from the Bale community, who are an agro-pastoral community.

I therefore selected two different communities, based on their proximity to Addis Abeba and the headquarters of MELCA-Ethiopia (for convenience purposes, as this would allow follow-up visits which I needed to do for depth of data); but also for their interest from a biocultural diversity perspective, and their willingness to participate in the programme. The other two P3DM models were not as convenient from a proximity to Addis Abeba perspective, although they also showed equally interesting profiles from a biocultural diversity perspective, and MELCA-Ethiopia also had good relationships with the communities concerned.

5.4 Research process

Developing in-depth insight into the two case study sites, doing preparatory work for the P3DM process, and involving the two communities in other mapping activities such as sketch mapping and building ecological calendars, while also interviewing respondents, undertaking member checking and following up on key aspects of the

data was an extended, complex process which took place over extended periods of time in both case study sites.

Table 5.2 below shows this process, in summary. Following the presentation of the table, I discuss the process in more detail, focusing on the methods used. In sections 5.7.1 and 5.7.2 below I give a much more detailed overview of the actual unfolding of the research and mapping processes in the two sites. Table 5.2 summarizes the data collection schedule, and illustrates the unfolding research process.

Table 5.2: *Data collection schedule for the two case studies*

Area visited	Visiting dates	Research activities done
Bale	November 2008 – January 9	Preparation including preparation of logistics and community engagement
	January 10 – February 15 2009	Building of the Participatory 3 Dimensional Model and individual interviews and group reflections
	June 20 – 26, 2009	Discussion with elders about the biocultural diversity, history of the Horo Soba *kebele*, a site chosen for the study, about the change in the landscape, ecological calendar and learning
	April 10 – 15, 2010	1. Discussion with local stakeholders (*wereda* level sectoral offices, the Bale Mountain National park, NGOs, local communities and students) about the usage of the model for development purposes 2. Participatory sketch mapping with the communities of Horo Soba *kebele* and group discussion on learning
	May 5, 2011	Feedback on research done and further discussion on learning and change related to participatory mapping
	September 2011	Redoing of the eco-calendars with the past and future dimension added
Telecho	Feb 7 – 11, 2010	Participatory sketch mapping and data collection at Adere
	September 1– December 6	Stakeholder consultation and logistic preparation
	December 6 – 16,2011	The building of the Participatory 3 Dimensional Model and interviews and group discussion
	February 24, 2011	Discussion on the agency that was created because of the participatory mapping
	April 28, 2011	Feedback on data collected and initial analysis and also gathering some more data on learning and agency
General	September 2011	Redoing of the eco-calendars with the past and future dimension added

As can be seen from Table 5.2 above, the research involved engaging with each community at various times over a period of more than a year. It involved various

stages and activities which deepened the initial data that was gathered in early interactions with the communities concerned. This allowed for a broader range of mapping activities, and also ongoing probing of issues, based on ongoing reflection after early phases of data analysis. Data analysis was ongoing, and iterative, and was extended through further data gathering and analysis on an ongoing basis in both sites. In addition to deepening the data, the repeated visits ensured prolonged contact with the local community and strengthened the validity of the research. It also allowed me to observe the changes that were brought about through the mapping interventions. This was necessary to develop an ongoing record to gain perspective on learning and change, as this is a key interest of the study.

Equally important, was the chance that this prolonged engagement over periods of time provided for reflection on the data and on the unfolding processes, and the theory and practice of mapping, biocultural diversity and learning and change (my views of which were deepening as the time span of the study unfolded). Lotz-Sisitka (2001) describes research as a reflexive process and describes how she reflected on her ideological and methodological assumptions while doing her research. She talks about how, among other things, she was constantly reflecting on her views and understandings of participation, the ideological and methodological assumptions of participation and empowerment, her understanding of knowledge construction and the ways in which she was representing the voices of the teachers involved in her study (p. 112). I went through a similar process of asking myself about what participatory mapping is, how the intervention could potentially empower or dis-empower members of the community (and how I would know if this was the case), if participatory mapping really mobilizes learning and agency for change, and if so how does one recognize this; and what would the value of this be to the work of MELCA-Ethiopia? I also reflected on whether elders were central to this process; and on how much of the local community context and the wider socio-political environment I could comprehend, and how this was related to understanding the wider factors affecting the socio-ecological resilience of the community. In short, the theory and empirical dimensions of the research were constantly held in an interactive, reflective, and reflexive relationship, which was aided by the time span used for

developing each case study, as well as by ongoing data analysis, and deepening of data collection, while deepening theoretical understandings of the phenomena of interest in this study.

5.4.1 Language translation

I have a limited understanding of the Oromifa language, even though my comprehension of the gist of what is being said has improved considerably as the mapping process went on. All of the MELCA staff understands the Oromifa language, which the language used by the community, and I was supported by them during the practice. Most of the translation has happened on the spot which has helped in building my vocabulary and in getting the meaning of the discussion as the activity was taking place.

The next section describes the research processes as they unfolded in the two study areas.

5.4.2 Research process for Bale

Table 5.2 shows that after three months of intensive preparation, MELCA-Ethiopia was able to undertake the first participatory 3 dimensional modeling activities between 10 January and 15 February 2009. The mapping process started with two elders developing a draft legend. The two elders who developed the legend later presented it to community representatives. The community representatives then used the legend to put their cognition of the landscape on the model. After they finished creating their cognitive maps, there was a general discussion and this generated data on the kind of learning that has happened during the model building process. The data was captured using audio recordings, observation and photography.

I returned to the research site after about six months and had an intensive interview/discussion with three elders from one of the *kebeles* on the Model, Horo Soba, which was audio recorded. As discussed previously, I had chosen Horo Soba as it was easier to access for repeated engagement and as it was an area where we have established a good working relationship. It is also here that one of the elders working for MELCA, Aman Mame, resides. The choice to include Aman Mame in the

interview was strategic because we have trust and a good relationship with him, and he also understands what is required. He was therefore able to provide in- depth insights in the interview, and he also gave others confidence to participate.

Through this interview process, I had an intensive discussion (the interviews were constituted as in-depth discussions, see below) with the three elders on changes in the landscape using trend analysis and construction of an ecological calendar. The calendar that the elders did was included in the data as well as their audio recording. This provided more in-depth perspectives on the biocultural diversity history of the Horo Soba *kebele* (see Section 6.4.4). I also interacted with the family of Aman Mame and went up the mountain with him to a place where we could see the landscape clearly and discuss the biocultural diversity in our field of vision which is also audio recorded.

I went back to Bale again from 20-26 April 2010 and had a one-day meeting around the model with stakeholders and undertook a two-day participatory sketch mapping exercise with community representatives. The stakeholder meeting involved participants from various government offices including agriculture, environment, land, culture and the Bale Mountain National Park. This intervention allowed me to gain in-depth perspectives on how the broader group of stakeholders from the area view the mapping project. It also helped with comprehension of the contextual framework in which the mapping activity was located.

The sketch mapping provided in depth understanding of how participatory maps can help learning and create agency (see Section 6.4.5). There were only three elders from the Horo Soba area who had originally participated in the model building process but the sketch mapping provided an opportunity to work with the larger community at a wider scale (the Model was built with a 1:12,500 scale, while the sketch map used 1:2,500 scale). As intended, the sketch mapping process, in which I collected the actual maps as data, and audio recordings of the process, provided further in-depth understandings of the landscape and brought further insights into the social-ecological challenges that the community were facing (see Section 6.4.5). I also used this opportunity to work on an ecological calendar (see Section 5.6.1.3)

with the elders and teachers who came to participate in the meeting, which I also kept as data for the study, together with audio recordings of some of the discussions that took place as the ecological calendar was produced. This further strengthened the discussion that I had with the three elders around the model roughly six months previously.

Finally, I went to Bale on 5 May and had a workshop with those who had originally participated in the mapping process. The discussion was audio recorded. I made the final trip to member check my initial analysis with both the MELCA-Ethiopia staff, and representatives of the local community. This visit took place after I had started writing up this thesis and after I had discussions with colleagues at the Environmental Learning and Research Centre (ELRC). These questions raised more questions about the process and analysis so far, and I decided that there was need for more data. During this visit, I engaged the community in an intense discussion about the learning that took place during the mapping process and the agency that had been created (which was also audio recorded) (see Sections 6.4.6 and 6.6). I also member checked the initial data presentation with those who had participated in the mapping process. I used the case study protocol that I prepared for this purpose (Appendix 2) and this involved discussion of my initial analysis with MELCA staff, getting feedback from those who participated in the process, including students and community members and gathering additional data which is all audio recorded.

5.4.3 Research process for Telecho

In Telecho, I started the initial stages of the research process with sketch mapping activities. With members of the Adere village in Telecho *kebele*, workshop participants of the ABN undertook participatory sketch mapping activities that took five days. As noted above when discussing the site selection process, a group of trainees from government and non-governmental organizations also participated. Through this activity, community members produced a map of the past, the present and the future. They had an intense discussion after constructing the map of the past and the present about the changes in their landscape. They also had a discussion before they constructed the map of the future as, it entails personal and group commitment. This is because a map of the future seeks to represent and present a

common vision for their landscape. The sketch maps were collected and kept as data for the study, and I also used observations (capturing the process in a detailed sequence of photographs); as well as written recordings of the discussions.

The Telecho community and others, with support from MELCA-Ethiopia and CTA built a P3DM from 6-22 December 2010 (see Section 5.7 below). The data collection process involved observation, individual interviews after the processes and group discussions focusing on what was put on the model.

To gather data about the action that was taken after the P3DM and sketch mapping process, one of the staff of MELCA-Ethiopia, Mersha Yilma, had a discussion with the local community on 21 February 2011 based on the interview protocol that I sent him (see Appendix 6). The interview (which was audio recorded) explored the actions that were taken after the mapping process (see Section 6.5.5). This provided interesting data on how the mapping process contributed to mobilizing members of the local community for further action. Lastly, I went to the study area on 28 April 2011, to give feedback on the initial analysis, to member check the interpretations, and to collect further data. I also used this opportunity to engage members of the community in producing an ecological calendar. The process of producing the ecological calendar was captured with audio recording of key discussions, with photography, and the actual calendar was also kept as data for the study. As in previous cases, the ecological calendar provided useful insight into social-ecological dynamics, and also aspects of community relations with the landscape.

5.4.4 Iterative relationship between data generation and analysis

As noted above through the process descriptions associated with each case site, an iterative (and different in each case) relationship existed between the data generation process, the analysis, and the deepening of insights into the two cases. This was a necessary process to develop the 'intensive' nature of the research, as is required for case study research. Sayer (1992, p. 242) explains that such processes are necessary in case study research designs that seek to answer questions such as "How does a process work in a particular case or small number of cases?","What produces a certain change?", or "What did the agents actually do?" (very similar to

my research questions as described in Section 1.8). He says that such iterative processes of data generation and analysis in what he terms 'intensive' research designs, are necessary to obtain insight into 'substantial relations of connection'. Of significance here, is Sayer's point that in intensive (case study) research it is possible (but not mandatory) that the research process is "exploratory in a strong sense" (p. 244). He clarifies this further by stating:

> Instead of specifying the entire research design and who and what we are going to study in advance, we can, to a certain extent, establish this as we go along, as learning about one object or from one contact leads to others with whom they are linked, so that we build up a picture of the structures and causal groups of which they are a part. This is not intended as a justification for empty headed 'fishing expeditions'. It is just a counter to the rather peculiar idea that researchers should specify what they are going to find out about before they begin and an acknowledgement of the need to develop research procedures, which do not inhibit learning-by-doing. (p. 244)

The repeated visits to, and meetings and interactions that I had with the Horo Soba and the Telecho communities have, over the period of time, helped me to gain a deeper insight in to the biocultural landscape of the areas, which is a key contextual feature of the study, and to explore in depth the learning and agency aspects that have emerged from the mapping processes. In this sense my research process was, as Sayer would say "exploratory in a strong sense" (although it did not lack a consistent research design and core areas of inquiry), a sentiment that Flyvbjerg (2006) shares about case study research in general when he says:

> If researchers wish to develop their own skills to a high level, then concrete, context-dependent experience is just as central for them as to professionals learning any other specific skills. Concrete experiences can be achieved via continued proximity to the studied reality and via feedback from those under study. Great distance to the object of study and lack of feedback easily lead to a stultified learning process, which in research can lead to ritual academic blind alleys, where the effect and usefulness of research becomes unclear and untested. As a research method, the case study can be an effective remedy against this tendency. (p. 223)

The following section describes the research methods that were employed for the study. I have used group interviews, focus group discussions and individual interviews; as well as observations using photographs and video (in some cases) to capture the processes in detail. Document analysis, of available relevant documents such as the maps themselves, the ecological calendars and a film that was made in

Telecho during the mapping process, also formed part of the research (these are described briefly below under 'general research methods' in Section 5.5). A central method used in this research was mapping, and a special section (Section 5.6) is dedicated to the actual mapping processes, as they are a participatory research method in themselves (as noted in Chapter 3).

5.5 General research methods

5.5.1 Group interviews

Group interviews allow a researcher to cover a variety of topics and the aim is to collect data from more than one person at the same time (Bloor & Wood, 2006). As indicated above in Section 5.4, I used this method extensively because of the nature of the research. The mapping was undertaken with different groups who came from different villages and they worked on the P3DM in turns, village by village, and once one group had completed their part of the map (see Section 5.7 and 5.8 below), they were replaced from another group from another village. After the map building contributions, the groups presented what they had done, village by village, before others replaced them. This allowed for detailed discussions with the group presenting, based on the following questions:

- How did they find the model building process?
- What surprised them about the process?
- Did the land look like what it does on the model some 50 or 60 years ago?
- What has changed?
- Why did it change?
- What will happen if the trend continues like this?
- Did they learn today anything that they did not know before?

In total, ten such discussions were recorded, and are included in the Case Record, as reported in Section 5.2.4 above.

5.5.2 Focus group discussions

Terre Blanche and Durrheim (1999, p. 388) indicate that 'focus group' is a general term given to a research interview conducted with a group. A focus group is typically a group of people who share a similar type of experience, but that is not naturally constituted as an existing social group. Patton (1990, p. 335) adds that "a focus group is an interview with a small group of people on a specific topic". I had focus

group discussions with elders and other community members on various occasions, as mentioned in Section 5.4. I also held a focus group discussion with those who made the legends in both the sketch mapping and the model building processes. This was to understand why they used a particular kind of colour, hue and texture for a point on the map. I also included questions on the choice of the colour of the paints for the polygons. These include agricultural and forest lands. As indicated in Section 5.4, after the model was completed, I went to Bale and had an in-depth focus group discussion with Aman Mame, Hule Uture and Oumer Burka (three elders), who are members of the Horo Soba community, to gain further understanding of both the history of the place, their culture and biocultural diversity and landscape relations.

I also had a focus group discussion with four members of the Bale local community on 6 May. I had a focus group discussion in April 2011 with six members of the Bale community who had been involved in the mapping processes, to check the accuracy of the data that I gathered and to ask some more questions about learning and change. This allowed me to access reflections of community members on learning and change after the event has passed.

I had a group discussion with 15 members of the Telecho community after the sketch mapping that they did between 7-11 February 2010. I had another focus group discussion with five members of this community on 27 and 28 April 2011 and this involved two of the elders who participated in the discussion mentioned above and three others who came for the first time but participated in the mapping process. The focus group discussion involved reflections on the model based on the case study protocol that I prepared for this particular purpose (see Appendix 2). On 28 April 2011, we had a long focus group interview centring on the ecological calendar.

All focus group interviews were semi-structured, in that I had a few key questions that I wished to probe with the community members concerned, but the interviews were also ‘discussions’ in the sense that they were open ended, and allowed for in-depth discussion related to the interview questions, and allowed for community members to take their time and to consider aspects being raised in the focus group interviews.

The selection of the interview group was based on their active involvement in the model building process and their availability. In total I conducted six focus group interviews for this research, all of which are recorded and contained in the case record.

5.5.3 Individual interviews

I also used semi-structured individual interviews throughout the research process to generate primary data. I used this method because it allowed me to obtain information at different times in the process of participatory mapping and to pursue relevant information for the research process. A case study protocol (see Appendices 1 and 2) was prepared for this purpose. I did not stick rigidly to the questions prepared but used them to guide my interaction with those interviewed.

I did interviews at Telecho with a range of participants (see Table 5.1, case study record). The insights gained during the interview processes were used to modify the interview approach and questions. Interviews were conducted with 56 members of the community living in and around the Foata Mountain complex which included members of the Telecho community (see Case Study Record CDRom). The individual semi-structured interviews were conducted mainly when members of the local community were about to leave the model building process. The interview processes took place either around the model, when there was little distraction by other community members, or at other quiet venues where Individual reflection was possible.

I selected the people to be interviewed randomly. Those who had been particularly active in participating and in explaining the model were chosen deliberately. I also chose elders for interview for their knowledge of the past and their understanding of the present.

In total I conducted 56 individual semi-structured interviews with members of the two communities during this research, all of which are contained in the case record.

5.5.4 Photographs and video-based observation

As indicated in Section 1.2 I was intimately involved in the research process where I acted as a participant observer, and facilitator of the mapping processes.

Participant observation is a method in ethnographic or social research where the participant gathers data by participating in the daily activity of people through "listening to what is said, and questioning people, over some length of time" (Becker & Geer, 1957, p. 28).

Fossey, Harvey, McDermott and Davidson (2002) add that:

> It is used to learn about the naturally occurring routines, interactions and practices of a particular group of people in their social environments, and so to understand their culture. It is so-called since the researcher's participation with the research participants in their social world is crucial to developing an understanding of what is being observed. (p. 727)

The participant observation helped me to generate data on how people responded to the mapping experience, to modify my interview questions, to generate more questions spontaneously and to interpret the photographs that I took while the community were mapping.

As shown in Appendix 6, and as explained at the start of Chapter 6, I used photographs as a key observation tool which also helped with the first phase of analysis in which I constructed 'photo narratives' (see Chapter 6). These photo narratives are a way of representing and describing both the processes taking place, but also the relational and learning-based interactions emerging from the mapping processes.

I did not use the photographs as cues for interviews (Bohnsack, 2008; Kolb, 2008; Knoblauch, Baer, Laurier, Petschke & Schnettler, 2008), which involves using photographs as a medium of interaction with interviewees and utilizes the interview data to shed light on what the photograph represents. Rather I used them as supporting evidence for the interviews that I had during and after the process

Although literature on using photographs to study and analyze social processes abounds, it is rare to come across literature on the use of photography as a mechanism to help structure analysis of other forms of data or in which photography was not the initial data collection strategy. Photo analysis can help to avoid misinterpretation, allows member checking, and captures the event for a later analysis, also allowing for thick description of the data. Photographs provide a

distance between object and researcher, and introduce certain codes into the field of subjective interest (Kolb, 2008).

Bohnsack (2008) laments that in the last 20 years qualitative research has grown in both sophistication and systematization and the analysis of text has advanced while using picture analysis as a methodology continues to be marginalized. He finds this paradoxical and his explanation is that there is a general understanding that for reality to be scientifically relevant, it must be articulated by words or sentences. This, he argues further has made picture analysis less valid even though it is not articulated as such.

I did not use the pictures shown in this chapter as a central feature of the data collection process in the sense that I did not show the pictures to the participants after they were taken to elicit further insights into the context or their knowledge on biocultural diversity. I rather used the pictures as supporting evidence for the interviews that I had during and after the process.

5.5.5 Document and text/model analysis

Document analysis is a well known method often used in case study research. However, document analysis can mean many things, and can involve reviewing documents for key themes, or content relevant to the research topic and questions (a kind of content analysis), or more in-depth critical forms of document analysis such as critical discourse analysis (Alvesson & Karreman, 2000). For this research I used mainly content analysis, which was complemented by in-depth perspectives on context and history, as well as relational dynamics associated with the documents (especially the maps).

As indicated in Section 5.4 above, I also used documents as sources of data in this study. The most significant of these were probably the maps themselves and these included the sketch maps produced in the communities, as well as the ecological calendars, and of course the model itself which is a kind of 'text'. MELCA-Ethiopia, also, however, produced a number of reports during the research process for different purposes, and these were used as documents for analysis. Any historical materials found on each of the communities concerned, or on the ecological,

biodiversity or sociological aspects of the landscapes were also used for document analysis, as shown in Table 5.1 previously, which lists the documents that are contained in the Case Record.

5.6 Participatory mapping as participatory research method

As indicated above, at the heart of this research lay the mapping activities. These, as explained in Chapter 3, are participatory research methods in themselves. The general research methods used above therefore complemented and were situated within and around the participatory mapping processes. I therefore provide a detailed description of the participatory mapping processes here to show how they were constructed as this helps to guide readers not only to understanding how the other research techniques were deployed, but also to understanding the outcomes of the mapping processes in more detail.

Tversky (2002), exploring the psychological role of sketch mapping, claims that:

> Sketch maps are a way of externalizing ideas, of turning internal thoughts public, of making fleeting thoughts more permanent. Of course, written language can do the same, but sketch maps have the advantage of conveying spatial ideas directly, using elements and spatial relations on paper or models to convey elements and spatial relations in the world. (p. 3)

This spatial relationship depicted in models or on paper can then be used to mobilize memory and assist both lateral and intergenerational learning which can be recorded and analyzed using theories of learning and change as lenses. This is what I did in using participatory maps and insights gained into the participatory mapping process as a data source in this research.

I also wanted to understand the conception of space, as expressed by members of the local communities; and to probe whether they see relationships among components of the biocultural diversity in their ecosystem or not. This is because understanding the relationships among components of the ecosystem is one of the elements required for resilience (Berkes et al., 2000). In my experience, and as reported by other African researchers, it is interesting to note here too that rural communities often use metaphors to explain their understanding of the environment (Mukute, 2010; Masara, 2010). Tversky (2002) claims that “through

sketch maps, one can formulate structural information about the spatial relations among elements". Participatory maps may convey abstract ideas metaphorically, using elements and spatial relations on paper to express abstract elements and relations.

The participatory mapping activity was designed in such a way that those involved in the map making, were able to respond to the maps after they had made them. In the sketch maps, community members were asked to produce a map of the past and to reflect on what they remembered about the landscape and about their relation to it. The elders took the stage at this point as they were the ones with longer memories of the past. After the past was visualized and the combined memory of the people involved in the process on biocultural diversity mobilized, they then constructed a map of the present. I recorded the discussion comparing the map of the past with the map of the present. After this members of the community concerned were asked to develop a map of the future. As mentioned previously this involved intensive discussion before the actual mapping; it took about five hours to agree on what would go on the map.

On this point, Tversky (2002) says

> The externality of participatory maps and cognitive tools promotes memory, providing a record that does not rely on unreliable human memory. They also provide a token for the contents of working memory, relieving the dual burden of holding the content and also simultaneously operating on it. Instead, computations and inferences can be made on an external representation. (p. 3)

As was explained in Chapter 4 where resilience was discussed, and in Chapter 7, where data is analyzed drawing on the resilience concept, memory is a key component of socio-ecological resilience as tested management practices can be mobilized in times of socio-ecological crisis for adaptive persistence (Folke et al., 2003). The public nature of participatory maps allows members of a community to observe, comment on, and revise ideas, and enact those revisions in the external representation (see Kirsch, 1995; Tversky, 2002). As described, the participants were provided with opportunities to put their memories on the maps and once those memories and understandings were on the maps, there were further discussions involving harmonization of ideas. Integrated ideas were then transferred to the map,

providing a 'holding space' for collective memory (see Chapter 6). The maps, while being 'objects' were therefore impossible to analyse without the attendant discourse, reflection and discussion on how and why certain things were included on the maps.

For the Participatory 3 Dimensional Models, it was too expensive and time consuming to develop three models (past, present and future). At the beginning of the process, the community was therefore asked whether they wanted to make a map/model of the past, the present or the future. They chose, in all cases, to produce a map of the present and discuss the past and future. As a result, a model of the present was constructed in each case. Each community explained what they had done after the model was completed, and as mentioned above, each village group was given a chance to review and reflect on what had taken place after making their specific contributions. Questions were then raised regarding changes in the landscape and future trends and the answers were recorded (see Section 5.4 above).

Participatory maps may serve as a tool for communication both at the individual level and group level. It is important that this communication is captured to investigate and describe the learning that may have happened as a result of the process. I recorded the results of conversations both at the individual and the group level through interviews and focus group discussions, as reported above in Section 5.5.

The following section describes in brief the detail of the participatory mapping methods and processes used in this study, especially the P3DM.

5.6.1 Participatory 3 Dimensional Modelling

As indicated in Chapter 3, and in the schedule of the research process outlined above, P3DM is an extensive process, often taking up to two or three weeks, with preparatory and follow-up work required. Figure 5.1 below outlines this process in more detail:

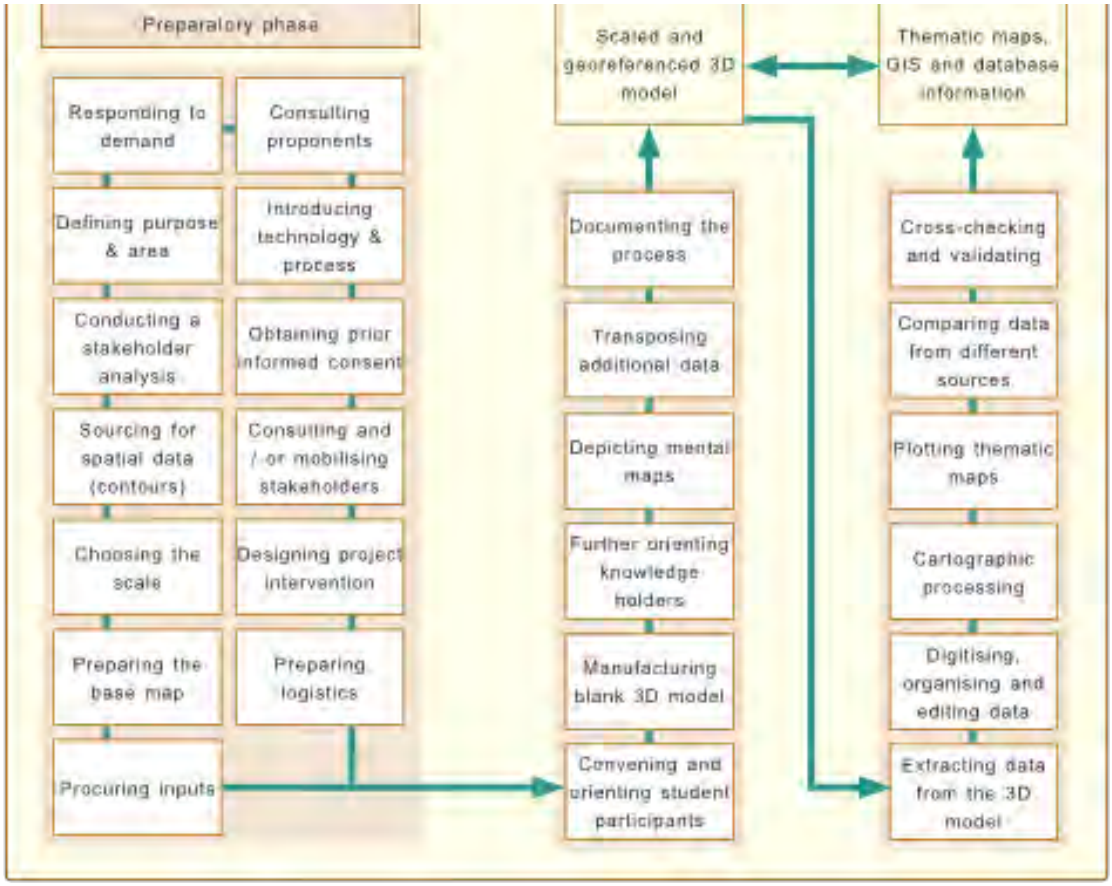

Figure 5.1: *P3DM processes and its integration with GIS (adapted from Rambaldi, 2010, p. 19)*

As shown in Figure 5.1 above, the process of P3DM starts with a preparatory phase involving choice of site, stakeholder consultation and logistical arrangements, and proceeds to the manufacturing of the model involving students and community members, to the final production of the model in digital form using GIS.

5.6.2 Participatory sketch mapping

The process of sketch mapping follows roughly the same process as noted in Figure 5.1. There is still stakeholder consultation, community engagement, and choice of the area to map, putting the cognition of the local community on the maps and, if there is the need, processing it through GIS.

In the case of this research, however, I used a topographic map to produce the sketch map: "Topographic maps make excellent base maps because they have sketch, north lines, and a coordinate system and they show natural features for local reference" (IFAD, 2009, p. 3). The study followed what Poole (2005) described as

'No Man's map'. This involves removing everything from the topo map except the rivers and contours. In the case of this research, we removed everything, except the rivers and roads. For Bale, one of the facilitators and the staff of MELCA, Tesfaye Tola, spent some time studying the rivers before the local community came to participate in the mapping processes. Therefore, with his facilitation, they could easily identify the rivers, and from this it was easy for them to populate the map with their cognitive understanding of their biocultural landscape.

5.6.3 Ecological calendars

Maps usually depict the spatial relationship of people with nature. It is of course possible to represent this relationship as dynamic and changing on the maps through arrows connecting events. But it is much more explicit and visual if this dynamic, temporal relationship is represented in a circular way showing the changing patterns of practice according to the seasons. Eco-cultural calendars are developed in many ways. As shown in Figure 5.2 that follows, one way of doing this is to divide the circles vertically according to the number of seasons and to draw others circles in the big circle to show layers of expressions of nature and activities. As used in this research, Figure 5.2 starts from the season in the middle and then expands to include people's livelihood, cultural expression, expressions of nature and climate, one after the other. If you take one season for example, expressed in the diagram having a triangular shape, the inner triangle shows the season. The second level shows the livelihood activity of the community. The next layer has the cultural activities. These include rituals, cultural ceremonies and yearly festivals. The next layer represents how nature responds to this particular season. It can include the particular kinds of fruits that ripen in this season, the birds that come or it can show behavioural changes associated with the season, and how the rivers, mountains and other parts of the landscape look at this particular time, etc. (see Chapter 6 for detailed explanation).

Ecological calendar data produced in the context of the two communities for this study was enriched through a study that was coordinated by the ABN in October 2011 focusing directly on the use of eco-cultural calendars. The purpose of the exercise was to explore the use of calendars for reviving traditional agricultural

systems. The staff of MELCA produced calendars of the past, the present and the future (see Appendix 6). The new calendars strengthened the data from the previous exercise and enriched the analysis for the question "What biocultural knowledge and practices related to landscape does participatory mapping mobilize in local communities?"

Figure 5.2: *Eco-calendar of the past, Bale*

In the next two sections (5.7 and 5.8) I provide specific details on the P3DM processes in the two sites, to provide further insight into the way in which participatory mapping was used as a research process and method in this study.

5.7 Participatory 3 dimensional model building processes in Bale

This section will detail the specifics of the data collection process for the P3DM constructed in the first case, Bale. Building the model of the biocultural diversity landscape of the Bale Mountains was undertaken from 10 January to 15 February 2009; shortly after the proposal for this PhD study had been accepted by the Higher Degrees Committee. The modeling exercise in Bale was the first of its kind undertaken in Ethiopia, and drew on the insights that I had gained from participating in a similar process in Kenya in 2006 as reported in Chapter 1.

The P3DM process in Bale involved more than 150 local people, including students, local youth, community members and trainees from the Frankfurt Zoological Society, MELCA and the Bale Mountain National Park. As mentioned earlier, the Frankfurt Zoological Society, SoS Sahel and MELCA-Ethiopia collaborated in sourcing the funding for the construction of the model. The community was, in principle, highly supportive of the concept when it was presented to them initially.

As it was the first such process to take place in Ethiopia, it was challenging to communicate to members of the community and other stakeholders who have never been part of such a process as to what a P3DM process needs and means. P3DM is not an easy process to explain. People need to actually participate to really understand what is involved and how it happens.

The project was implemented through the following phases: (i) preparatory, (ii) modeling, and (iii) handing over. These combined activities were implemented over the period from 10 January to 25 February 2009.

5.7.1 Phase 1 - Preparatory phase

This phase lasted three months. Activities undertaken included (i) identification of the area, (ii) sourcing spatial data and preparing the base map, (iii) choosing the appropriate mapping sketches (vertical and horizontal), (iv) procuring workshop materials, (v) consulting and mobilizing students and stakeholders, selecting trainees, and (vi) organizing the logistics.

Identification of project area

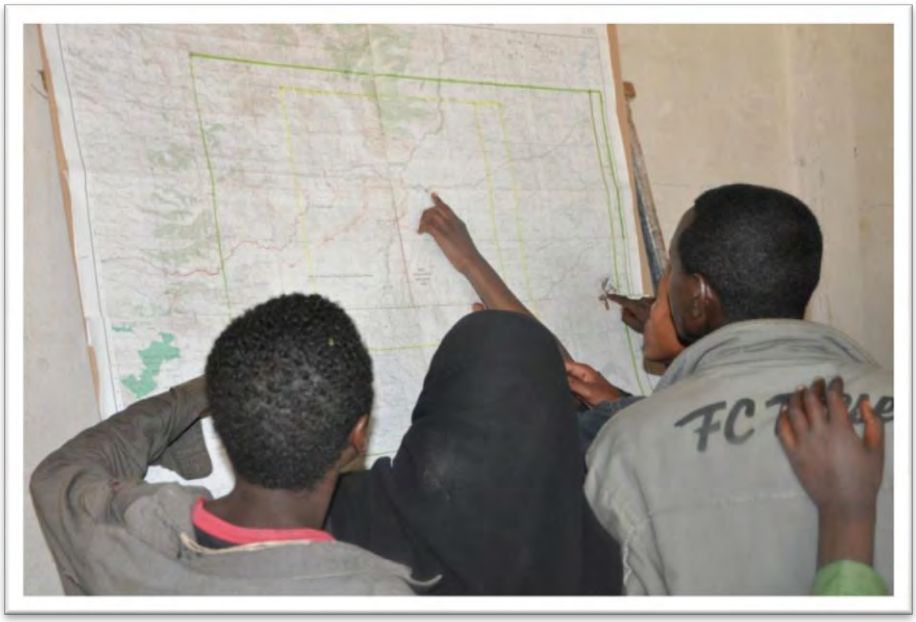

Figure 5.1.1: *Identification of area to be modeled*

Figure 5.1.1 shows youth participating in the model building process looking at the topographic map. The yellow line indicates the area chosen for modeling. As indicated in Section 1.5.1, the Dinsho *wereda*, which houses the headquarters of the Bale Mountain National Park, was selected for modeling. The selection of the site was undertaken in consultation with the Frankfurt Zoological Society and SoS Sahel and Farm Africa. The scope was decided to be at the *wereda* level to assist with *wereda* level planning and implementation. As mentioned in Section 1.5.1, in Ethiopian government structures, the *wereda* is the lowest autonomous administrative level. *Weredas* are given the power to utilize budgets according to the needs specific to their area. Thus, it was felt that the model could be used by the local community in the *wereda* for planning and learning. Some areas of other *weredas* were also included in the model. This is because the *weredas* have a polygon shape and to put the *wereda* in the rectangle, which is the shape of the model, other areas must be included. This, however, created substantive logistical and budgetary challenges because official letters had to be written to each participating *wereda*. It was also necessary to go in person to select members of the community who would participate in the model building, and to negotiate modes of transportation as most of the areas are inaccessible.

Sourcing of data and preparation of the base map

***Figure 5.1.2**: Preparing the base map*

Figure 5.1.2 shows trainees and students preparing the base map for the modeling process. Preparation of the base map featuring colour-coded contours was the responsibility of a GIS consultant. This proved to be a frustrating process because the first GIS consultant made critical mistakes in the process of digitizing; the second could not deliver it in time. The only consultant who was professional enough was also difficult to deal with. Therefore, the whole exercise took much longer than it should have.

The topographic sheets from which contour digital data was derived were readily available at the Ethiopian Mapping Agency. The terrestrial contour interval is 20 metres ranging between 2380m and 4120m elevation. This process involved scanning of the hardcopy using an A0 scanner, geo-referencing the digital image and digitizing the contour layers. Intervals of 20 metre depth contours were generated starting from 2380m above sea level. We used a horizontal sketch of 1:12,500. This incorporated a large area but was limited in terms of locating places on the model as the sketch was smaller than 1:10000. One elder commented “you know we could have put a lot of information on the model if it was a bit bigger”.

The model measures 360cm by 280cm and was constructed in three parts using three base tables each measuring 280cm in length and 120cm in width. The height of the table was 60cm. The size of the base map and the cardboard used was equal to

the size of the table. This is necessary as the carton boards rest on the table and as the shape on all four sides should fit the table. Using three tables instead of one ensured easier access to the working space. In hindsight, though, we should have had two tables each of 180 cm width. Making three parts of the model demanded considerable energy and organization and joining the three models for analysis with computers proved to be a huge challenge. The cutting of the cardboard was not perfect either so we had a problem with perfecting the sides where each joined another.

Procurement of workshop inputs and their on-site delivery

Figure 5.1.3: *Preparing the base map for tracing*

Figure 5.1.3 shows a pile of cardboards in the background used for the modeling. It also shows carbon papers and adhesive tape used for the process. The success of any P3DM exercise depends heavily on the availability of all necessary materials at the location where the model building will take place. We could find most of the necessary materials from Merk, the biggest market place in Ethiopia, and some were obtained from Robe town in Bale. The crepe paper and coloured pins could not, however, be sourced anywhere in Ethiopia.

The materials were ordered according to specifications listed in the handbook *Participatory 3-Dimensional Modelling: Guiding Principles and Applications*

(Rambaldi, 2010) and in consultation with Giacomo Rambaldi, author of the handbook. The pins and crepe papers were sent from the Netherlands courtesy of the Technical Centre for Agricultural and Rural Cooperation EU-ACP (CTA), which has been supporting the use of P3DM methods in Africa.

Consulting and mobilizing students and stakeholders

Figure 5.1.4: *Community consultation*

Figure 5.1.4 shows one of the public consultation meetings held as part of the process of introducing members of the community to the purpose of the mapping process. At this meeting we asked their consent and also selected elders who were both willing and able to participate in the mapping process. This was a critical process as it was possible that members of the local community could interpret the mapping event in a negative way. As mentioned in Section 1.5.2, the area borders the Bale Mountain National Park and there is conflict with the park authorities on the issue of boundaries. After consultation it was agreed that three representatives from each of 24 *kebeles* would participate in the mapping exercise. Collectively, this large group of 72 community members was composed of traditional leaders, elders, and farmers, men and women, and youth. All contributed to the collation of the knowledge base which formed the basis for depicting biocultural diversity features, resource distribution and use on the P3DM. In order to mobilise the participation of villagers, MELCA-Ethiopia staff members, Tesfaey Tola and Abebayehu Kassaye, visited each village to meet with the heads of the *kebeles* and other community members. In each village the team introduced the planned workshops (mapping and

planning), the importance of village involvement, and assisted with selection of representatives. They also discussed benefits deriving from villagers' participation which included exercising their constitutional right for participating in development and using the model to develop a plan for reviving their culture and their ecosystem. After arriving at the mapping site, participants were given an orientation including how the data would be utilized for research. The work continued after getting their permission.

Trainees were also part of the process as model builders. Selection of trainees was undertaken in consultation with Frankfurt Zoological Society and SOS Sahel. Both organizations contributed five trainees and the trainees worked with me and other MELCA-Ethiopia staff throughout the modelling process. The two institutions funded the process and are important for the implementation of decisions, which might be taken by the community. This is because they could provide expertise in natural resource management and funding. They were therefore trained 'on-the-job' so to speak, and learned through receiving ongoing orientation, trying things out, and reflections, most of which I facilitated. I observed that all trainees successfully acted as co-facilitators throughout the process and were able to participate in all roles necessary for learning good facilitation practice such as inducting and coaching newcomers.

MELCA-Ethiopia coordinated most of the selection and the mobilization processes involving local community members, which, as noted above involved selecting representatives from the different *kebeles*. Students from Dinsho primary and secondary schools and local youth groups also participated with permission from their schools. Local authorities in Dinsho were also informed about 3D Modeling exercise, and were invited to join in the process if they had the time.

Preparation of the draft legend

Figure 5.1.5: *Aman Mame checking legend with group of community representatives*

Figure 5.1.5 shows Aman Mame (the elder from Horo Soba who works for MELCA-Ethiopia) presenting the draft legend to participants. He had produced the draft legend with another elder two days earlier. This helped the facilitation of the model building, as communities need to speak with one language when they do the map, and it provided a starting point for the development of this common language or referent for the model building. The community added and elaborated the draft legend as the process unfolded (see Chapter 6). Prioritizing and getting a consensus among mapmakers on which items are relevant and what should be featured on a map, is the first step in a participatory process aimed at addressing community-based issues related to the territory and its resources. Involving knowledgeable community member (elders) in this process at the start helped to establish this critical element of the mapping and modeling processes.

5.7. 2 Phase 2 - Community mapping phase

The preparatory phase was followed by the community mapping phase. All activities within this phase were carried out at the Dinsho Secondary School. It involved the following key activities: introducing and orienting trainees on facilitation techniques and participatory 3D modeling; assembling the blank model, drafting and fine-tuning the map legend; transposing cognitive maps; transferring data from and to the 3D model; and extracting data using digital photography.

Introducing and orienting trainees on facilitation techniques and participatory 3D modeling

Figure 5.1.6: *Orienting students*

Figure 5.1.6 shows me using my computer to explain the process of P3DM. I showed participants a film on how a similar process of model building was undertaken with other communities in the Philippines. However, I later found on repeated occasions that no amount of explanation of the process is adequate, and cannot replace the understanding of model building that emerges through participation in the practice itself. Providing initial orientation was, however, a critical process, as it is also crucial that the trainees involved understand the concept of participation and what the purpose of the modeling is. Participants were given introductions to the stages of the model building, and each participant was given the P3DM guidebook (Rambaldi, & Callosa-Tarr, 2002), which they could refer to for more information.

Assembling the blank model

Figure 5.1.7: *Assembling the blank model*

Figure 5.1.7 shows part of the model built. Trainees, local youth and some elders participated in the assembling process. It was a pity that, in the case of Bale, we were not able to get the entire base maps at the same time (they were delayed by the GIS consultancy process, mentioned above). This would have allowed us to complete the whole model in one go. This would have prevented boredom due to some members of the community sitting without work to do as they waited for the base maps to arrive. The youth easily mastered the techniques of tracing and cutting the cardboard, piece by piece, to overlay on the previous layer and build the blank model. It was fascinating to watch how the whole landscape shapes itself as each cardboard rests on top of the others, and the three dimensional topography is 'built'. The whole process took three weeks.

Drafting and fine-tuning the map legend

Figure 5.1.8: *Finalized legend*

A draft legend was made before the start of the model building as mentioned above. Two elders had identified eighteen points, three lines and six polygons. After the blank landscape model was assembled, elders came to populate the first model. The first elders showed the draft legend that they produced to the newcomers who, through their participation with others, continued to modify some items, and to add new items to the legend until a final legend was in place (see Section 6.4.1).

Transposing cognitive maps

Figure 5.1.9: *Transposing cognitive maps*

Members of the local community used paint, pins, lines and polygons to populate the cardboard topographic model with their knowledge (Figure 5.1.9). They identified sacred sites, water points, rivers, forestlands, agricultural lands, and mineral waters. These were represented using the coding system provided by the legend as shown in some detail in the figure below.

Figure 5.1.10: *Close-up showing mountain (dark green), Hagenia forest (pink), seasonal grazing area (green pin), funeral site (red pin) and residential area (white pin).*

Transferring data from and to the 3D model

Some information was transferred from the topo map to the P3DM. This includes the road from Addis to Goba. The community also corrected some points, which were wrongly identified on the topo map. For example, a mountain peak called Shawiso was wrongly placed on the topo map in the area chosen for modeling. The mountain was actually located at an area outside of the model. This created a lot of confusion but the community finally agreed that it did not belong to the model and those who know the area later confirmed this. Inaccuracies such as these may potentially be related to the relatively short history of mapping in Ethiopia, as referred to in Chapter 3.

Extracting data using digital photography

Figure 5.1.11: *Extracting data using digital photography*

Figure 5.1.10 shows the completed model tilted vertically with participants in the modeling process. A good photograph was taken of the first model. This was made possible by tilting the model perpendicularly and taking photographs with a Nikon 90D camera from a distance of four meters. The photo was later de-referenced and digitized using GIS. A two dimensional map was produced as a final product (see Figure 5.1.12 below). The product can be used to calculate the area under forest, agriculture, the number of, and spatial referents of selected points, for example sacred sites, etc. This digitizing of the P3DM model has only just been completed, as it involved a complex GIS construction process, and the final product is yet to be shown to the community to confirm whether what is on the digitized map is what was placed on the model. Digitizing the data in this way, allows it to be used for planning purposes. The P3DM is said to be less of an extractive process, as the model will stay with the local community in the area that they have chosen for this purpose. For the time being, it is staying at the school where it was made and the local community is happy with this arrangement.

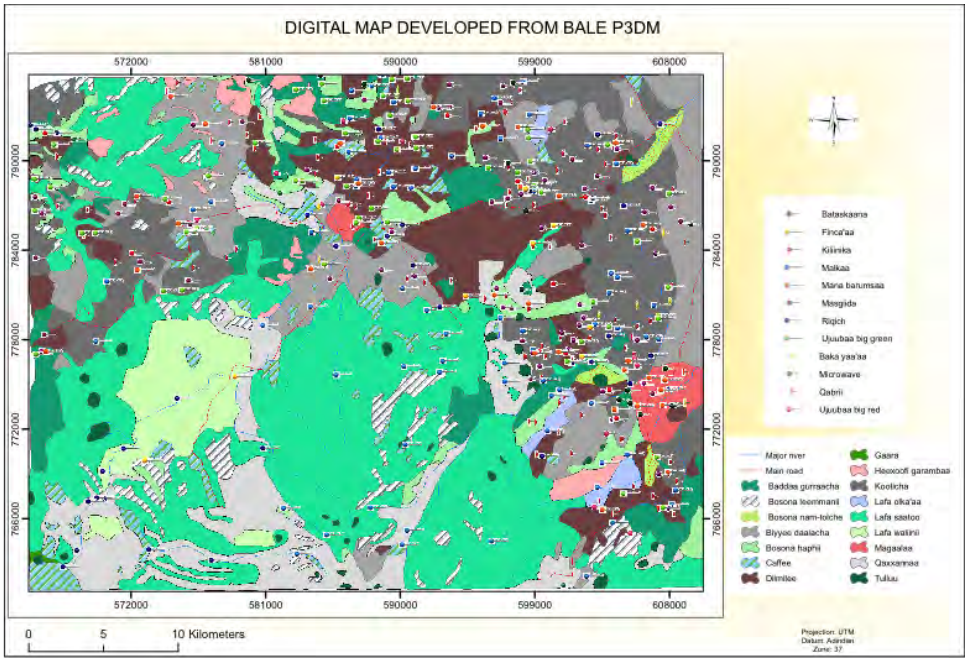

Figure 5.1.12: *Digital map of the Dinsho wereda and its environs (see larger version in Appendix 7)*

The digitization process was undertaken to obtain statistical and spatial information from the physical model. As mentioned in Section 3.5.2, the P3DM is not movable as it is large and heavy, and more importantly, it stays with the community who produce it. This is a huge advantage as it is not possible for outside bodies to complete the map and take it away as is normally the case. While digitization is a process of 'taking the map away', there is a case to be made for digitizing the information in this process, as it allows for calculation of the percentage of forest cover, agricultural and grazing lands and allows for calculation of frequency and occurrence of a component of the ecosystem. It can also serve to educate others about the state of the biocultural landscape in the community; and can also be used to raise funding to support communities to reclaim and rehabilitate degraded biocultural landscapes. It also allows for representation of biocultural diversity in new and different ways as items such as sacred sites can also be included in social-ecological system maps.

An added importance of this process is, according to Rambaldi (2010):

> Images taken from a 3D model will not align properly with other data until they are geo-referenced. Thus, to use the photographs that have been taken of the 3D model in conjunction with other spatial data, it may be necessary to align,

> or geo-reference, them to a map coordinate system. A map coordinate system is defined using a map projection, a method by which the curved surface of the earth is portrayed on a flat surface. In case of P3DM, it is necessary to refer to the map projection of the base map used to manufacture the model. (p. 49)

The digitization, information extraction and mapping process involved a number of complex technical steps. This included collection of top view photos of the P3DM models, merging photos, geo-referencing, digitizing, information extraction and mapping. Geo-referencing, digitizing, information extraction and mapping were done using ArcGIS 9.2 software while photo merging was done using *Adobe Photoshop*. An example of the type of data obtained from this process is provided below from a final report produced by MELCA-Ethiopia (2011a).

> The Bale model covers an area of 156621 ha which is more than twice that of the Telecho model and is made from three blocks. Here, the community has identified 16 land cover types. The major land cover type identified by the community is 'lafasato' which is an Erica forest covering an area of 43806 ha (28%). Agriculture takes the biggest portion of the modeled area covering 58872 ha (37.5%). Degraded forest covers 6036 ha (3.9%). Bamboo thicket and scattered wetlands cover 4795 ha (3.1%) and 4281 ha (2.7%) respectively. A unique aspect about this area is that it contains 38 small mountains that were identified by the community using their local names. (p. 6)

From the above extract, it is also possible to see that landscape referents are related to traditional ecological knowledge and referents are provided in local languages, thus potentially holding greater meaning for the communities that produce the maps.

5.7.3 Phase 3 - Handing over of the model

Figure 5.1.13: *Preparation for inauguration*

Figure 5.1.13 shows the three models joined together and the community members (and me) preparing for the handing over ceremony, which was to take place the next morning. The purpose of the meeting depicted above, was to agree on which members of the communities would present the model to the invited guests which included a higher-level government official. The model was handed over to local government in the presence of local community, representatives from the Zone, the deputy administrator, and representatives from SOS Sahel, Farm Africa, the Frankfurt Zoological Society and MELCA-Ethiopia. A slide show, which showed the process of building the model, was presented. Members of the local community who had participated in the various stages of model building, explained to the participants the points and features on the map. The participants commented how impressed they were by the power of the model: it demonstrated graphically how knowledgeable the communities are. It also showed, they said, the challenge that both the government and the community face to conserve their environment. This was a critical process in the whole endeavour, as it helped to bring the value of traditional ecological knowledge to the fore in land use management and governance (which as explained in Chapter 2 is neglected and marginalized in modern (often Western influenced) forms of governance), and to elicit commitment to support the decisions taken during the mapping process.

Technical aspects of the P3DM process are summarized below in Table 5.3.

Table 5.3: *Mapping exercise summary fact sheet*

Organizing Institutions	MELCA Mahiber
Funding Partners	Frankfurt Zoological Society and SOS Sahel and Farm Africa
Venue	Dinsho High School
Dates	10 January to 15 February, 2009
Duration of the actual P3DM exercise	One month
Duration of preparatory work	Three months
Participants	
▪ Villagers	Dinsho, Sinana, Goba, Agarfa and Adaba *wereda* elders
▪ Trainees from various institutions	FZS, Bale Mountain National Park and MELCA staff
▪ Students and teachers	Dinsho elementary and high school
▪ Resource persons	Million Belay – P3DM facilitator GIS advisors
The model	
Horizontal sketch	1:12,500
Vertical exaggeration	2x
Elevation contour interval	20 metres
Highest elevation on the model	4120m above sea level
Lowest elevation on the model	3280m above sea level
Final size of the model	360cm x 280cm
Area covered	1,575 sq. km or 157,500 hectares (or 45km x 35km)
Geographical coverage of the exercise	
Region	Oromia
Zone	Bale and West Arsi Zone
Weredas	Dinsho, Sinana, Goba, Agarfa and Adaba

Participatory sketch mapping in Bale

The steps undertaken to conduct participatory sketch mapping are explained in Section 5.2.2 and in Section 6.4.5. As shown in Table 5.2 above, the sketch mapping was undertaken in the Bale area after the P3DM, a process which differed in the Telecho case.

Two representatives from the five villages of Horo Soba, two women as well as the chairperson and manager of the Horo Soba *kebele*, participated in this exercise. Three Development Agents and two Health Officers from the Horo Soba *kebele*, two teachers and one student from Horo Soba School, and five teachers and five students from other schools around Horo Soba also attended and participated in the mapping process. Furthermore, government officials from Education Bureau, Agriculture Office, Culture and Tourism Office, and Land Administration and Environmental Protection Office attended and participated in the mapping process.

Before the start of the mapping (which involved mapping the past, present and future as mentioned above), I told the story that I was told by a Colombian mapping facilitator about a community called Pestos. The community was challenged by social and environmental changes and, after praying to their god and upon his instruction, they used mapping to bring back the memory and the language related to land and also the food and the governance system. The story resonated with the situation here in Bale as the environment and their culture here are also under threat, and the community is also religious.

A 'No Man's map' was created after Poole (2005). As mentioned above, a no man's map is a sketch map taken from an official topo map but with all the information removed except rivers and contour lines and often roads, to help the local community orient themselves. A 1:50,000sketch map was enlarged to 1:2,500 and this base map had only the main road and some of the rivers included. After some discussion, the community added other roads and rivers and removed some. They also, as mentioned above, engaged in long discussions comparing the maps of the past and present, the results of which are presented in Chapter 6.

Eco-cultural calendar

While the elders and the youth were doing the sketch mapping (described above), a group, mainly composed of teachers, prepared an eco-cultural calendar, as described in Section 5.6.3 above. See Section 6.4.4 for further presentation and description of the calendars.

5.8 Participatory 3 Dimensional Modeling of the Foata Mountain Complex

As indicated in Table 5.2, a Participatory 3 Dimensional Model of the Foata Mountain Complex, where the Telecho village is located, was built in December 2010 at Telecho. As already explained in some detail in the Bale case, the P3DM process came about through earlier involvement in another mapping process. After discussing it and its potential, the model was produced at the request of the Telecho community and the government from one of the four *weredas*, Welemera *wereda*, where the bulk of the Foata Mountain is located. The demand arose from members of the community expressing a need to rehabilitate their land and improve agricultural productivity. In addition to the Keble Chairman, Tesfaye Wako, some community members saw another model that had been produced of a mountain nearby called the Wechecha Mountain Complex; they wanted a similar model for the Foata Mountain.

The model was done in collaboration with the Technical Centre for Agricultural and Rural Cooperation (CTA) and the local government. The stated purpose of this model for MELCA-Ethiopia was "to mobilize the knowledge of the local community for better natural resource management and to ensure the passage of this knowledge to the next generation" (MELCA, 2010 p. 1). I used the model building exercise for further data collection within this study, a process which I duly negotiated with all concerned (see ethics discussion in Section 6.8 below).

Close to 140 people worked in shifts to construct the model which covers –a 1:10,000-sketch - a total area of 672 sq km including portions of four *weredas* namely Welmera, Ejere, Adea Berga and Mulo. Assisted by the trainers 14 students, three teachers and the foreign delegates (the trainees) manufactured the blank

model. Approximately 110 elders representing 28 *kebeles* contributed in overlapping groups to the elaboration of the map legend and the depicting of their mental maps onto the model. A number of representatives from local government units contributed to the exercise as well.

The assembling of the blank model using 3mm thick sheets of carton board and measuring 2.8m x 2.4m, took three days while the depiction of the landscape and the location of features relevant to the community, took an additional six days. Once completed, the model stored 48 layers of information including 25 point-, 5 line- and 18 area types.

The project was implemented through the following three phases (similar to those reported in the Bale case above): (i) preparatory, (ii) modeling (iii) handing over. Only those aspects peculiar to the Telecho case will be discussed below, to avoid duplication. Otherwise, the processes were very similar.

5.8.1 Phase 1 - Preparatory phase

This phase lasted three months. Activities undertaken included similar processes to those described in the Bale case in Section5.7.1 above; namely (i) identification of the area (ii) sourcing spatial data and preparing the base map, (iii) choosing the appropriate mapping sketchs (vertical and horizontal) (iv) procuring workshop materials, (v) consulting and mobilizing students and stakeholders, selecting trainees and (vi) organizing the logistics.

Identification of project area

As discussed previously, the Foata Mountain Range was selected for modeling through engagement with the local communities and the local government, after a request from the communities who had seen another model built. In this case, we thought that including the whole mountain range, instead of only what community members could see from their place, would provide a broader perspective of the landscape, with potential to generate discussion for learning and wider social-ecological decision making. Figure 5.2.1 shows Telecho participants looking at the area selected.

Sourcing of data and preparation of the base map

Figure 5.2.1: *Topo map showing area identified for modelina*

Figure 5.2.2: *Preparation of the base map*

Figure 5.2.1 shows the topographic map bought from the Ethiopian Mapping Agency. The map was further digitized and the base map was produced (see Figure 5.2.2). Preparation of the base map featuring colour-coded contours was, once again the responsibility of a GIS consultant. Having learned from the Bale experience, we had numerous preparatory discussions on the sketch of the map and the areas to be included prior to the base map preparation process. This clarity seems to have enabled an easier process of producing the base map; and it was produced without problems this time. The model measured 240cm x 280cm and was constructed using two base tables each measuring 280cm in length and 120cm in width; which was also an improvement on the Bale case as indicated above. The height of the table was 60cm. Cardboard measuring the same size as the base map and the table (120cm x 280cm) was procured from a local paper factory. The cutting of the cardboard was not perfect so we had to organize a group of young people who measured each of the cardboard pieces and cut them to size at the start (another improvement on the Bale case).

Procurement of workshop inputs and their on-site delivery

As in the case of Bale, we were able to procure most of the necessary materials from

Merk, a big market in the middle of Addis, except for the crepe papers and coloured pins. This time, the crepe paper and the colored pins were sent from the CTA according to specifications noted in the handbook *Participatory 3-Dimensional Modelling: Guiding Principles and Applications*, the same handbook that we used for the Bale case (Rambaldi, 2010).

Figure 5.2.3: *Materials for model building*

Figure 5.2.3 shows some of the materials used for the model building process: paint brush, paints, adhesive tape, plastic jars and cardboard.

Consulting and mobilizing students and stakeholders

Figure 5.2.4: *Community consultation*

Figure 5.2.4 is a photograph taken during one of the community consultations with the Telecho community. Here, the head of the *kebele*, Tesfaye Wako, the man wearing a cap and sitting in front, talks about the previous relationships that the community had with MELCA-Ethiopia.

In order to give adequate attention to the mobilization and participation of the villagers, a member of the staff of MELCA-Ethiopia, Shimeles Tegegn, organized four meetings with the heads of the four *wereda* administrators and representatives of local communities. This was to let them know why the mapping was going to take place, and to ask the *kebeles* to send representatives and get their support for the follow up decisions that would come at the end of the process. There were also a number of meetings with the Telecho communities (Figure 5.2.4) to explain the purpose of the model to them, and to request and establish their willingness to participate. The communities were generally happy with the processes proposed, but the hall where the modeling was to take place, was extremely run down and dilapidated and had to be renovated. This involved considerable coming and going and was a logistical nightmare at some points as transporting gates and other materials proved to be a challenge. The advantage was that we could replace the existing roof with transparent roof sheeting, which allowed for much improved lighting than would otherwise have been the case. The road to the village and community was also in bad shape and the local government and the community had to engage in some maintenance actions it to make it passable.

Preparation of the draft legend

Figure 5.2.5: *Checking the draft legend with wider members of participating group*

Figure 5.2.5 shows Negasse Ayano and Wro Deneke Bisrat (two elders) showing the draft legend that they developed to other participants in the group. Here they can be seen asking for approval and additions. As noted above, legend making is one of the

most critical processes in participatory mapping as it is key to ensuring full participation of the local community.

Four elders, three men and one woman, participated in the legend making. As in the Bale case, other community members added to, refined, and elaborated the draft legend as the process unfolded. Prioritizing and getting consensus amongst the mapmakers on which items were relevant and what should be featured on a map, was, as in the case of Bale) the first step in the participatory process aimed at addressing community-based issues related to the territory and its resources.

5.8.2 Phase 2- Community mapping phase

As in the Bale case, the preparatory phase was followed by the community mapping phase. All activities within this phase were carried out at the rehabilitated Telecho Community Hall. It involved the following key activities: introducing and orienting trainees on facilitation techniques and participatory 3D modeling; assembling the blank model, drafting and fine-tuning the map legend; transposing cognitive maps; transferring data from and to the 3D model; and extracting data using digital photography.

Introducing and orienting trainees on facilitation techniques and participatory 3D modeling

Figure 5.2.6: *Providing orientation to the model builders*

Figure 5.2.6 shows me explaining the process to the trainees and the students in front of the topo map of the area selected for modeling.

This was an essential process for developing understanding of participation and purpose, and was conducted in a two-day workshop in Addis Ababa at the Desalegn Hotel where participants were exposed to the principles of participatory mapping and ethical issues. This was supported by two films produced by CTA documenting the training process. Participants were given an introduction to the stages of the model building, and each participant was given a copy of the P3DM guidebook for reference purposes.

Assembling the blank model

Figure 5.2.7: *Model building*

Figure 5.2.7 shows a model in the process of being built. The model building process followed was similar to that of the Bale map, starting with tracing (by tracers), cutting (by cutters) along the contour lines, and building (by builders who fix the different layers one on top of the other with glue. Trainees, local youth and some elders participated during the assembling process. It was an exhausting process but the trainees worked at it enthusiastically: they could see the progress of the model and they were fascinated by the emerging shape of the landscape. As in the case of Bale, the trainees easily mastered the techniques of tracing, cutting and building the model.

Drafting and fine-tuning the map legend

Figure 5.2.8: *Finalized legend*

As mentioned above, a draft legend was made before the start of the model building. After the assembling of the model was finished, elders came to populate the first model. The first elders who had developed the legend presented it to those who came to map. In this process, members of the community added and refined some items, but accepted almost all of the legend items produced by the first group (Figure 5.2.8).

Transposing cognitive maps

Figure 5.2.9: *Transposing cognitive maps*

Figure 5.2.9 shows an elder carefully painting an area on the model. As in the previous case, members of the community used paints, pins, lines and polygons to populate the models with their knowledge.

Transferring data from and to the 3D model

In this case, some information was corrected using the topo map. A road diverging from the road going from Addis Ababa to Holeta and heading to Muger Cement factory was incorrectly placed. The local trainees discussed this with the local community and corrected it.

Extracting data using digital photography

Figure 5.2.10: *Photographing model for digitization*

Figure 5.2.10 shows the built model at a perpendicular angle being photographed. A good photograph was taken of the model. This was done by tilting the model and taking photos with a professional camera from a distance of four metres. The information written about each of the points, and the rivers on the model was fixed with pins to be clearly seen when the photograph was digitized later on. At a later stage, the photos of the two models were pieced together using Adobe Photoshop and digitized, with the same purpose as that explained in the Bale case.

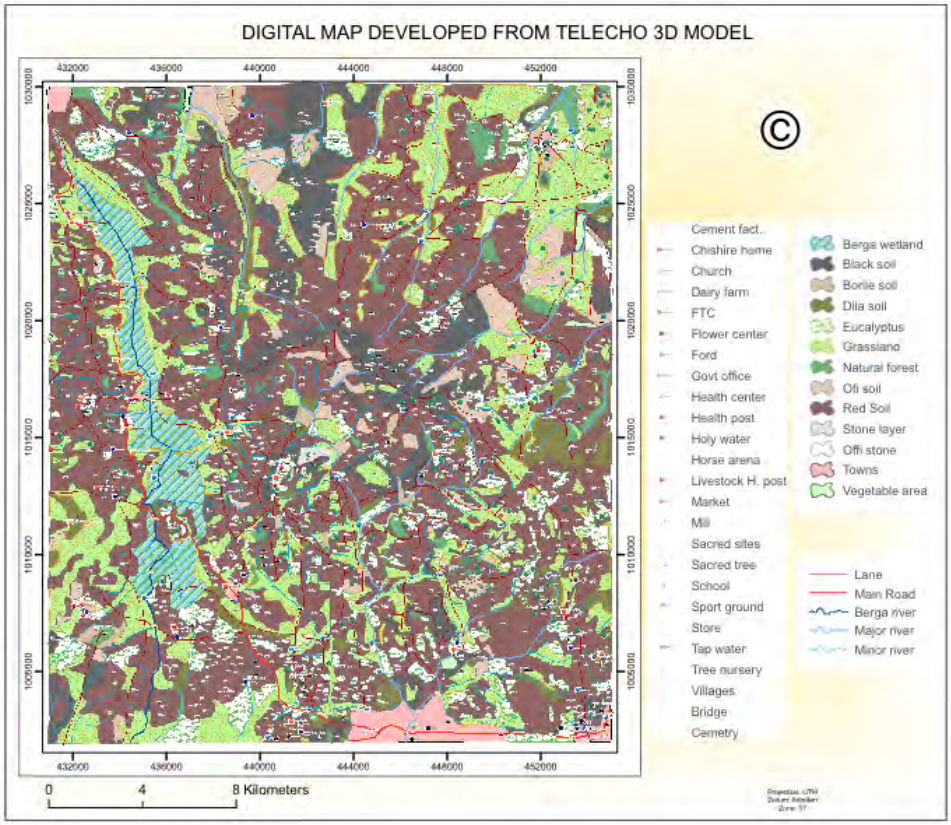

Figure 5.2.11: *Digital map developed from Telecho 3D model*
(for a more detailed version see Appendix 8)

The GIS map shown in Figure 5.2.11 reflects the conception of people of their landscape, since they constructed it according to the legend produced by them. As the legend is a language of communication, communities, through this technology, are able to invite others to read it as they have crafted it. It would have been interesting too if they had been able to handle the GIS process, but this was not possible.

The Telecho P3DM model was made from two blocks. It represents a total area of 67997ha and is composed of 13 land cover types. MELCA-Ethiopia summarises the information that can be obtained from this map as follows:

> From the total area modeled, the dominant land use/land cover type is red agricultural soil, which covers 30840ha (45.4%); followed by grassland covering 14157ha (20.8%). An impressive aspect about the area is that it has an extensive wetland area covering 2806ha (4.1%) and a small natural forest covering 1491ha (2.2%). This might have some implication for the significance of the area for the conservation of natural habitats (MELCA-Ethiopia, 2011b, p. 4).

As in the Bale case, the map also contains traditional ecological knowledge of

biocultural diversity which, through this process, was made available in wider knowledge contexts for planning and decision making (see Section 6.5).

5.8.3 Phase 3 - Handing over of the model

Figure 5.2.12: *Inauguration process*

Figure 5.2.12 shows some of the people who attended the inauguration ceremony. Over 200 invited guests came and the local communities presented their map to those who attended. This ensured that the rest of the community was aware of what had emerged from the model building process. The local government representatives pledged to work with the community. Other results of the process are discussed in Chapters 6 and 7 in more detail.

The technical aspects of the mapping process are summarized below in Table 5.4.

Table 5.4: *Mapping exercise summary fact sheet for Foata/Telecho*

Organizing institution	MELCA-Ethiopia
Funding partner	Technical Centre for Agricultural and Rural Cooperation ACP-EU (CTA)
Venue	Foata Rural *kebele* hall
Dates	8-18 December 2010
Duration of the actual P3DM exercise	Ten days
Duration of preparatory work	Three months
Participants	
▪ Villagers	Welmera, Ejere, Mulo and Adeaberga *weredas* elders

▪ Trainees from various institutions:	International trainees from: Kenya, Uganda, Tanzania, Benin, South Africa and Cameroon National trainees from: Wereilu community of Wello, ORDA, Oromia Land Use and Environmental protection Bureau, Welmera, Mulo, Ejere and Adeaberga *weredas* agriculture offices, MERET-SNNPR and MELCA-Ethiopia
▪ Students and teachers	From Telecho junior secondary and Ilu Berga elementary school
▪ Resource person	Million Belay and Giacomo Rambaldi
The model	
Horizontal sketch	1:10,000
Vertical exaggeration	2x
Elevation contour interval	20
Final size of model	240cm x 280cm
Area covered	24 by 28 kilometres or 672 Km^2/ 672,00 hectare of land
Geographical Coverage	
Region	Oromia
Zone	Finfinne Area Special Zone
Weredas	Imera, Adeaberga, Ejere and Mulo

Participatory sketch mapping and Ecological calendar

This process took place with the Telecho community, as was described in Section 5.2.2. The Telecho *kebele* was contacted for a map making process with purpose of understanding the history of seed diversity in the area. The area to be mapped was identified with the local community from the topo map and was digitized. The digitized map was printed in an enlarged form to the sketch of 1:2,500. This was taken to the community. As is explained in Chapter 6, maps of the past and present were produced and recorded for further analysis. The eco-cultural calendar was produced following the same process and logic of my visit to the community in April 2011, during a visit for further data collection.

5.9 Data analysis

As shown above in Sections 5.1 to 5.7 this research process was complex and generated a considerable amount of data over an extended period of time. The data covered all of the key interests of the research, namely biocultural diversity, learning, agency and change, and was constructed in two case study sites using intensive research processes as discussed above. Analysing the data was initially a

challenge as I was faced with the challenge of analysing the data a) processurally to reflect the process; b) thematically to reflect key themes and insights relevant to the research questions; and c) theoretically to show insights into the learning drawing on some of the theoretical perspectives (e.g. morphogenesis) as discussed in previous chapters of the study.

To respond to these challenges, I undertook a two-phase data analysis process which involved:

- **Phase 1**: Narrative constructions based on the processes followed (outlined above) but using the categories of biocultural diversity; education (to highlight the educative intervention aspect of the mapping process and to help me reflect on my own role in the process); learning (to highlight emergent learning interactions) amongst those participating in the process; and agency (to highlight any emerging evidence of agency. These categories are used to construct the narrative analysis in Chapter 6, providing a rich description of the topic. I used photographs as 'cues' that represent key moments in the process to guide the narrative construction. Although there were many more photographs showing the process, key photographs were selected to provide these cues, and are in some ways 'representative' of a whole range or more compiles and ongoing social interactions during the mapping process. This analysis was primarily inductive and used 'thick description' (see Chapter 6).
- **Phase 2:** A second phase of analysis was then undertaken, after the raw data had been reduced and presented in narrative form in Chapter 6. This phase of analysis was abductive, and worked more closely with interpreting the data using theoretical perspectives deliberated on in Chapters 2, 3 and 4 of this study. This was to provide in-depth analysis of what had been observed in relation to the main research questions. This analysis presents the main 'findings' of the study, and is included in Chapter 7.

Danermark, Ekström, Jakobsen and Karlsson (1997) differentiate between deductive, inductive, abductive and retroductive modes of inference in research. For critical realist studies they state that any combination of inductive, abductive and retroductive analysis is valid. Inductive analysis involves drawing conclusions from a number of observations; and seeing similarities in a number of observations (the mode of inference used primarily in Chapter 6). Abductive analysis involves interpreting and recontextualising the data within a conceptual framework or set of ideas. It involves being "able to understand something in a new way by observing and interpreting this something in a new conceptual framework"(p. 80). In the case of this study I drew on theory and contextual insights to understand the learning and agency, and resilience potential associated with the mapping processes. Retroductive analysis, they say, involves moving "from a description and analysis of concrete phenomena [e.g. the mapping interactions] to reconstruct the basic conditions for these phenomena to be what they are"(ibid.). Retroductive analysis involves 'thought experiments' and analysis that produces knowledge of transfactual conditions, structures and mechanisms that cannot be directly observed in the domain of the empirical. In this study, it helped me to identify what qualities should exist for improved learning, change and resilience to exist in the contexts in which the research was conducted (see Chapter 7). Abductive and retroductive modes of analysis were mainly used to construct interpretations and explanations presented in Chapter 7.

As the study was also interested in the relationship that exists between participatory mapping, learning, agency and change, it required analytical and explanatory processes that took account of causality. The study did not seek to produce correlational forms of causality, but rather *explanatory* analyses of causality within a critical realist framework. Danemark et al. (1997) explain that "If we wish to understand the dynamic dimension of reality [which this study was interested in] … the abstract and structural analyses must be supplemented by analysis of *the causal conditions*" i.e. causal analysis. They go on to say that "causal analysis deals with *explaining* why what does happen actually does happen" (p. 52, emphasis original). They however, note that such explanations do not take the form of natural laws as is

the tradition with natural sciences, but rather that such explanations recognize that causes are about relations, and the nature of relations, and about *how objects work* (for example, how the maps and models and mapping processes work to enable learning and/or change to emerge). This is the focus of the analysis in Chapter 7, which seeks to make explicit the *causal powers [and liabilities]* that exist within the participatory mapping processes as they relate to learning, agency development and resilience building. This is consistent with critical realist research which emphasizes generative mechanisms at the level of the real, and their influence on morphogenic processes of change (see Chapter 7 Section 7.4.1).

Within this process I also refrained from generalizing from a case study, but took account of possibilities for generalization that *do exist* in the context of case study/intensive research, as defined by Sayer (1992) and Flyvberg (2006; see section 5.9 below.

5.10 Validity and trustworthiness

Validity may be seen as the "correctness of credibility or a description, conclusion, explanation, interpretation of any other sort of an account" (Maxwell, 2005, p. 106). The two main threats to validity in qualitative research are researcher bias and participants reactivity (ibid.). "Researcher bias may influence the researcher to select only certain types of data. This can be overcome by the researcher's declaration of personal values and beliefs that he/she brings into the study" (Mukute, 2010, p. 144). In this research I declared openly that I was both an NGO worker and a researcher (see Section 1.2). I had a vested interest in using participatory mapping as a tool to mobilize local communities to take action. But I used member checking and continued engagement with the local communities, and ongoing reflexivity in the research process to avoid selective use of data. Furthermore, I undertook model development in four areas in Ethiopia and selected only two of them (Bale and Telecho) to study as mentioned in Section 1.5. The experience and data that I had from the other areas helped me to reflect on insights gained and processes in the two study sites, and this increased reflexivity, and it helped me to avoid selective use of data. I also asked other members of the MELCA-Ethiopia staff to conduct some of

the interviews and I compared mine with theirs as a further strategy to reduce potential biased readings or constructions of the data. In addition to this, both community members and colleagues took part in facilitation, as in the case of the community members presenting the model to the newcomers. It was always difficult for the newcomers to understand the modeling process but once those who had been there explained to them in their own language and showed them how to do it, the newcomers found it easy and finished their part in much shorter time than the first group.

Maxwell (1992) presents a typology of five types of validity including: descriptive validity, interpretive validity, theoretical validity, generalizability and evaluative validity. I used descriptive, interpretive validity, theoretical validity and generalizability to ensure the validity of both my data collection and my analysis in this study.

In descriptive validity Maxwell's (1992, p. 285) concern is for the factual accuracy of qualitative research: that researchers are not making up or distorting the things they saw and heard. He divides it in two categories: the first is the descriptive validity of what the researcher reports having seen or heard, and the second is the validity of accounts of things that could in principle be observed but are in fact inferred from other data. In my case, as mentioned in the previous paragraph, I used strategies including member checking and continuous engagement with the research group to ensure validity. I also used photo narratives as a first level of analysis and I checked this analysis with those who had participated in the research. Areas of the landscape which were included in the model were also used for sketch mapping, reducing the bias that I may have had during the first mapping processes. This also helped to obtain the views of a larger segment of the community than were involved in the P3DM building about the history and the current understanding of the landscape.

The second type of validity described by Maxwell (1992) is interpretive validity. Maxwell (ibid.) states that interpretive validity involves the quality of inferences made from the words and actions of participants in the situations studied. It applies also to the unconscious intentions, beliefs, concepts and values of these participants.

To ensure interpretive validity I tried to comprehend the values of the community not on the basis of my perspective but those of the participants and the situations of the study area. Again the member checking strategy that I used, based on the photo narratives helped to avoid misinterpretation. Member checking was undertaken on 27 and 28 April 2011 for the Telecho community and on 5 and 6 May 2011 for the Bale community. The community members and my colleagues who co-facilitated with me corrected some errors and added some more reflections. Historical data recorded in documents and geographical information contained in topo maps also helped with interpretive validity.

Maxwell (2005) also emphasizes the importance of theoretical validity. In this study I ensured theoretical validity by in-depth reading into the concepts and processes that were significant to this research, namely biocultural diversity, participatory mapping, learning, social change and resilience. Contemporary views on these were deliberated in some depth in the study (see Chapters 1 to 4), and those views on these concepts that seemed most appropriate for addressing the research questions and the broader context of community-based learning and decision making were worked with throughout the study in relation to the research questions. The interest in community participation in mapping, learning and change processes drew me to socio-cultural theories of learning and to critical realist explanations of change, which I have worked with consistently and with theoretical and methodological rigour throughout the study. Clear arguments for these perspectives were presented.

Another type of validity discussed by Maxwell (2005) of relevance to this study is generalizability. Generalizability refers to the extent to which one can extend the account of a particular situation or population to other persons, times, or settings than those studied (ibid.). It is divided into internal and external. Internal refers to generalizing within the community, group or institution studied to persons, events, and settings that were not directly studied. External generalizability refers to other communities, groups or institutions. I was cautious in making inferences based on individual interviews or focus group discussions in relation to the larger community, other similar populations, or other individuals. As Maxwell (1992, p. 294) warns,

interviewing poses some special problems for internal generalizability because the researcher is usually in the presence of the person interviewed only briefly, and must not necessarily draw inferences about the rest of the informant's life, including his or her actions or perspectives from what happened during that brief period. As can be seen from Table 5.2, I engaged with the local community for a prolonged period of time, going back again and again to interact with them. Through this strategy I was able to interact more with some of the interviewees and to understand their lives better. This helped the analysis process. I also used three participatory methodologies (sketch mapping; Participatory 3 Dimensional Modeling and Eco-calendars) which helped to get different actors involved with different methods, and which allowed me to gain more insight into their thinking and knowledge. I worked with generlizability as discussed by case study researchers, who argue that it is possible to offer 'fuzzy' generalizations from case study research; which means that recommendations, claims or assertions should be tentative, in recognition that there *may* be similarities with other contexts, but that these may also differ. Bhaskar (1978, p. 227) argues that generality in social sciences cannot exist at the level of the empirical (as all humans experiences are differently expressed), but that generality can be established at the level of 'deep structures of reality' or the real domain. He expresses it in this way: "Scientifically significant generality does not lie on the face of the world, but in the hidden essence of things p. 227". Thus, according to the critical realist conception of reality, "scientific generalizations largely refer to transfactual conditions, to the more or less universal pre-conditions for an object to be what it is (ibid.)". Thus, in the case of this study, this might refer to those conditions that enable communities to learn in and through activities such as participatory mapping; or those conditions which influence the resilience of such communities. This is discussed further in Chapter 7.

5.11 Ethics

As indicated above, there were many people involved in the different mapping processes. Ethical issues pertaining to this study involved ways of involving people in the research, but also issues associated with the purpose and practices of mapping.

Fox et al. (2006) reflect how dangerous mapping can be if it is not done in ethical manner.

> While mapping is useful for bounding and staking claims to ancestral or traditional territories, it also facilitates a shift toward exclusive property rights. It provides outsiders with a legal means to gain access to common property resources. Common property resources are managed through rules and practices that enable sustained control of knowledge about the location of valuable resources. By making knowledge accessible to all, mapping weakens existing common property management systems. Mapping generally promotes practices that shift attention and concern away from a fluid human/environment relationship to a relationship with quantifiable limits implied by boundaries/borders. So the newly acquired authority to define and exert control over the use of space has begun to compromise the customary uses and governance systems it was intended to protect (104).

The context that Fox et al. (2006) talk about (also discussed in Section 3.7), is quite different from the context that I was researching. In MELCA-Ethiopia's work, and in this study I was not dealing with land ownership issues, but rather with processes of supporting communities to express their knowledge of landscape in order to take ownership of ways of responding to degradation of the landscape. However, the statement underscores the necessarily of ensuring the ethicality of mapping process.

Rambaldi, Chambers, McCall and Fox (2006) suggest a range of measures to make sure that the ethical dilemmas mentioned by Fox et al. (2006) are addressed. These include being open and honest, being clear about the purpose and making sure that the purpose of the community comes first, avoiding raising false expectations, being sensitive and considerate of people's time, avoiding outlining boundaries, ensuring the custodianship of the community by leaving copies of the maps with them, ensuring the intellectual ownership, getting the free and prior informed consent of the community, prioritizing the local toponymy and selecting mapping methods suited to the local community.

As mentioned previously, the mapping processes all took place in areas that MELCA-Ethiopia had been working in before. Even then, before the mapping process took place, we went from village to village and had meetings with the local community to explain to them why the mapping was happening (see Sections 5.1.4 and 5.2.4). During these meetings, we also asked the community to identify representatives

who could participate in the mapping with us. The community invariably agreed to the request, and identified representatives who could work on the mapping. In all cases community members were informed that the processes would be used for research purposes and that photographs would be taken of the interactions. Community members agreed to this and were happy to see the outcomes of this in the photo narratives. No objections to the photo narratives were received from community members who had been part of the mapping process. When interviews were recorded, I asked for permission from respondents before making audio-recordings. I also informed community members that they could withdraw from the processes should they so wish. In these ways I tried to maintain what Bassey (1999) refers to as 'respect for persons' and 'respect for democracy'.

We were also careful not to raise expectations and explained to the community how the maps could potentially benefit them. We asked if they recognized those benefits and agreed with the purpose. In all cases they said that they did.

In other areas, as in the Telecho case, the models were developed in response to a request by the community. In all cases we avoided delineating boundaries. Even when the communities wanted to do this, we refused to engage in the activity of delineating boundaries due to possible political consequences. We faced a minor problem in Bale when members of the community asked why a certain forest was not on the map. We explained that the map is not for boundary delineation but for visualizing their history and knowledge and to support them to make decisions and take action based on the mapping process and product.

I used the local names/toponyms on the maps and on the legends to ensure understanding, ownership, and to facilitate communication between insiders and outsiders. Finally, the models stayed with the local community, as it is almost impossible to move them around. This ensured ownership by the local community. We have left the copies of the sketch maps with the local communities and have taken only photographs of these artefacts. The communities bring the maps to meetings that we organize and take them back after using them to present what they have done. The distribution of the digitized versions of the maps will be

discussed with community members after they have been shown the final products (this was not possible to do before the finalization of the thesis as the digitization process has only just been completed) before they are used for any specific purpose, and will be used only with their permission.

5.12 Reflexivity

Reflexivity is identified by a number of qualitative researchers as being a significant process of ensuring research quality, particularly in studies where researchers are also partly interventionists or actors in another role, where their subjectivity is 'admitted' into the research process.

As noted above, and in Section 1.2, I held the dual role of both researcher and NGO Director during the mapping processes. This had positive consequences, and some negative consequences. My role as a researcher allowed me to ask critical questions and help the local community reflect upon changes in their landscape and relationships observed among components of the landscape; this provided more in-depth data. The down side of this is that I was deeply involved in logistical and organizational matters and this, to some extent, hampered effective allocations of time for data collection. To address this, I went back after an extended period of time and extended intensive data collection activities, as described in Section 5.4 (see Table 5.2). This, while initially a negative effect, had the positive effect of enabling me to get reflections of the local community after the event has passed and also allowed me to validate the data. As part of ensuring reflexivity in the research process, I reflected my initial analysis back to the communities and did the same with those involved in data collection. I also produced two case studies to develop reflexive perspectives on similar events but with different communities. Therefore, I can say that prolonged engagement and checking the accuracy of the data collected is critical for research reflexivity, especially when one plays a double role of researcher and development worker. As Burns and Chantler (2011) state:

> Reflexivity is difficult to define precisely, but there is general agreement that reflexivity is primarily about challenging the notion of objective, neutral and value-free research, focusing instead on accounting for subjectivity … [and that] … ideally, reflexivity focuses on positioning the researcher within relationships in a move towards more egalitarian research practices and

> towards creating the knowledge that incorporates an understanding of the power relations that are constitutive of, and reproduced through, research. (p. 72)

This meant that I had to take account of the relational aspects of the research, the processes of building and establishing trust and the educative role that I played in the research. I was always cognizant of the fact that as the Director of the NGO I had powers to influence and shape the processes, which I did as outlined above. I tried to deal with this in the research through being open and honest, and always requesting others' permission to work with them. I also, through careful reporting in Chapter 6, took account of the influencing role that I took in the process, and how I also supported others to take on educational/training/developmental worker roles; making the 'educative process' a key category of analysis in the construction of the photo narratives.

Bourdieu (2004) refers to yet another notion of reflexivity, one which concentrates less on narcissist renditions of the researcher and his/her role in the research, but one which takes broader account of the research as a social practice making a contribution/s within a wider social/socio-logical/material landscape. With this notion of reflexivity at hand, it was encouraging that the research process, and my involvement as NGO worker, allowed for follow up on the decisions that members of the communities had made during the mapping process as a way of improving the landscape and contributing to the well-being of the life of people in the communities. One example is, after the P3DM process in Telecho, the community decided to organize themselves to undertake some rehabilitation of their land (see Section 6.4.5.4). As an NGO concerned with such matters, we were in a position to take a decision to assist further through proposal development with the community concerned. We also agreed on a general principle that our involvement should not create dependency and there should be a time when they would not need us anymore. This discussion has also included how much they can do and what kind of support they need from us. After this process, we secured funding from the Finnish Embassy in Ethiopia and have started working with them.

This 'real world' broader contribution of the research to ongoing social change

processes not only shows that the research has potential catalytic effects in the context of wider social change processes (which Bourdieu alludes to in his concept of reflexivity), but has also given me some sense of satisfaction that I am not there only as individual researcher interested in a PhD, but also as a community worker who can contribute towards the societal changes and rehabilitation of degraded ecosystems. This accords with some calls for research in Africa to have both academic rigour, and societal relevance (UNEP, 2008). This approach to reflexivity is also being valued in the field of environmental education in Africa (Mukute, 2010; Masara, 2010).

However, even this orientation to reflexivity cannot be taken for granted or without ongoing reflexive engagement. While I could see the positive developments out of the Telecho P3DM processes, as described above, I was still troubled, especially about our involvement with the Telecho community. This is because our organization, MELCA-Ethiopia, is the first to work within a development framework with this community which is still relatively well off from a livelihood perspective, but is suffering from an impending socio-ecological crisis. Reflexive questions arising at present about this involvement are for example: how much involvement is enough? Will we create a conflict among the community members and invite jealousy by working with some and not with others as our capacity is limited? Will we enforce the traditionally maintained inequality in the society by choosing some elders to come and participate and thereby strengthening their social standing and perpetuating long established dominance by a group? Have I really thought about the implications of mapping and what if things go wrong in terms creating old tensions and surfacing problems that we cannot address? Are we creating expectations? These are, I suspect, the ever-present reflexive dilemmas of NGO workers and researchers in Africa. Wals (2007) in the title of an article on social learning, speaks of “reflexively fumbling our way to sustainability”, which indicates that such processes may be normal ways of being in the world in complex and rapidly changing societies.

5.13 Conclusion

This chapter has provided a detailed rendition of the research methodology and research methods and processes engaged in this study. It has discussed the mapping processes in some depth, to provide insight into how the research process unfolded, and has also provided insight into the way in which I approached general research issues such as validity and trustworthiness, ethics and data analysis. In the next chapter I present the first layer of data analysis, which was constructed using a photonarrative approach.

Chapter 6: CONVERSING WITH THE MAPS

6.1 Introduction

This chapter presents the results of the Participatory Mapping (PM) processes in the two study cases. As indicated in Chapter 5, I used photo narratives as a method of analysis. I used carefully selected photographs, which acted as 'cues' to describe insights into the biocultural landscape, the education process and the learning interactions that occurred and emerged during the course of the PM process. I used the interview data and documents and interactions and contents of the maps where relevant to develop 'full descriptions' of the processes as they unfolded, using the photographs as 'cues'. Thus, as indicated in Chapter 5, I used the photographs selectively (I chose certain 'representative' photographs from a much wider selection of pictures documenting the process). While the photographs are 'representative' they were also carefully selected for their capacity to provide 'cues' that could communicate detailed, yet broad insights into the raw data.

I recognize that the selection of the photos shown in this chapter is my own and in this way I am involved in the creation of the story as much as those who participated in the process. Bohnsack (2008) calls this a relationship between *representing picture producers* (those who take the pictures or produce them) and *represented picture producers* (all persons, beings and social scenes which stand in front of the camera.) She says that methodologically it is easier to deal with the explanation if both were participating in the process rather than if the one analyzing the photograph is from a different era. To address this, I took the pictures back to participating communities, and checked with those who were in the picture or involved in the process for correctness of my interpretation. This, to some extent, makes the analysis work with the photographs, consistent with Bohnsack's recommendation.

6.2 Using categories of analysis

As indicated in Chapter 5, I found four categories of analysis to be significant in the inductive analysis of the data as I found them present across all data sources. They were also consistent with key interests in the study. They are biocultural landscape, education, learning, and agency. I work firstly with the former three categories

(throughout the photo narrative), and include a section on agency at the end of each case study. I briefly explain my interpretation of these categories next, before moving into the actual 'photo narrative stories'.

- **Biocultural landscape**

As explained in Chapter 2, the level of analysis in terms of biocultural diversity in this study is at the ecosystem level. Biodiversity works at genetic, species and ecosystem levels. By using the ecosystem as a level of analysis, the presentation of data focused on what members of the community said and put on the maps which reflects knowledge of the major components of the ecosystem including the rivers, sacred sites, mountains, grazing lands, agricultural lands, wetlands and forest lands. The social-ecological complexity of the landscape, as it became evident through the presence of infrastructure including roads, schools, religious sites and government buildings, is included in these descriptions. Therefore, each of the biocultural landscape/contextual analysis sections will begin by describing the activities shown in the photograph, and will also explain what the colours, pins, polygons and lines used on the model (as placed there by community members) say about the landscape as described by local community members during the model building process.

- **Education**

Ball and Forzani (2007, p. 530) describe educational processes as consisting of an interaction among the instructor, the learner and the content. This involves interpretation of the content of instruction by the teacher/facilitator, and the interaction that both the facilitator and the learner have with the content and with each other. Using the category of educational process in the sections below, I will explain my own role in the facilitation process to start with, and also show how the local community took over the facilitation activity at a later stage, becoming the facilitators themselves. I also explain the roles and contributions of others such as the trainees and MELCA-Ethiopia staff who acted as facilitators during the process. In these descriptions, the maps are the content or the text in the teacher-learner-text interaction. The learners are the majority of the community members. This category

of analysis helps to explain the educational relationship that existed between the facilitators and the learners using the maps or models as content or text.

- **Learning**

This category of analysis helps to make visible what the participants said they gained individually and as a group. It also includes the evidence of learning, as emerging from reflection processes. Rickinson, Lundholm and Hopwood (2009, p. 4) define learning as "a process of change in the way we look upon the world – our thoughts, feelings, and actions – which is dependent on the learner, the object of learning, and the physical, biological, social, cultural and economic situation and settings". I will work with this definition as it encompasses change and as it indicates context as one of the critical factors influencing learning. Based on the interviews that I had, both during the process and after the mapping, I will describe the kind of learning that has happened.

6.3 Case Study 1: Participation, learning and agency in the Bale mapping activities

This section will present the data from the Participatory 3D Modeling, sketch mapping and eco-cultural calendars that were produced in Bale. It will start with the legend making process, which is the backbone of the participatory mapping process, and describe the modeling process, the cognitive mapping and the discussions that followed the finalization of the models. It will then describe the results of the eco-cultural mapping and the sketch mapping experiences. The Bale case will end by discussing evidence of the agency created as a result of the PM experience.

6.3.1 Legend making and presentation

Figure 6.1 below represents the legend making process. This was the first process to be undertaken before the mapping activity started (other than the preparatory activities described in Sections 5.7 and 5.8).

Figure 6.2: *Aman Mame presenting the draft legend to participants and asking for their comments*

- **Biocultural landscape**

Map makers use maps to convey information mainly through visual languages made out of legend items, a combination of symbols (points, lines, polygons and volumes), their variables (hue, orientation, shading value, shape, size, and texture), and interpretation keys (Rambaldi, Kyem, Mbile, McCall & Weiner 2006, p. 2). In this picture, Aman Mame, one of the elders who participated in the legend preparation process, is explaining the legend to those who came to populate the model with their cognitive maps. The legend is divided into three sections. In the first section, coloured pins with a different hue, size and shape are used to indicate points/sites of cultural and infrastructural significance. These include sacred sites, mineral waters, and infrastructure such as schools. The second part includes identifying colours and their hue and shading to designate agricultural, forest, grazing, wetland and mountainous lands. The third involves using lines to indicate roads, streams and rivers. The legend that the elder is explaining contains symbols for critical water points, sacred sites, infrastructures, spiritual places, forests, livelihood related places, etc. Detail of the legend can be seen in Figure 6.2 below.

Figure 6.2a: *Legend of the Bale community showing points, lines and polygons*

Figure 6.2b: *Finished P3DM showing the usage of the legend*

As can be seen from Figures 6.2a and 6.2b, the community identified places of significance for them on the legend. The Bale community is agro-pastoral. The local people used the legend shown in Figure 6.2a to indicate the biocultural landscape. They identified 29 points, four lines and 17 polygons (see Appendix 6). The yellow papers are the names of places called toponyms in cartographic language. Forexample, five kinds of forested areas were identified according to the dominant tree species on the landscape. Areas dominated by *haxo* (*Hageniaabyssinica*) and *garamba* (*Hypericumrevolutum*) are called *Laffahaxofigaramba* (land covered with *haxo* and *garamba*) and are indicated in red (upper right corner on Figure 2a). The

fruit of *haxo* is a medicine for tapeworm and a valuable material for house construction. *Garamba* is used as medicine, for construction and is highly valued for its honey and for preserving ghee. Land above the tree line is called *sato* (*Erica arborium*) and no other tree grows at this high altitude (3750m asl). The people use *sato* as fodder for their animals, as fuel wood and for construction purposes. The Bamboo forests, (*Bosona Lemion*), are also useful for construction and for honey. Land covered with eucalyptus and other exotic species is called *Bosona Nemi-tolche* meaning man-made forest, and is used for fuel and construction. The community noted that these plantations were spreading as they grow fast and can be converted to cash quickly. Dense forest areas were also identified, usually in inaccessible areas, and these are protected for spiritual reasons and are called *Badda Guracha*. There are also three kinds of agricultural lands identified according to the colour of the soil: *Koticha* (black soil), *Dimille* (brown red soil), *Dalacha* (grey soil).

The coloured pins shown scattered on the model in Figure 6.2b indicate places too little on this large landscape to be indicated with paints or polygons. Sacred sites on the land are identified as *ujuba* and they take the forms of a single tree, a group of trees or a boulder. These are the blue rounded pins on the model. These places are important for environmental management and social cohesion. *Melka* (a crossing point on a river and indicated with a flat topped blue pin) is also sacred, mainly used by women for praying in times of drought or environmental problems (see Table 6.1). *Hora (*flat topped green pin*),* mineral water, and *Holqa*, mineral soil, also have some form of sacredness: people who are participating in anti-social activity are forbidden to use these places (see Section 6.2.3). They also serve as cultural information exchange places as hundreds of people gather every day to let their cattle drink mineral water. Infrastructures related to health, education, religion and administration are also indicated on the model with different coloured pins. The lines are mainly rivers and roads but the rivers are identified by name and viewed as critical by the people (see Table 6.1 and 6.2).

Figures 6.2a and 6.2b show a sophisticated relationship between the people and their landscape. The sacred sites are used for governing the people's relationship with each other and with their environment and those who manage this relationship

claim their mandate from these places. Wild plants and animals are also found at sacred sites showing the value of these places for conservation. Table 6.1 details the cultural and livelihood relationship that people had with the changing environment and climate and, read with Figures 6.2a and 6.2b, demonstrates the complex and sophisticated understanding and relationship that people have with their biocultural landscape.

The following sections will explore the educational and learning process that may have taken place during the mapping practice.

- **Education processes**

As explained in Section 6.3.2, educational process is as an interaction between the instructor, the learner and the content. The pictures (Figure 6.1 above) show an educative interaction between a 'teacher', in this case Aman Mame, interpreting the content of instruction (the legend), and the interaction that both the facilitator and the learner have with the content and with each other (Bol & Foranzi, 2007). In this case the content is the legend that was in the first instance produced as a result of interaction between me acting as a facilitator and the two community representatives who acted as learners as they learned how to construct a legend. The learners soon, however, became facilitators, when they presented the legend that they had developed to the wider group of community representatives, which in turn were the learners shown in Figure 6.1. These multiple layers of interaction are what is described as the educational process here.

Aman Mame and Kadi Hassan developed the draft legend. To help them with the process, I arranged the various pins of different size, hue and shape and the different paints. We used a colour palate from a shop selling paints to help them choose the colour that corresponded with their environment. We used a book on painting to help us produce different hues of the same colour, for instance green, to differentiate between different variables of a forest. These included disturbed forest, dense forest, and plantation and bamboo forest. It was not that difficult for the local community representatives to relate to the difference in colours of both the pins and the paints. They used criteria including the nearness of the colours to reflect the

actual colour in nature and some other abstract criteria such as using white to represent religious places. They said that churches and mosques are places of peace and should be represented in white.

The two elders who developed the draft legend had no idea of representation of places with symbols made up of coloured pins, polygons and lines at the start. So being 'scaffolded' to learn this, involved an educational process for them and other members of the community. In the picture (Figure 6.1), Aman Mame is presenting the legend, explaining what it is, and what has been included in it. He is asking if they agree with what has been produced. The community members made some changes. For example, previously, points representing churches were green while those for the mosque were white. One of the elders opposed this and said that both should be white. His reason was that both are places of peace and the colour for peace is white. All of them have agreed and they used different shaped white pins for both religious places. Another suggestion was to use green for all agricultural lands. His logic was that all of them in the end would be covered with green plants. This was instead of representing these lands according to their soil colour. Intervening, through dialogue, I argued that this would not show what is underneath the green plants. It would not represent the relationship of the soil with the crops planted. The communities agreed with me and this demonstrated how a researcher is not merely a passive observer, but can actively influence certain outcomes.

- **Learning processes:**

The two elders who developed the legend had never before experienced representing landscape with paints and pins. So mixing of colours to reproduce their landscape was a learning experience. The wider group of participants had not been involved in an exercise like this before either and learning how to represent their conception of an area with pins, polygons and lines was a new experience. Participating in the argument and dialogue on which colour to use for what kind of representation was also a learning process.

Learning the significance of place through interactions with each other also seemed to be a key learning process. A woman called Hawa Adam, for example, said that "they did not know that they have all these places in the landscape". Muhamed Gibril said: "they are surprised that places that they thought insignificant become important now and put on the legend". While the landscape and the places were not new to them, some did not seem to know that they had the knowledge of these places in them, as shown by this citation from Burka Adam, who said that "our coming together completed the knowledge. We could complement each other. A single individual would not have known all these places."

Another learning process was the combination of colours. This was also a learning process for me. We had to mix the colours to create the colour of the landscape. We used a painting book, which showed how to mix colours, but mostly we did this through trial and error. The students that were helping me in this process were satisfied that they could get most of the colours required by the community. It was interesting to observe members of the community deciding on when the colour was 'right' and approving the work of the students.

Figure 6.1 also shows two age groups: those who were almost equal in age to Aman Mame, and those who were very young. This indicates that learning also took place laterally among equals and at an intergenerational level.

The young were learning about new places as well as how colours can be used for representation. One young participant called Jibril Umar said:

> I was tracing lines on the base map. They are of four colours and they repeat each other as one goes from the lowest altitude to the highest. I was amazed to see that these contour lines changed into the Bale Mountains. I can talk about shapes now. I was told that only straight lines are regular. I felt that the curving and twisting lines could also be regular as they are converted from a contour to a mountain. In geography at school we were taught maps are useful for knowing direction, distance, names, but now I know how that we can use maps to talk about culture. Paints can also describe a lot of things. Features on the landscape show a lot of things with a lot of colours. Now I know the elders know very much more than any others.

6.3.2 Transferring cognitive maps onto the P3DM

The pictures below, Figures 6.3 and 6.4, were selected and presented here to show the actual process of how communities transfer their cognitive understandings of their landscape onto the model and how they describe it. This is obviously an extended, interactive process, so the picture is merely representative of this complex and interesting process. Figure 6.3 shows a map that represents an area of 15km by 35km or 525km^2, which is equal to 52,500 hectares. The biocultural landscape represents a number of villages. As indicated in Chapter 5, each village mapped their own area and described what they had done to others. In their accounts they discussed the past and the present and indicated what would happen if things continued as usual. They also discussed what they learned in and from the process.

Figure 6.3: *Transferring cognitive maps onto the P3DM*

Figure 6.4: *Community members explaining what they have done*

- **Biocultural landscape**

Figures 6.3 and 6.4 show the model from north to south. In Figure 6.3, where a young lady is talking to an elder, a mountainous area with different shades of green is seen. The darker green colour represents a dense forest. The dense forests are either sacred forests or are found in inaccessible areas. People do not cut down the sacred forests because they are afraid of a curse from the spiritual leaders. As to the forest found in inaccessible areas which is not sacred, Hadji Aman Nuru lamented that "people have cleared all the forests that they can lay their hands on and those that we see are on a sheer cliff and very difficult to get at".In Figure 6.3, those around the table are watching an elder in the middle while he is placing a green rounded pin on the model. This pin represents an *ujuba* or sacred site. *Ujubas* can be a single tree, a rock or a boulder or a forest. Even though he is wearing a Muslim hat and is not allowed to believe in these sites or practise rituals related to these sites, he and many others do this either openly or secretly. They think the *ujubas* are responsible for the health of the ecosystem, including their livestock (see Appendix 6 and Table 6.1).

The others look absorbed by what he is doing. This is because placing a pin or painting the model tends to only happen after a lot of discussion and argument. There is often disagreement and dialogue on the right place for a particular kind of pin. The person placing it has to also put it on the village that he or she comes from. This is because the issue of territory is critical. There was, for example, an extended dialogue and argument between a woman who came from a neighbouring community and the man in Figure 6.3 regarding the name of the river and a patch of a forest and where they are located on the model. This may be because the scale was not big enough. The man placing the pin, Nuru Hassan, said, "if the map was bigger, we could have put a lot of things".

In both Figures, one can see *ujubas* (sacred sites), *horas* (mineral waters), the *melcas* (crossing point on a river and a significant ritual place for women), *urane* (seasonal migration place for cattle) and grazing lands. The people surrounding the model were able to 'look upon' an area of 52,500 hectares, giving them a wide perspective of their landscape. This, in turn, gave them the opportunity to discuss changes in

natural resources management across the biocultural landscape, and how changes in lifestyle, affect the whole ecosystem.

In Figure 6.4, a member of the local community is showing an area where seasonal pastoralists come to graze their cattle. This is called *urane*. On his right is a government worker responsible for the protection of this area. He is learning how the people are managing the landscape and listening to their issues. The other two, sitting on the left hand side of the government worker are students. They listened to the discussion that follows and learned from the process. We can see a farmland painted brown, a forested area painted green and an area dominated by *Hygenia abysinica* (locally called *koso*) painted in orange red. This shows that local names and knowledge are represented on the maps. This is further demonstrated in the following discussion by Aman Mame about *melca*:

> it is a place where there is no bridge. It is the shallow point on a river. You can cross it either on foot or on the back of an animal. When there is drought, husbands ask their wife to go to *melca* and pray. An elder lady will call the others and they go with their *sinke* (a thin stick made of either bamboo or *arabe*. It can't be made from olea branch. Since olea is strong, they say God's hurt will not budge if they use it for praying), and fresh grass cut from a clean place, *gadi* (a belt like rope made from the skin of cattle and which they use to tie the leg of the cow before milking) and a gourd full of milk called *chucho*. They go singing to *melca* and their number will be between 15 and 20. Men are not allowed to follow and if they do they will be asked to pick grass and throw it in the air as a sign of respect and if they do not throw the grass, they will pay with cattle. On the day that the women go to melca, children and calves do not drink milk. At the river, they splash the water upwards and the falling water mimics rain and they sing and pray. Rain will come after this exercise.

A women called Halima Usuf also referred to biocultural relations on the landscape when she said this about a ceremony called *atete:*

> *Atete* means St. Mary. They go to a place where there is fresh grass and cool. They do *atete* to ask for rain if there is drought, to ask for stopping of rain if it is a lot, to facilitate safe delivery when a women is suffering from labour or when the delivery date delays. If the woman has no child, she will go to the river with other women. She will put the twig of a tree called *kenefa* on either side of her forehead and tie it with cloth. They will give her a child and she will take it to her house as if it is her own. Her and the community feel that she got a child and the women will have a child after some time. During *atete* they make coffee and eat porridge made of barely. The ghee that they use for

> cooking is not spiced. They pray for the coming season to be bountiful and for health to abound in the family.

There are a lot of *ujubas* on the model. Aman Mame said this about their use:

> … these are sacred places where there is either a single tree or a forest or a hill. People go to these places when they are in a problem and beg their God, much like going to a church. People do not protect them but nobody touches these places. There are those who got sick or died because they tampered with these places. But the respect for these places is decreasing. The main reason is *sharia* and the new generation does not feel the same attachment as us. Now we are trying to revive it.

They gave the example of a sacred site on the model called *muda*. There was a big forest near the village some years ago but the trees were cut rapidly, except for some hygenia trees around the *muda*. The *muda* protected the hygenia forest. The local people had stopped doing their rituals and that was the explanation given for why the forest had gone. They explained how people had reflected on this, and had decided to start the ritual again. They protected the place and trees started to grow again. They reported too that wild animals have started coming back to the area, and the community has encouraged that. They said "Previously they run away from us. This has signified to us that we are not doing the right thing. Now they are coming back and this means we are doing the right thing." The spring that was starting from the sacred site had also dried up, but it came back after they started with the ritual again, and by association protecting the forest. They noted that the Muslim community had criticized them for this, but they had persevered and continue to rehabilitate their land. This was also said to have increased the cohesiveness among members of the community who practise the ritual. During the ritual, the community eats together and they dance together. They act like close families when they are together, and as such participation in the ritual has started strengthening cohesiveness of the society.

From the above, it is possible to see how Figures 6.3 and 6.4 are merely representative 'cues' that elicit perspectives and insights that form part of a much wider body of knowledge and interaction showing complex, interesting and changing biocultural diversity relations in the landscape. It also shows the presence of rich

sources of traditional ecological knowledge, and that this is linked closely to livelihood practices and community relations.

- **Educational processes**

The educational element described here (in relation to Figures 6.4 and 6.5) reflects on the interaction between the facilitator, the local communities and the 3D model. The facilitators at this point were mostly members of the local communities who explained to other members the technicalities of putting their cognitive map on the model. I was mostly involved in following the details of the process of mapping. It was the members of the local community, as described in Section 6.2.1 above, who introduced the legend to other community members who came to participate in the mapping. My role as facilitator, at this point, was mainly to check for, and support the right usage of the pins and the paints and also the usage of the yarns to designate an area before painting. Much of the educational work was therefore in the form of ongoing scaffolding at this stage, involving careful observation and provision of support if and where needed.

In the far corner of Figure 6.3 a young lady, Mariama Adem, is seen discussing something with an elder. The assumption in some participatory mapping work is that elders normally teach the young, but in this case, the young woman was explaining to the older person how the model is made. She had recently graduated from a drawing school and was very active in the model building process. This shows that those with technical specialist knowledge of mapping or related skills can also contribute actively to the participatory mapping process, and they have useful knowledge to share with others, and that the older members of communities can learn from younger people. The process of transferring cognitive maps onto the actual maps allows for such educational moments to take place.

Figure 6.3 also shows one of the students taking notes. This was a deliberate facilitation strategy on our part, as we encouraged students to record the discussions for their later reference. Students appeared to learn in two ways. They learned how a model is built and how paints are mixed through being given the opportunities to participate in these activities. This required creating the spaces for

them to be involved in such activities. This was educational in itself as described above in the legend making narrative. Observations associated with Figure 6.3 showed that they learned from elders by listening to how they argued among themselves about the name of a place or the size of an area or its history. They also learned more about the content when the participants explained the model. In this sense there were multiple 'teachers' who were providing educational opportunities for students to learn through their participation in the process.

- **Learning**

Figure 6.3 shows yellow papers on the model. The yellow papers contain the names of the identified places. In this way names of places or toponyms are not lost. Chambers, Corbett, Keller and Wood (2004) say that:

> Indigenous and local toponyms are often made up of a series of words that give meaning to and hold valuable information about specific places. Mapping placenames indirectly records histories and traditional associations, for example, between natural features and boundaries. Documentation of information as fundamental as traditional place names is of great cultural importance. (pp. 20-21)

In Figure 6.3 a young man is looking at the features on the model and is recording toponyms. He, and others like him, is learning about the landscape and its attributes. Most of those around the model are looking at the old man placing a green pin. He was explaining about the place while he was sticking in the pin; this shows that those involved in the process were learning about features of the landscape from him.

Figure 6.4 shows a young man explaining the model after they had finished the section that represented their village. This process was a key activity undertaken at the end of the mapping process, as representatives of each of the villages presented what they had included on the map. This provided an opportunity for everyone to learn from each other, in turn studying the different sections of the model and slowing building up a picture of the whole. The gaining of a wider landscape view, or a wider picture of the whole seemed to be a significant learning experience, as explained in the citations that follow.

Kassim Sheka said:

> we worked in agreement and we know places that we did not know before. We learnt what is present in another village. We learnt about places – rivers,

> mountains, etc. that we never knew before. We now know the sources of the rivers and the tributaries. We were only aware of the rivers crossing our villages and now we know where they start. We know the tributaries now that we did not know before. It also showed plants that grow only around rivers. We can learn from this how to care for our soils.

A women called Zeyneba Hussein said:

> I am shocked by what I see. I had no chance to go to very far except to visit my relatives and I can see now how big the Bale Mountains is and how degraded it is. I am happy that I could work with those who know more than me but I am also sad that the forest is going.

And Washo Urba said:

> I can see that there are a lot of things that our fathers did not tell us and show us. We could have known a lot if they did. We have expressed our culture here. We felt that culture will not disappear even if it sleeps a bit.

The learning experience was not only related to the knowledge shared, but also to how the learning took place, and how participation at the level of who was involved (see Section 4.3.2) was important in this process. For example, Nuru Kedir appreciated that there was a mix between those with formal education and those who did not go to school:

> We can see that mixing those educated and the others can bring change. They help in technical ways and we bring the knowledge.

Abdurahman Mame agreed

> I know that it was only people on airplanes or the army who does mapping. I am happy that I am doing mapping now.

Aman Mame said that the participation of women was important:

> They can have the bigger picture of the landscape and also identify areas important to them. They are also very much attached to cultural sites and they made sure that we have put them all here.

Others reflected their learning through statements that were emotive. For example, Kassim Sheka felt the connections that were expressed through the mapping processes:

> We can see the relationship among components of the landscape. There can't be rivers without the mountains and no forest without the rivers. It is like our body. Our head will not be there if our shoulder is not there. And our shoulder needs our stomach to survive.

Kedir Aman lamented:

> Our animals were living with wild animals. Wild animals were breeding with domestic animals. Now they avoid each other. We have left our culture and now people talk about democracy. They cut trees and they say that it is their democratic right. Previously it was forbidden to cut trees.

The Bale elders tend to be hyperbolical. They make exaggerated claims to make their point. He is probably trying to say how close they were with nature in old times.

6.3.3 Zeroing in on the Horo Soba kebele

As the building of the map was a complex interactive process, I needed to 'zero in' to one particular component/area on the map to gain a more detailed perspective on the participatory mapping as a learning and change tool. I thus opted for looking at a particular *kebele*, Horo Soba. This is one of the 9 *kebeles* which makes the Dinsho *wereda*. It has five *gotes* (villages) namely: Ursha, Wede, Alibana, Tianta, and Kelbo Tonsicho (see Section 1.5.1.1 for more socio-economic detail of the *kebele*, and why it was selected).

Figure 6.5 below represents the wider event of revisiting the map after the P3DM activity took place. As indicated in Chapter 5, Table 5.2, the purpose of this was to go deeper into one of the project areas to understand the historicity of the present and develop a deeper understanding of the intricate cultural historical narrative of the local people. Subsequent discussion involves a detailed reference to what is represented in this particular photograph, which in turn, is representative of a wider social interaction/process, knowledge base and social-ecological history.

Figure 6.5: *Discussion with the elders of the Horo Soba kebele*

- **Biocultural landscape**

Much of the data presented here draws on the discussion that I had with four elders from Bale six months after the model was completed. The elders came from the Horo Soba *kebele*. The lady in front of the model is called Zenebech Tilahun and she accompanied us to the household of Aman Mame, to help in the discussion with the women at the household. Aman Mame sits next to her. As mentioned in Chapter 5, he works for MELCA-Ethiopia as one of the elders for the SEGNI program (a school biocultural diversity programme run by MELCA-Ethiopia) and has participated in the model building throughout. He was also one of the elders who developed the legend, as noted above. The person sitting next to Aman Mame is Omer Burka. He is a former soldier and knows most of the landscape. He speaks fluent Amharic, which is the language with which I am most comfortable. The elder pointing at the model is called Hule Uture and is he is considered one of the best in terms of knowing the landscape.

People in Horo Soba *kebele* live at the foot of a mountain facing the Geysey wetland. The Geysey wetland is drained by the Geysey river. This wetland is a grazing area for wild animals and cattle. Part of the wetland falls under the Bale Mountain National Park and because of this, there is endless conflict between the local communities and park officials.

Residents of Horo Soba, especially Orasha, often have more than two houses and tend to spread out and exploit their environment. Omer Burka, pointing at the model, said that:

> What we see in front of us is a settlement. We have planted potato and garlic mainly and there are no cattle allowed here. The cattle go to the hill when the land is planted. I have one area for farming and one for living and cattle rearing. My farm is 3 hours far from here. Where I farm, there are lots of indigenous trees and wild animals. This is because the area is warmer than here. There is no rain now so the people have moved from there to here. There is also a forest just out of the model and the cattle are in the forests. When it rains, we will go back to the area that we left.

His refection shows how the people are spread across the biocultural landscape and how this is related to their livelihoods.

Aman Mame added:

> There is a big wetland in front of my house called Geysey. So many people bring their cattle to it, as it is full of green grass. People come here from very far for grazing their cattle.

Horo Soba got its name from the *hora* called *Soba*. The use of *hora* as a source for mineral (sodium, zinc, calcium, potassium and manganese) and is as a source of conflict between the Bale Mountain National Park and the local communities as well. Its effective management through local communities is documented by some authors (Flintan et al., 2008; Kemp-McCarthy, 1990; Ayele, 1975; Guilio, 2003 and Hillman, 1986). At one point in the year, many people go to *hora*, which is indicated with a blue pin on the legend. *Hora* is a place where they get mineral water for cattle. At *hora*, people undertake many activities including castrating their bulls. They prefer to do it here because the castrated bull can drink the good water and there are young people who can help the owner of the bull. The water is salty so the cattle defecate a lot, thus the *hora* also helps cattle keep healthy and cleanse their bodies. The *hora* is owned communally. There are more than 1000 cattle per day at the *hora*. They come from as far as Gojira, Geremba Dima and Chofira. The Geysey river starts in Chofira. They say thieves and those who wish bad for other people do not go to *hora*, indicating an element of sacredness. People who use the *hora* stay there till until their cattle have had enough mineral water to drink. The *hora* has a social and learning function in that community members discuss their lives and their practices, and share information about the landscape while spending time there waiting for their cattle.

The main source of income for the Bale community is from cattle. People in Horo Soba farm but their income from farming is very little. Previously the only Horo Soba economic activity was cattle farming, and people used to feed mainly on milk and meat. Now the population has reached 6500. The number of cattle per household has decreased from 100 to 20-30, and other forms of farming have spread. Farming sheep is a popular new farming practice, as it is possible to rear and sell a sheep in 5 months and it fetches a prices of more than 500 birr (about USD 28). Cattle are also critical for farming and for milk. People also need donkeys and horses, mainly for transportation. After harvest they save the straw and feed the cattle. Rain is erratic

and livestock need to make use of dew for water. Cattle are a good form of security as they can cope with such conditions.

Aman Mame explains:-

> We rely both on cattle and farming. We have a big family and when barley is ready, I feed the family. Cattle alone are not enough. We also have sheep and they are good for cash. Now agricultural activity is increasing but the productivity is really low. The number of cattle has decreased because of the expansion of agriculture. The wetland, Geysey, is under stress as the number of cattle has increased. Grazing area is decreasing and this is causing pressure on our family and the cattle.

Aman lives under the foot of the mountain called Orasha. The Geysey wetland is in front of his house. He described it in the following way:

> The people live around the hill facing Geysey. In some parts of the year sun and wind dries the wetland. During the rainy season, it gets flooded and grass is good. So people come from very far. The hillside is forested. When there is not enough grass at Geysey, we go to the Hora forest with our cattle, as there is wet grass. At other times, the cattle come once to the wetland and once to the mountain. There are hyenas in the mountains so people guard their cattle. The horses can't go up and down so they stay at Geysey however little grass there is. There is a river called Geysey that drains the wetland. It is a tributary to Web. At certain time of the year, there is water everywhere. Very good for animals! There are a lot of springs and small rivers starting from the mountain. Geysey is always wet.

The mountains are communal lands for livestock. Nobody claims the land.

Talking about the change in the landscape, Oumer, using the change in political regimes as a time referent (see Section 1.4.2), said that:

> During Hailesilasie (about 38 years ago) the area was forested. It was mainly a hygenia forest. The Derg has settled people in one area. They used to live scattered. They said this is not good for development. We started farming with the settlement program. We were told that we should become agricultural. We stayed only for 7 years in the settlement area. We went back to our places after the Derg regime has fallen. Now people have two places to live. The first is where they were before settlement. The second is where they went after settlement.

This section shares a story of ongoing change and increased pressure on the landscape and on people in the area to make their livelihoods work. It also shares insights into conflicts that arise at landscape level; and how cultural practices and knowledge shape land use and land use management. All of this knowledge can

partly be represented on the maps, and as shown in this dialogue with the elders, the models are also a significant source of 'memory', as they are able to communicate in-depth stories and detail about places represented in or on the models through reflective discussion.

- **Educational processes**

As shown in Figure 6.5, the elders are sitting at one corner of the model and they are discussing the features that they observe. The model depicts their topography and the colours represent what is on their landscape. The purpose of situating the dialogue around the model is to generate discussion and reflection on the landscape and its past, present and future. Most of the points that were raised would have been difficult without reference to the model; as such it is clear that the model plays the role of an 'aide-memoire' or a reminder of their memories and knowledge. As observed, and as shown in the discussion above, the elders could easily discuss the changes in their landscape and their lifestyles by pointing at various areas on the model. To stimulate this, and to generate further reflections on what was contained in the model, I asked questions and gave them feedback in the form of further questions. As such, this dialogue, reflection, questioning and knowledge sharing during the interaction that we had using the model as reflection tool months after it was produced, constituted an educational activity with the power to generate and stimulate learning.

- **Learning processes**

The two elders are much older than Oumer Burka. They reflected at the end of our interview that remembering the history of their landscape through the model building and through reflective discussion on it, was a learning process for them. They noted what they had remembered and what they had reflected on, had potential for future learning, as shown by these two citations:

Aman Mame said:

> We have left most of what our families were telling us. We had culture for everything. We had culture for marriage, for stories, for the mountain, for *melka*, for everything. I am happy that we are discussing this. Our families used to know a lot and today we talked a piece of what they used to talk about. Our discussion is highly related to nature and it reminded us of many

> things. We can remember now. We remembered how they used to play games with us and tell us stories.
>
> There was no agriculture here. We used to live on cattle. Milk was plenty. We bartered milk and butter for barley. We did not plant it. The land has changed a lot. The middle of Geysey was not suitable for grazing. The grass was tall. Grass was plenty. We did not cut trees. We had a law that said 'do not cut two branches from a tree if they are growing parallel to each other.' We did not cut the tip of a tree or a root. We did not sell wood and meat. They say it is selling the dead body of a once living thing. This ensured the protection of the land. We learnt this today.

Hule Uture said:

> Culturally we used to go in high mountains and we go to these places for praying. We used to go to *melca* also for praying. We left that but this map has reminded us. When we had a disease of animals we used to mix their waste with milk and make them drink it. It cured them. Now we are going to tell these stories to the coming generation.

The elders also discussed seasons and divided the year in to five seasons. One of the elders, Aman Mame participated in the second mapping process and explained the seasons to teachers. The next section presents insights gained from this process.

6.3.4 Eco-cultural calendar

The two photographs below (Figures 6.6 and 6.7) represent the process of producing an eco-cultural calendar. As explained in detail in previous chapters, an ecological calendar is part of participatory mapping, but it focuses on the temporal representation of the landscape through the seasons, with related activities and practices represented. These calendars can be used for various purposes, such as for health purposes to show the prevalence of diseases according to seasons, to know when to engage with developmental activities and/or for environmental education purposes, amongst others (see Sections 3.5.2 and 5.6.1.3). In this research I used eco-cultural calendars to explore changes in the biocultural landscape throughout the year and how lifestyles are adapted in response to these changes.

Figure 6.6: *School teachers drawing up an eco-cultural calendar of the Horo Soba environment*

Figure 6.7: *Eco-cultural map of the Horo Soba village (see larger version in Appendix 8)*

- **Biocultural landscape**

In April 2010, a team from MELCA-Ethiopia, including myself, went to the Bale Mountains to facilitate a mapping workshop with local communities. During this workshop, as reported in Chapter 5, a sketch map of the Horo Soba area, which includes the Geysey wetland, was completed involving 30 local community members. Six teachers came from six local schools to participate in the process (see

Figure 6.6). The teachers divided the year into four, according to the national seasonal calendar, and started producing the eco-cultural calendar using this framework. Based on earlier discussions with elders (reported above) I thought it would be important to ask their advice at this stage of the process. As mentioned above, the elders said the year is divided into five seasons (see Figure 6.6). The teachers did not believe him, and were initially resistant to changing the calendar. However, after the elder described each of the seasons in detail, they started with the big circle and divided it into five seasons, each different in length and name. The first calendar done in Bale was not differentiated into the past, the present and the future. In September 2011, another eco-cultural calendar writing exercise was done and the local elders created an eco-cultural calendar for the past, the present and the future. Elements of the previous legend developed with the involvement of the teachers (see Figure 6.6 above) were used by the facilitators to elicit detailed information about the past, the present and what they think will happen in the future, as far as change in seasons and biocultural activities are concerned. Table 6.1 below describes Figure 6.7 (see also Appendix 6 for detailed presentation of the five seasons). Figure 6.7 shows a map of the past activities, although some of these activities and changes continue into the present. I have not presented the calendars of the present and future here as well, but they are included in Appendix 6, on CD Rom, and are used to present trends analysis in Table 6.2. This table shows trends and changes related to the biocultural practices of people in the area, as they are related to the seasons, and as they were reflected across the maps of the past, present and future. Table 6.1 shows the local naming of the five seasons.

	Bedessa (March & April)	**Chamsa (May & June)**	**Gena (July – Sept)**	**Bira (Oct & Nov)**	**Bona (Dec – Feb)**
Culture	Children used to play a traditional game '*korbo'* while shepherding. Women used to go to *melka* when there is drought. They used to take cattle to *hora* (mineral water). Animals were thin and shed their hair. Honey was consumed more at this time of the year. Elders and the youth used to play '*saddike'* (a game played on a table with rows of holes and with beads – commonly called African bead game). If a woman did not have a child, the women went to *melka* and prayed using '*kenefa'*. They smeared mud from sandstone called '*keru'* on the forehead of people to pray for rain and for good fortune/ future.	The women prayed in the barn for more cattle. They used to take livestock to *hora*. The barn was prepared for horses. They mixed coffee and blood and spread it in the barn to pray for the health of animals. If a women was pregnant for the 9th time, an old sheep wasslaughtered and an old cow if it was for the 10th time. This wasto pray for her safe delivery and the ritual is called '*Awanda'*.	It rained a lot at this time and if it was heavy they took roasted barley and bread to the sacred site to pray. The cattle werekept outside and their position waschanged, as the barn couldget muddy. Butter would be stored. During their gestation period, sheep, cows and horses wereisolated and given special care; and were kept in a barn called '*arara'*. The cattle slept around the homestead for warmth. There were special management approaches for calves as it was muddy.	This was weeding time, and there was plenty of harvest. Children used to eat freshly harvested barley. Plants flowered at this time and this was good for producing honey. This was the most important season for taking cattle to *hora*. People went to *muda*, a sacred site to thank their god for a good harvest. People used to barter grain with butter. There wasnot that much crop production. This was also a time for making cultural materials from grass and wood.	Weddings could take place in this season. This was a resting time for the community, more so than other seasons. People go for '*godantu'*, to forested area as there is grass under the canopy. They used to use bamboo for fetching water. They stored grain inside a container made from cow dung called '*dogogo'*.
Livelihood	Men used to get involved in farming and women and children took care of animals. Seeds of potato were sown. The domestic animals were very thin and women and children took care of them. They grazed animals on fields and around wetlands as the animals could not graze in the mountains.	Cattle were taken for *godantu* and *hora*. As many young people came to *hora*, bulls, sheep, goats and horses were castrated as they could help with the process. Sheep and goats would also be fed at '*korka'*, a sand stone, for fattening. Cattle were fed with '*haya'*, a	Cattle were taken to *hora*. This was a good time for the cattle and they weretaken to the mountain (the wetland was full of water and dangerous). Houses were maintained at this time as there was plenty of grass. The burden on women	They used to take cattle for *godantu* and *hora*. Grain containers were made from cow dung. This was also a honey and pot harvesting time. Production from animals wasvery good as there was plenty of grass. This was a time for threshing of crops and storage of butter.	Men construct and maintain the house and the barn. They used to take cattle for *godantu* mostly to *hora* forest. The grass under the canopy was good and water in the forest was good for the animals. They prepared and placed beehives. They threshed some of the grain and stored grain.

	This was a honey harvesting time. A little bit of farming took place. Wetlands could only be grazed in this season.The rainy season meant that wetlands were full of water and dangerous.	muddy mineral water, for the same purpose. They hung beehives at this time.	was heavier than on men in this season because they cleaned the barn, milked cattle and produce ghee and cottage cheese.		
Nature	Little rain and grass was dry in the beginning but would grow by the end of the season. The mountain was slippery when the rain came at the end of the season and the wetland was full as seasonal streams flowed into it. Frogs started to croak heralding the coming of the rain. Some of the herbs started to come up. '*Krkasho'* plant was dug up and eaten by children. Birds like the Abyssinian ground hornbill (*Humo*) could be seen.	The seasonal rivers started to flow in this season, the wetlands were wet, grass was better than in *Bedessa*. Daytime was sunny and there was little rain in the night. A fruit called *Dobi* ripened and was eaten.	Rivers were full and the wetland was also full. Soil was washed away because of the heavy rain. Frogs croakeda lot. '*Leyla'* flowered and birds fed on this. Children played with it in a game called '*lecho'*. Children played '*korbo'*.	The land looked beautiful because of the flowers. Water was low in rivers and wetlands but grass grew tall in the wetlands. We sawa lot of bee swarms and a bird called '*birollee'* came.	The grass was dry because of the absence of rain, presence of frost and the hot weather. Most of the herbs dried except the herbs under the dense forest. There was high wind pressure. The grass was dry. Bee colonies sometimes abandoned the beehives entirely.
Climate	Very dry at the beginning and wet in the end. There were clouds that were better than in the *Bona* season. Frost decreased and the temperature also decreased. There was little dust.	There was less rain than in *Bedessa* and strong winds but more rain came at the end. It rained during night-time.	There was heavy rain during this season but it decreased at the end of September. It was wet and lightning and thunder increased. There was thick mist and many hailstorms.	Frost started in this season.There wasvery little rain. The weather was mostly sunny, but if there wasrain in the morning, the afternoon was sunny and vice versa. The surrounding smelled nice due to the flowers.	There was lots of frost, the weather was very hot, and there was no rain. Locusts destroyed every plant and '*andoleessa'* bird followed to eat them. Morning and evening were cool and the daytime was hot.

Table 6.1: *Eco-cultural calendar of the Horo Soba kebele*

Table 6.1 shows that the lives of people in Horo Soba were filled with rituals, movements and different experiences as the year unfolded. People went to (and still go to) sacred sites to pray for various purposes including when they had problems and for the abundance of livestock. The eco-cultural calendar shows how closely culture was related to livestock. People exchanged animals for crops. Children played cultural games and helped the family in managing livestock. In the past, people used to move around with their cattle in their biocultural landscape in search of pasture and minerals, a practice, which still continues to some extent today. The table shows how people managed the complexities in nature with their cultural responses. Reading the climate seemed (and still seems) important for livelihood activities as it influences the harvesting of food, including honey, and knowing where to take animals and when.

Livelihood was, and still is based primarily on livestock. The calendar shows that there was, and still is little activity related to crop or vegetable farming. The activity across the seasons demonstrates the management of both the environment and of the livestock. It shows how people in Horo Soba used (and still use) elements of the environment (*hora*, *korka* and *haya*) for their cattle. They moved in the landscape with their animals. They moved according to the changes in season showing that knowing how nature responds to change in times was and still is key for survival. As also noted in the calendar, the women tended (and still tend to) to carry a heavy burden, as they have to manage the livestock, as well as household activities such as food preparation and taking care of children.

From the eco-cultural calendar, it appears that at the time referred to in the calendar (the past) there was plenty of rainas the rivers and wetlands were noted as full of water in most of the seasons. As no specific date was allocated to the map, it is not really possible to verify or compare the indications of a 'wet year' as found in the eco-calendar with climatic data of the area, or to establish if the area is generally 'wet'. Interview data, however, indicated that the climate used to alternate between abundance of rain and dry spells; creating unpredictability to which the community has had to adapt. From the data presented in the eco-cultural calendar, it would seem that people in the Horo Soba had a range of strategies to deal with changes in the environment. Examples are taking animals to the mountains when the wetland was full of water,

going to the forest called Hora in times of drought, closing access to the mountain when there was enough grass in the wetlands.

The calendar also shows an awareness of seasonal animals including birds and amphibians that appeared at certain periods of time, and how people used to (and still do to some extent) relate to them as food, and as an indicator of the seasons.

The climate used to alternate between an abundance of rain and dry spells. Living with unpredictable environment seemednormal and people knew how to manage their life accordingly. From the data presented in the eco-cultural calendar, it would seem that people in the Horo Soba area have developed strategies to deal with changes in the environment. This is mainly through moving around the landscape, changing the management of their cattle (keeping the weak and the little ones at home, and, in previous times, closing access to some places) and changing their food habits, relying on honey, for example, in times of drought. They used to close access to mountain areas when there was sufficient grass in the wetland and take their cattle to the mountains when the wetland was dry.

As discussed above, Table 6.1 shows the seasons of the past, as represented by community members in the construction of eco-cultural calendars. Data was verified through fieldwork and additions were made to the eco-cultural calendars through a member checking process. MELCA staff also gathered additional data in September 2011. Appendix 6 contains full details of the seasons, as represented by community members in present time and in the future. Table 6.2 below summarizes the change in cultural practices in seasons. It shows how the cultural practices of the Horo Soba community are eroding and changing and tries to indicate some of the reasons. The table also includes a 'desired futures' component, as deliberated with community members after comparing the maps, and the changes that became apparent through the process. The table is followed by a short analysis.

	Past	Present	Future, if things continue as normal	Desired future
Culture	People's lives were filled with rituals and movements. People went to sacred sites to pray when they had problems and for the productivity of cattle. People exchanged animals for crops. Children played cultural games and helped the family in managing livestock. They moved around a lot to take their animals to better pastures and mineral waters. Reading of the climate was important for livelihood activity as it influenced harvesting of food, including honey, and knowing where to take their animals and when.	Rituals greatly diminished. People pray at religious places – mainly the mosque. They take their cattle to veterinary clinics, and don't use traditional healing systems. *Hora* and communal grazing areas have decreased and there is no '*godantu'* (long distance travel for pasture) any more. Cultural ceremonies are diminishing. Even singing is not permitted. Cultural materials are replaced with plastic.	Traditional games will be abandoned and love will be lost among children and elders. *Hora* will be affected as farming is increasing all around it. Rituals are prohibited and praying happens at mosques and this is going to create natural disasters, as they do not pray to their God. The love among people and identity will be lost. Production of honey is decreasing and this will affect health.	Reviving rituals – rituals are thought to increase solidarity in people, strengthen identity, and increase productivity. Reviving games–his would increase intergenerational learning and ensure a feeling of belonging to the culture. Reviving sacred sites will be good for conservation, identity and cohesion. They want to keep making cultural materials, including clothes.
Livelihood	Livelihood was based on livestock. There was little activity related to crop or vegetable farming. They had a detailed understanding of how nature responded to each season and livestock management was tuned in to the changes in the seasons. They used to move in the landscape, much more than now. The burden on women was significant, as they had to manage both cattle and house chores.	Agriculture is a major new livelihood practice. There is an increase in vegetable gardening. People are learning to fatten animals around the homesteads through the cut and carry system. They have started planting tree seedlings for rehabilitating their ecosystem.	Expansion of farmland is creating problems because grazing areas are being lost, and this is creating conflict among neighbouring farmers for boundaries. Domestic animals will get thinner or die because the land is dry so there is no grass. Wetlands will be drier and livestock will be affected and this will create a big problem. There will be no place for '*godantu'*.	Culture related to livestock production will be revived. Cattle will be taken to *Hora*, *Korka, Haya*. The culture of managing the livestock according to the seasons will be revived. New element of planting trees and taking Soil and Water Conservation (SWC) measures will revive flowers and honey will feature in their diet. Agriculture not abandoned – adaptive management.

	Past	Present	Future, if things continue as normal	Desired future
Nature	It appears that there was plenty of rain at this time. The rivers and wetlands were full of water for most of the seasons (at least according to the memory of community members). There were also seasonal animals including birds and amphibians that appeared at certain times and people in Horo Soba used to relate to them as food and as indicatorsof the seasons.	Land looks dry and yellow and most rivers have decreased in volume. Most wetlands have dried up. Flowers have decreased and honey production is affected. Cattle are thin.	Amount of rain will decrease and most rivers will disappear. Wetlands will dry out furtherand frogs will croak indifferent seasons.	Due to the soil rehabilitation and water conservation activity that they can and wish to undertake, their area will be revived.
Climate	The climate used to alternate between an abundance of rain and dry spells. This was normal and people developed strategies to manage their life accordingly.	It is much colder. Crop pests are abundant. There is a decrease in production. The temperature has decreased. Much frost and water gets icy and animals cannot drink it.	The amount of rain will decrease. Frost will increase damaging crops. It will be hotter with clear blue skies.	Rain will increase. Frost will decrease. Rivers and streams will be full, as the land will be rehabilitated. Smell of land will be better as there will be a lot of flowers. Rituals and Soil and Water Conservation will bring the soil and the plants back.

Table 6.2: *Eco-cultural calendar of the Horo Soba kebele showing the past, the present and the future in two scenarios (predicted future if trends continue and desired future)*

As mentioned above, Table 6.2 is a summary of a trend analysis that was conducted using the eco-cultural calendars of the past, present and future. I will analyze and discuss the table further using the four categories outlined in the table, namely culture, livelihood, nature and climate.

Culture: The trend shows cultural erosion. Reasons given are mainly the influence of dominant religions, Islam in the case of Horo Soba. In Bale there were many rituals that were practised throughout the seasons, mainly to ensure the health of animals, to ask for rain during drought periods, and to stop rain when there was plenty. They also practised rituals for the health of the land and the people, but this practice has mostly stopped now. The trend indicates that if things continue in this way, rituals will disappear, and praying will only take place at mosques. Community members indicated that they want this trend to be reversed and that they would like to practise their rituals again. Traditional games played by children are also on the decline as children today go to school where the traditional games are not played. It was also indicated that the gap between children and their parents seems to be widening, and in response, community members expressed a desire to bring back important aspects of their culture.

Livelihood: The trend shows that main sources of livelihood for people in Horo Soba are changing. As indicated in the map of the past, they were primarily an agro-pastoral community and used to move in their landscape in search of *hora*, grazing lands and to a forest nearby called Hora when their other grazing areas were dry. Present patterns show an expansion of agriculture and that agricultural lands are taking up grazing lands. The movement of cattle is largely curtailed and their *hora* is in danger. Horo Soba's *hora* sustains more than a thousand cattle per day; they need space but this space is increasingly limited due to agricultural activities. The number of cattle per household is decreasing and this has an impact on their lifestyles and livelihoods. They foresee a disaster if this continues, and expressed a wish to continue practising agro-pastoral livelihood activities, while also practising some agricultural activities.

Nature: Nature was seen to have been better in the past than the present. This was expressed in reports of plentiful rain and full rivers and wetlands. Now most of these water bodies have dried up, and reports are that things are getting worse. There is little tree cover due to deforestation and the biggest wetland, Geysey, is being degraded. The amounts of flowers are also reported to have decreased considerably, affecting honey production. The community in Horo Soba has, however, started soil and water conservation activities, and there is a positive sense that this may turn things around.

Climate: It is said that in the past it was very cold and it used to rain a lot, and that rain occurred for about six months of the year. Now it is said to be getting warmer and the amount of rain has decreased. Some domestic animals that they used to see at lower altitudes are now being found in higher altitudes. Trees and animal diseases common to lower altitudes are also appearing at higher altitudes. They predict that this trend will continue if no measures are taken to reverse the trend.

From the above, it is clear that much can be learned about the biocultural landscape from the construction of eco-cultural calendars. In some instances it would have been interesting to compare what was said here with, for example, wider climatic records and other historical documents. This was not done in the case of this study as this data is not easy to find at the ecosystem level in Ethiopia. This could, however, be a potentially interesting angle in longitudinal studies using eco-cultural calendars.

- **Educational processes**

The concept and the experience of constructing an eco-cultural calendar were new to the teachers and to others involved in contributing to the process. I had to explain what is meant by an eco-cultural calendar, what the purpose is, and I had to show them on paper how to create the circles to represent the changing landscape and the corresponding change in people's livelihoods and culture. The interaction that took place between the teachers, the calendar and me constituted an educational activity. As mentioned above, the knowledge held by the elders of the seasonal patterns was also an important knowledge source for the construction of the

calendars, which was also educational in the sense that others could learn from this knowledge in constructing the calendar. Undertaking comparisons of the past, present and future was also educational, as it opened up new ways of seeing the landscape, and it opened up opportunities for creating new alternatives and ways of doing things. Tesfaye Tola and Abebayehu Kassauye facilitated this process, drawing on their experience of developing calendars with teachers more than a year previously, in May 2010.

- **Learning processes**

Through the educational actions outlined above, the teachers involved in constructing the eco-cultural calendars learned how culture is both spatial and temporal. The landscape changes according to the seasons and so people's activities. They also learned how to think about the seasons in terms of their specific culture and how to identify and express in art what is happening in each of the seasons.

Prior to this session, the teachers thought that there are only four seasons in a year. These corresponded with the seasons of the entire country, and each season was given a 'national' name. They reported that they "were shocked" when they learned that there are actually five seasons in the Bale region and the people have various cultural and livelihood activities that are organized according to each of these five seasons. Aman Mame, one of the elders who participated in the participatory mapping exercise and who works for MELCA-Ethiopia, was able to explain this alternative construction of seasons and the teachers were able to deconstruct their previous views of seasons, and depict the new knowledge that they had gained on a paper sheet, as shown in Figure 6.7 above.

A teacher called Abdalla Muhammed reflected on this learning as follows:

> I was born, grew up, went to school and now I am teaching here. I have learnt an entirely new thing today. I never thought that our seasons were divided into five. I was teaching how the seasons were divided into four. I would not have believed it if somebody had told me. I was astonished when the elders explained to us in detail what happens in each of the seasons and we could not argue with him. This is like a revelation to me. I will teach what I have seen today in the future.

Oumer Burka later said:

> I was not here 40 years ago. What the forest was, what brought the damage to nature, the change in landscape, I was told and remembered today! As a soldier, I have been to many places. I had forgotten the history and the culture for my land and I learned a lot today. Now I am thinking of what is going to happen. I will teach the coming generation from what I learnt today. I could see the change in the landscape has started a long time ago.

This section shows how cultural representations using eco-cultural calendars can 'excavate' memory. The next section presents the results of the participatory sketch mapping in Horo Soba. It will also discuss evidence of agency created in the context of the mapping activities.

6.3.5 Scale mapping and agency in Horo Soba

As indicated in Section 5.6, this exercise was undertaken to generate more data using participatory mapping approaches in ways that could involve the larger community; and also to ensure the validity of the research through repeated engagement on the research topic with the community (see Section 5.10). It is also part of the emancipatory agenda of the research: involving more community members could ensure broader community participation and subsequent decisions that are taken by a larger group of people in the community.

As discussed in Section 5.6.1.2 this workshop took place on 11 April 2011, and involved creating a 'No Man's map' after Poole (2005). This base map showed only the main road and certain rivers, but after some discussion, members of the community added some roads and rivers and removed others.

Figure 6.8a: *The Horo Soba village elders producing sketch map*

Figure 6.8b: *Sketch map of the Horo Soba village*

- **Biocultural landscape**

Figure 6.8a and b above shows Aman Mame, Wzo Washo Roba and Oumer Burka discussing a place on the sketch map of the Horo Soba *kebele* and the final result. A legend was made with a combination of coloured stickers and drawings. Various kind of coloured stickers were accessed from stationery stores to serve as points. Drawings represented the actual elements on the landscape. Therefore, a tree, for example, was drawn as a tree (see Appendix 6 for a more detailed picture of what this map looked like). As the scale of the mapping was a much larger, member of the community could put in many more elements than was possible during the P3DM making. As the number of participants increased, the remembering and what was reported, also increased and more detail was provided. Forexample, it was possible to learn the biocultural history of the Horo Soba *kebele* in detail as we mapped the past and the present and could compare the two, which was not possible in the case of the P3DM.

Figure 6.8b show the biocultral diversity of the Horo Soba *kebele*. They could identify the dominant species in their landscape and their use (see also Section 6. 4) for further discussion) they have identified 23 sacred sites. Sacred sites could be single and big trees, a boulder or a patch of forest. *Melka* is also a sacred site. They also

identified wild animals including Mountain Nyala, Ethiopian wolf and hyenas. The number of rivers and streams and their use by the community were also identified. The rivers have relationship with wetlands, which are critical places as grazing points. They were also seven *horas*, which are critical for their animals. Map of the present shows all these places and features of the biocultural landscape in great danger (see appendix 6 for more photos and Table 6.1 and 6.2 for descriptions of the problems).

Some members of the local community raised a serious issue, which could potentially have disrupted the mapping process. They noted that the map had left out one of most contentious forests in the landscape, the Hora forest. There is a longstanding feud between the communities of Horo Soba and the neighboring community Agarfa *wereda* about the boundary of the forest. Members of the community asked why the map had omitted the forest and what the meaning of this would be if it were to be used for delineating boundaries. We explained that the purpose of the mapping process is not boundary delineation but discussion around biocultural diversity and training local teachers to use mapping for linking schools with local communities. This placated them and they continued with the mapping process. This experience shows how mapping can surface age-old conflicts and how it can fuel community feuds thereby unintentionally raising conflict.

- **Educational processes**

Both the community members and others involved in the process had never seen a 'No Man's map'. They found the map a little bit disconcerting at first as their imagination of their area was 3 dimensional, especially after the P3DM process, and also because this is the way in which people experience the landscape on a daily basis. This was mediated by Tesfaye Tola, who understands maps and could help to orient them. It also took some time to explain the concept of scale to the teachers; a process which I undertook by explaining how a 1:50,000 scale map can be converted in to 1:2,500 map by multiplying the 2 cm on each of the 1:50,000 square map by 20. I explained how they could identify the area where their school is located and put it in a big square/ triangle and multiply the sides with 20 to get a 1:2,500 map. This process of scaffolding of the learning process seemed to help the mapping practice.

Slowly, through careful scaffolding using examples, and showing how to construct aspects of the map, and through use of local knowledge and examples provided mostly by the co-facilitator who knows the area, Tesfaye Tola (the Bale branch office co-ordinator of MELCA-Ethiopia), the farmers could place themselves on the landscape. This showed the importance of local knowledge in mediating some of learning.

Following this, community members were able to identify each of the major rivers and their tributaries. However, some of the tributaries and the streams that were taken from the topographical maps were confusing to the local community. The topo map also omitted some critical rivers and streams that were known to the community members. These 'dissonances' spurred the community into lively discussion and some argument, after which they reached consensus, and jointly constructed their landscape.

As this community consists mainly of agropastorialists, who travel extensively in their landscape, this gives them a refined knowledge of their environment, and thus they had substantial knowledge to draw on. Sharing this knowledge through dialogue and argumentation was educational, as it involved intensive interaction between the local communities, the maps and the facilitators.

- **Learning processes**

From a learning perspective, community members reflected on how the map had been able to show them the degradation oftheir environment. This is also reflected in changes to their quality of their life, which they lamented was worsening. The area used to be full of forest and one of the elders, Nuru Kedir, reflected on the learning and the wider changes in this way:

> This map has surfaced what we have forgotten. I did not think that we would finish our trees and be in a problem. Now we see everything. Forty and fifty years ago, we did not have that many people here. There were only three or four houses in a village. People used to use plants wisely. They used to listen to each other. It was forbidden to cut trees from the top. There was a law and people used to respect it. Now the government and the law say no but people do not listen. When we look at the maps, we see a naked place in the present and a forested one in the past. A forest is part of us and it even goes to our funeral with our body. During the cold windy season, people used to

> go to the forest. Nobody sits in exposed areas. Now there is no place to hide from cold wind. People just suffer from cold. People had no shoes before and they walked bare foot. They never got sick. They used to eat fat and ghee. The cattle used to graze on thyme. The ghee/butter had a particular smell. Now we eat ghee coming from another area. Now there is no ghee and fat from here and we are having a lot of illnesses. I think the people who have participated here should do something and be an example to others. This map has reminded us a lot of things. Whatever we do is for ourselves. Now because of the shortage of wood, hyenas eat people when they go to fetch wood. We are left with nothing. And we are exposed and we have no life. **The responsibility of a gourd is to keep the water that is left**. Now we have to start doing our share and we should not wait for others to act. We should start acting. Our fathers brought us to a plentiful world. We finished that. Now we should also leave something when we go. [metaphor emphasized]

This reflective interview comment raises many issues including population increase, erosion of customary laws, degradation of health, and loss of security from dangerous wild animals. All of this was seen to be a punishment from nature for mismanaging the biocultural landscape.

Hule Utara also explained how the process provided him with renewed identity and said:

> I was born and grew up here. I did not know about most of the names. I did not know about the landscape features in Albena village. For example, there was Ujuba (a sacred site) but we did not know it as Ujuba. I now know the name of all the rivers in Horo Soba. I know the name of the valleys, the rivers, the roads, and the territorial boundaries. I am reborn now to this place.

Abdurahman Aman joined this refection and talked about how he could learn about the names of places from his father as a result of the mapping processes, reflecting its potential for inter-generational learning:

> We have remembered a lot because of this map. This map is like a school. I never thought that elders know. I never asked my father about anything. I thought knowledge from a school is the only valuable knowledge. I have asked my father about places on the map because I was afraid that you will ask me and I wouldn't know. I asked my father about why the place was called Horo Soba. This is because of the *hora* nearby. Why the grazing land on the map is called Tertara. The name Tertara came from a particular kind of grass called Tertara. There was a river called Dalecha and I asked him why it is called Dalecha. The river name was called Dalecha because it dries during the dry season and the colour of the place where the river was looks *dalecha* (grey). The place Oda Gembo is because of a fig tree. A place was called Werebo because the area was a hunting ground and there are always hyenas and the name of a hyena in Oromifa is *werabesa*. I have a son and I have to

> teach him about all this. You said yesterday that the map talks and I confirmed that. We were talking with this map while we were doing the map.

One of the teachers said that he used to use maps for the teaching about far-off places such as places in Europe, the United States and Africa. Yet, he had no idea what the history of this landscape was. He never thought of relating maps to the area where he teaches. Constructing the map therefore provided him with a different experience. He said:

> I am a teacher here but I have no idea about this landscape. What I was teaching was about Africa and the world but not about Horo Soba. Now we can teach about Horo Soba using this map. This helps to compare the present and the past. We understood how the forest was full of fruit trees but the children did not know it. This map has the knowledge of elders and is critical for connecting generations. This connects schools and the community.

From the above, it is possible to see that there were many learning dimensions associated with the 2D mapping processes which included inter-generational learning, learning through engaging with dissonances, learning through reflective memory and sharing knowledge, and learning that makes connections with the local context. In the next section I discuss the emergence of agency, as evident from data related to the combined mapping processes worked with in the Bale case study.

6.3.6 Agency emerging in the context of the mapping processes

A discussion focusing on agency took place almost two years after the first P3DM had been completed. Tesfaye Tola, MELCA-Ethiopia's branch office co-ordinator in Bale, conducted an interview based on the interview guide in Appendix 6. The main purpose of this group refection was to find out whether the community as a group or as individuals had done anything as a result of the mapping process. This was to probe possible structural elaborations that may have been related to the mapping activities (Archer, 1995; see Section 4.5.2). As indicated in Section 5.9 it is difficult to establish correspondence based causality in social contexts as there are many different factors that influence learning, agency and change, but as shown in the interview citations, it is possible to establish that some changes have occurred, and that these are associated with the mapping activities by the actors concerned. This is what I looked for in the data to provide evidence of the emergence of agency, at least as directly expressed by actors in the social context. As will be discussed in

Chapter 7, there are broader processes and explanatory details that reveal changes in agency, but these are not dealt with here.

As described in detail above, there were many examples of the emergence of agency that were related to the construction of the different kinds of maps. For example, development of agency amongst elders to produce map legends, and ordinary community members to produce three dimensional models; and agency for deliberating alternative futures using the maps. These forms of agency are important within the mapping process itself, and as described above, they were supported by various facilitation and educational processes, and were related to a variety of learning processes. These will not be repeated here, but will be discussed in more detail in Chapter 7.

The interview, conducted two years after the mapping process revealed a different form of agency that was said to be linked to the mapping experiences, and this is related to direct actions for change at community level. As reported above, the community felt the loss of its natural resources, and through constructing the maps of the past and present, they felt the loss while mapping. This, they said, has initiated action in them as shown by the series of citations below.

Muhamed Abda talked about actions to stop deforestation and said:

> We have looked at the map of the past and compared it with the present and have agreed to stop the cutting of trees. We have decided to rest the axe. We have also decided to reforest degraded lands with indigenous trees. We started collecting tree seeds to raise them in our nursery beds and to plant them.

Hadji Husen Wako from the Orasha community talked about actions to reverse changes in social structure that were occurring as a result of changes in the landscape:

> When we look at our history from the past, we do feel that we do not exist anymore. When we compare the past and the present, there is a huge gap. It is not only the soil and the forest that is lost. Even the people are not there. People are leaving the land. We have really felt it and we said to each other 'Let's not lose hope. We can get it back.'

Aman Mame talked about actions to manage the land differently, and described the action that they have taken after building the P3DM:

> We have seen the problem and consulted on what we can do. We have delineated a piece of land and are protecting the land. Now the land has changed. Looking at the change on the land, people, either individually or in a group, are also protecting more. We are healing the land in this way. We are prepared to do more.

Musa Kubsa talked about using cultural approaches for environmental protection. He explains how they are using cultural methods to help them bring the land back to its glory:

> Me as individual, I am trying to revive our culture of protecting the environment. We used the culture of the Oromo where people agree as a community over an action and where people are cursed if they go out of the agreement. We are using that to protect the land.

Muhamed Abda explained that undertaking such actions is not easy, and talked about the challenges that they were facing from other community members, and the determination that they have to engage constructively with these challenges:

> We felt that we should rehabilitate the land after the mapping exercise. From then on, we started planting trees and we are raising tree seedlings. We have the rogues among us who can go out of the agreement but the cutting of trees around me has stopped and I do not allow others to cut. Personally, with the support of the Development Agents, I am going to plant at least 1000 tree seedlings. The biggest change is, except rogues, indiscriminate tree cutting has stopped. We will get it back in the future. We are all ready to protect now. We are not leaving it to other people.

From this it is clear that there are direct actions on the ground occurring that are closely associated with the mapping experiences. The time span between the mapping processes and reviewing agentive outcomes also seems to be important, an issue I reflect on in more detail in Chapter 7.

6.3.7 Member checking and deeper reflections on learning

Figure 5.9 below represents the wider agenda of ensuring further reflexivity, deepening of my understanding, and member checking to ensure trustworthiness. As mentioned in Table 5.2, after the initial data analysis, I had a meeting with the local community with my computer in hand to show them the photographs that I had taken, and the pictures that I selected to use for developing the photo narrative. I shared with them the content of the analysis that I had produced based on the photos and the interview data. No major or significant changes to my

interpretations were suggested, except for some correction of names and events, but the member checking process elicited further reflections and insights into what was learned, and what the significance of the mapping process was in the community context.

Besides the member checking, I also used this opportunity to ask further questions, particularly on aspects of learning, as I realized that this was a complex area that needed further in-depth understanding. Insights gained into learning aspects from the member checking and further interviewing are shared here.

Figure 6.9: *Members of the community reflecting on aspects of their learning two years after P3DM and one year after 2D scale sketch mapping*

The picture shows members of the local community who participated in the mapping process. From left to right are Adam Bira, Aman Mame, Husein Gelano, Oumer Boke, Misa Aman and Tesfaye Tola. We are sitting in the compound of the son of Aman Mame who is the fifth from the left.

As this section focuses primarily on the deeper probing of learning, I structure it broadly according to three key areas of discussion emerging from the semi-structured focus group discussion (see Appendix 6, CD Rom). These are: learning and change (which reflects both on what was learned through the mapping process, but also on changes in society); memory (which reflects on the relationship between the mapping processes, memory and the learning and changes occurring); and learning

together (which reflects on collaborative aspects of the learning in the mapping processes).

- **Learning and change**

Responding to a question on their experiences of the mapping process, the group reflected that the experience *had made them more conscious of the landscape, and naming of the landscape*. They said that even though they had lived in their landscape all their lives, they had not thought consciously of their surroundings and they had not, for example, bothered to ask why certain places were given particular names.

Adam Bira said:

> I did not know much of the land even though I was living here. There were places that I did not know and now I know. Our ancestors have named this land and we did not know it and this map made us know it. Even the burial places of some of the famous people that we heard about, we did not know where they are and now we know. We were surprised when we were shown the place where the big bird lammergeyer break bones and now we know.

Aman Mame added:

> It has started a pain in us. We remembered our history. Our history was being forgotten. The memory is painful. Our forefathers gave names to our land. There is a *melca* called *Tarura* and I did not know why. Why it was called, nobody used to know. *Tarura* is *Jibira* (Giant Lobelia). There was *Jibira* around the *melca* that time and that is why they called it that.

They reflected too that the experience had heightened their awareness of *the significance of their communication system*. They indicated that previously, natural elements in the landscape were used to communicate and they said the mapping process has helped them to remember this. Aman Mame continued:

> As we know from history they used to use natural elements in the landscape as a means of communication. If a person passing a place wants to indicate to somebody that he passed that place, he will put a sign and even indicated if he wants to be waited for there. If the road is bi-furcating and confusing, they put signs showing the direction that they have taken. This generation does not know that. So doing the map and remembering the communication system that was there helps to transfer knowledge to the coming generation.

They reflected too that the mapping experience had helped them *to see relationships among components of the landscape*, as shown in the citations below:

Oumer Boke said:

> The mountain has forest, the forest attract rain, the rivers come from the mountain, the rivers create the wetland, men and animals get water from that, rain comes because of all this and cattle get grass because of this. The climate is also good because of the forest and the rivers. The water in the wetland brings rain. The cattle have a relationship with nature. There are times that the cattle want to go to hill, times to the wetland.

Adam Bira added:

> Water starts from the mountain and it will not rain if there is no forest. The field gets water and rain because of the forest on the mountain. When this happens, our cattle get grass and when they get grass, and then life is great for us.

They also reflected that the mapping process had heightened their awareness of *changes to the landscape,* and why these were taking place. They agreed on the fact that there is rampant deforestation now and discussed the historical origin of the destruction, which seemed to be linked to changes in land use governance. They said, during the Hailesilasie Regime (1930 – 1974), land was administered by a *balabat* (landlord). People had to ask the landlord if they wanted wood for construction. If they stole wood, there was heavy punishment, and as a result people did not dare to cut wood for fear of reprisal from the landlord. They did not even cut grass for thatching their houses without asking for permission.

They reflected further that in the same era, the land was owned communally, was governed by an elected person called a *burka*. Under the *burka* was the council of elders. The *burka* was accountable to the landlord. The responsibility of the council was to manage the grazing lands and the communal forest areas. For this, there were bylaws, not written but known to everyone. They closed some forests and grazing areas from access at certain times of the year. This was to preserve grass for cattle to graze during April and May, which they call *bedessa* (see Table 6.1 above). At times there was no rain and most areas were dry, at which times the community used the closed areas for grazing their cattle. This way they spread the risk across the year. If people did not respect this and if they went to the grazing areas without permission, the council of elders would punish them using their bylaws. The *burka* had the responsibility of coordinating that. Only when the matter was above the elders' council and the *burka* did the *balabat* intervene.

Husein Gelano said:

> Elders managed this. They knew the land very well. They even knew the boundaries of people. The communal lands also had boundaries. The elders used to manage that. They had cultural protection methods. If somebody broke the rule, they had a special grass type where they will hold in their hand and call the offender and curse him if he did not beg for forgiveness and pay the fine. People were assigned a time and a place for grazing and cutting wood.

People in the community elected the elders. If one of them died, the son would take up the responsibility of his father. This is probably because the son grew up following his father when his father went around mediating conflict and in the process was able to learn the traditional bylaws and ways of mediating reconciliation among people. There were things that were permitted and not permitted. People could go to a bamboo forest and cut, because it was fast growing, and grows again in three years time.They could cut creepers for making rope and could put their beehives in the forest. Other cutting activities were not permitted. As Husein Gelano said: "This has kept the forest and life was better". They also reflected that the youth who had participated in making the maps had learned about this from the elders.

They noted too that this system had changed during the Derg Regime (1973 – 1990, see Section 1.4.2).

Oumer Boke recalled:

> The Derg has taken the power off people. The people who were protecting the forest were dubbed as drinking the blood of the community so they were running for their life. The destruction of the forest has started because there is no *burka*. These people were protecting the forest with rules and when that was broken, then everything crumbled. The land lost ownership. People now go out and cut as they want. We used to choose the tree to be cut. Even branches were chosen. Our fathers did not allow us to cut whatever we want. When the land is fatherless, there is nobody to say stop.

They also reported that the destruction increased when people were 'settled' by the Derg's resettlement programme. The resettlement programme sought to gather people at a specific area to provide infrastructural services like health and water. It faced a lot of opposition, and as soon as the regime fell in 1993, people went back to their original places. In Bale, most people settled in new places that were not previously occupied. This further exacerbated the clearing of the forest. The Derg

also introduced agriculture to previously livestock rearing communities, which resulted in people farming in grazing and forested areas.

Adam Bira said:

> The forest destruction was acute between 1998 and 2009. It was bad. People competed for wood and cut it for various purposes. Forget passing it to our children, we do not have enough for ourselves now.

There are, however, signs of change in people's attitudes. Aman Mame said for example:

> People looked at the destruction and have started to change. They have started planting tree seedlings and protect the trees that they have planted. We have started protecting the trees on our farm and land now. We started protecting the trees on our farm starting 2009. After the mapping process, things have changed. The map made us remember a lot and we could see the trend in the direction of rehabilitation.

- **Learning together**

The interview respondents agreed that working as a group during the mapping process had helped them a lot. They reflected on *the way that knowledge and memory is distributed and shared* when they said that people come with their own memories that are incomplete, and when they come together, they remember together. This is illustrated in Aman Mame's words below:

> Working as a group made us remember a lot. If one forgets, the other remembers. With the previous map, [referring to the P3DM] we knew a lot. We found Shewiso on the map and we proved it wrong the way it was put on the government map because we worked together. There was a place name Guri. It means collect. This was a place where the landlords used to collect tax from the people. So we understood the meaning of the name because of working together. We did not know Alija was a sacred site and we did not know its significance. Alija was a place used for administration by our ancestors. And this we knew because of working together. We could remember a lot and we got what we had thought had disappeared.

They also noted the significance of *intergenerational communication*, and commented on the way in which elders were able to pass their knowledge of the landscape to the youth. Misa Aman, who was a younger participant in the mapping said:

> When we do mapping together, elders will tell us about the past. We know only the present. When we do it with elders, the elders will teach us how the land was 40 years ago. We know what we did not know.

Oumer Boke added:

> When we do it together with elders, we learn from them. We learnt how they were protecting their cultural lands. Now there is nothing like that. Now we can see that we are in a problem. Our way of thinking is creating a problem and we could see that.

- **Memory, culture and biocultural diversity**

As already noted above, the mapping process was intertwined with memory. This, it seemed, was linked closely to experiences of biocultural diversity and it seemed too that the mapping has brought forth *a sense of loss associated with these past experiences of the regional biocultural diversity*. As Adam Bira said:

> First, when we started mapping, we did not consider it significant. Then, we were thinking 'how can we do mapping when we are not educated' then I was surprised with our capacity and started the mapping process in earnest. Second, when elders drew springs which were there 40 years ago, we wondered. When I travel around my home area, I was not thinking about the rivers that I was crossing and the mountains that are there but now due to the mapping process, I am looking at them as something new. I was surprised to learn the name of the rivers and their *location*. Now they are all on the map and our children can see them. The maps have made us remember. Rivers that were flowing are dry now, and rivers that are there now and may disappear tomorrow, now our children can know.

The respondents also felt that the mapping activities had reminded them of their culture, as expressed in two citations below.

Hussein Gelano said:

> Previously, our fathers used to live with their culture. Now it is called backward and people are leaving it. Previously, our culture was respected and protected. Now life is not that good. It is much more expensive.

Aman Mame added

> … the maps have shown that people were protecting the communal land together. They used to respect their agreement. People did not cut trees as they want. Now they do that and this is bringing drought to our people.

It seemed too that reflective discussions after the mapping processes, brought forth new learning and memories, as Aman Mame said:

> I participated in both maps. Now you have come to reignite my memory and because of this I will remember this constantly.

And Oumer Boke said [in response to the member checking process involving the eco-cultural calendar]:

> Today when we discuss about seasons, it made us remember a lot. It made us understand more. We were born in this land and we understand the names of places like Alija, Melca, Tarura, Gura and others. We could understand the significance of these places. Even when we were told about the colour of skins that our forefathers were using at Alija and their significance, we learnt a lot about traditional way of justice.

Mapping was not, however, only about memory of the past, but also seemed to generate *perspectives on the future, which seem to be important for agency and change*.Respondents felt that the mapping process and the reflections that it brought to the fore, has encouraged them to change course, to stop cutting trees, and to undertake rehabilitation work. In this regard, Husein Gelano said:

> Now after 2009, (year of the modeling), people have started the protection of their land. Now I feel that the destruction should stop. We all feel that we should plant tree seedlings. We plant eucalyptus in our backyard for cash income and for fuel and because of this the protection is increasing. It is very difficult to say that nothing will be cut. There are people who still cut. But through time, there will be change.

Aman Mame concluded:

> People are ready now for protecting land. The forest land has been given to people. People were thinking that the seedlings that they plant will not survive but now people could see that it grows. So even if they could not see it in their lifetime, they are ready to do it for their children.

This statement is perhaps a fitting conclusion to the Bale case study data presentation. I turn now to the second case study, which reports in similar detail on the insights gained from the Telecho mapping processes.

6.4 Mapping at the Foata Mountain and the Telecho community

This case study presentation follows a similar format and logic to the Bale case study, unfolding the story of the mapping through use of the four main sub-categories used for analysis throughout the study: biocultural diversity, educational processes, learning and agency. As in the previous case study, I use photographs as 'cues' that help to unfold the story of mapping, learning and change.

6.4.1 Legend building

Figures 6.10, 6.11 and 6.12 below show the process of legend building in Telecho. As in the previous case (see Section 6.2), and as discussed in Section 5.6, participation of local community members in the legend building process is a crucial step in participatory mapping, especially in P3DM. The Telecho P3DM was done after completion of the scale maps which, as explained in section 5.8, were completed before the P3DM; therefore, those who came to participate in the legend making exercise already had an idea of what was involved. This made the activity easier than in the other P3DM model building activities. Figure 6.10 shows the deliberations taking place to construct the legend, while Figure 6.11 shows the presentation of the legend to community members who participated in the map building process, and Figure 6.12 shows the final legend.

Figure 6.10: *Legend making with elders*

Figure 6.11: *Legend presentation by elders for approval to the wider community*

As in the previous case study (see Section 6.2 above), I now examine insights gained into biocultural diversity, educational and learning processes as emerging from the legend building process.

- **Biocultural landscape**

Figure 6.10 above shows the process of legend development in which Deneke Bisrat and Negesse Merga, two of the elders from the local community, are the main actors in the process. The central person in the photo is called Endale and he was facilitating the process as he had participated in a previous model building process. The plastic containers in the background of the photo had pins of different colours, sizes and textures, which were used to indicate points. The criteria for the selection of colours for the legend combined the nearness of the colour to the object in question or some abstract criteria. For example, when asked why they chose a yellowish brown colour for the soil *ofi* [local name for a type of soil] Dmeke Bisrat said:

> This is a type of soil found around the Foata Mountain. The colour we have chosen resembles the soil. Faba bean, wheat and barley grow there.

Asked why they chose a red colour for bridges, Deneke Bisrat and Negassa Merga said:

> This is a place where people, cattle and cars cross the river. Sometimes a flood comes and kills people and animals and the colour red is selected because it is dangerous: People become careful when they reach the bridge.

Deneke Bisrat identified most of the colours and other men sitting around the table agreed with most of her suggestions.

Figure 6.11 shows Negesse Merga and Deneke Bisrat presenting the legend to those who came to populate the model. As in the previous case, the legend is the communicating mechanism between the local community and the model. The two elders presented the colours, points, lines and the polygons and asked if the local community agreed with what they had produced.

Figure 6.12: *A close-up picture of the legend showing the points, lines and polygons*

Figure 6.12 above shows the actual legend. The communities have identified 25 points, five lines and 18 polygons. The points included infrastructure (including schools, health centres, recreational centres, farmer training centres) and cultural places (including sacred sites, horse arena, churches, and burial grounds). The lines were rivers and roads (both tarmac and foot paths). The polygons included agricultural lands. As they are largely an agricultural community, traditional knowledge was demonstrated through their nuanced and complex understanding of soil types. They identified five kinds of soils with the kind of crops planted on each of them. For example, faba bean, wheat and barley are grown on *ofi soil* while *borole* soil supports only wheat. The dominant soil identified is *dimile* (red) and almost everything that grows in this area grows on this, which includes wheat, beans, peas, barley, vegetables and chick peas. There is also *dilaland* which is not yet formed into soil. Barley grows mainly here and herbs like thyme also grow. Different kinds of soil mix in some part of the landscape and they are called *oborse*. Lentils, barely, fava bean and chick peas grow here. They have also identified three kinds of forested areas namely eucalyptus, hagenia and a mix of indigenous trees. It could be seen in Figures 6.13 and 6.14 that forested areas have decreased considerably and this is due to unchecked human intervention, which will be explained later. Other areas

identified included communal grazing lands, which they manage according to their own rules. A very big wetland called Berga is identified and it serves as the largest grazing land for cattle.

After some discussion, the colours and what they stood for were largely accepted, which set the stage for the next phase, the actual building of the map. After the cardboard construction phase of the model was completed, it was painted white.Later some of the community representatives said that they were “absolutely frightened” as they did not know what to do with the model (see Figure 6.20 and related explanation below).

As was the case in the Bale case study, it seems that the first group will always be particularly challenged to understand the initial translation processes that involve making the links between legend, memory and map. Those who follow are able to see what the first group has done and therefore find out what and how to do the map building more easily. It is therefore important for the learning process to make sure that the first community group who participates can act as facilitators, later showing the others how to do things.

- **Educational processes**

The elders involved in the mapping activity had never before had a chance to discuss, in such depth, the colour of their landscape. The pins, and other technical aspects of the P3DM process were new to them, although they had been previously involved in sketch mapping. Through the structuring of the activity, and the discussions that ensued, they could start to relate the colour of the pins and paints with their landscape. Some of the colours were similar to those used internationally in mapping practice. For example, the colour of rivers is almost universally always blue. Light blue indicates the colour of tributaries. However, they said in reality the colour that they know for rivers, changes according to the season. The rivers are muddy and brown during the rainy season and greyish at the end. But they agreed to use blue and light blue. However, they refused to use it for the Berga River. They were adamant about this. They said that the Berga River looks black throughout the year and blue does not represent the river accurately. The colour used to indicate

roads internationally is red. But the elders refused to use red for roads, and chose to use a dark grayish colour as this more accurately represented the natural colour of an asphalt road. In this way, there were educative interactions between the elders and myself (I was acting as main facilitator at the time), and we used the pins and the paints as a learning media. This was an educational process, both for the elders, and for me, and Endale, who was co-facilitating with me (Endale is pictured in Figure 6.10, co-facilitating the process of legend building).

Figure 6.11 shows Negesse and Deneke facilitating the process. In the process of educating others how to use the legend, they made use of the draft legend that they constructed as an instructional media. In this interaction, the two elders are the facilitators and the other community members are the learners. This process continued till the end of the model building, and the education process 'rolled on' in this way from group to group.

- **Learning**

Before this experience, diverse members of the Telecho community, had never had a chance to come together and use a legend to communicate features of the landscape in the same way (it is done with less detail in sketch mapping, see Section 6.3.5 below) The use of the legend to put their understanding of their landscape on the model helped to develop a wider perspective of the landscape and what was occurring on it, as reflected in this statement by Kasaye Tola, a community member from Welmera *wereda*, whose reflection shows the relationship that exists between the legend, and developing knowledge of the landscape:

> We are working on the map. There are different colours and pins that represent the different things in our area. We also selected the colours and pins. So we are using those colours and pins to show the features of our landscape on the model. First all of us felt that it would be hard for us to do that. But gradually we learned that the model looks like our land. So we took some time to identify the rivers, roads and hills in our respective localities and after that it became very easy to identify other things. What we learned from the map is that we are running out of our natural resources, specially the forest. The forest coverage on the map is very small. It was not like this some years back. The mountain was covered with forest. So there is a lesson that we learn from the model. It seems we are consuming everything without leaving something for our children.

Mekonnen Abebe, another community member from Welmera *wereda*, when asked why he is participating in the P3DM process, showed a similar relational understanding of legend, mapping and emergent landscape knowledge, when he said that:

> We are here to work on the map of our area including the Foata Mountain. Our role is to show the different natural resources and institutions on the map, in accordance with the legend, using the colours and pins prepared for this. I think this is a great opportunity for us to learn more about our environment by looking at the past and comparing it with what it looks like at the present. We know that our area is being deforested and degrading very fast. But we have not so far had such a discussion around the area itself. I can see now that the entire land is becoming agricultural land. This has come with the increase in the number of population. Most of the forest has gone. As a result we are suffering from problems of shortage of rain and water. I am concerned how our children will be able to survive if things continue like this.

The depth of local knowledge that becomes visible and available for others to learn from is an interesting aspect of the learning in the map building process, as is reflected by this comment from a teacher, Endale Sahilu, who said:

> … from maps in geography class, I only knew three colours. I was saying to myself, 'why do we need all this colours?' I did not think that the elders would identify more than 4 or 5 colours. I was told by Million not to interfere and to let them do it but I did not believe him. But they came up with a lot of colours even for one attribute. There were three kinds of agricultural lands and more than five colours for forest areas. I was arguing with them that there is no soil called Dalecha but they explained to me and I had to accept. I was astonished by how much they know and my respect increased.

6.4.2 Putting cognitive maps onto the 3DM

This section shares insights from the wider process in which community members were involved in putting their cognitive maps onto the model. As outlined in Section 5.8 selected community members from different villages came to build the map of their own village on the larger landscape. They used the legend to help them do so. Figures 6.13 and 6.14 below illustrate this process.

Figure 6.13: *Putting cognitive maps onto the model, Telecho*

Figure 6.14: *Discussion and cognitive mapping*

- **Biocultural landscape**

Figure 6.13 shows community representatives engrossed in painting, identification and marking of their land with yarn. On the left side, a member of a community is painting with dark green. The legend identifies this colour as an indigenous forest. In front of him lies a vast area of yellow green. This colour, according to the legend, represents the Berga plain, which is a big wetland and an important bird area, which provides a home to the endemic white winged fluff tail. The size of the model that they are working on is 120cm by 280 cm. On a 1:10,000 map this would mean an area of 12km by 24km (288 km^2 or 28,800 hectares). As the area was vast, in total 119 people came from a number of villages, distributed across the landscape, to build the model. On the right side of the map, two participants are using light blue

yarn to mark a river and paint it light blue, indicating that it is a tributary to a larger river, which, as noted above, will be dark blue.

Community members involved in the process used yarn to delineateland use types, ecological features and to agree on the size and identity of the featured area before painting it in. Size is tricky as what seems like a large area on the actual landscape will be very small on the map. A reference guide is used for this purpose; and it is also a key point that needs to be well mediated and understood at the start of the mapping process. Figure 6.13 shows that the dominant colour on the landscape is the Ada Berga plain; which is complemented (in coverage) by a growing size of brown that represents agricultural land. The brown is even encroaching into the wetland and Figure 6.14 shows how the brown became the dominant colour as the mapping progressed. This is indicative of the changes in land use, and an increase in conversion of wetland to agricultural land. It is not always easy to 'see' these kinds of conversions in land use on maps (unless maps of the past and present are built and compared), but these become 'visible' in the conversations and dialogues about the changes in the land which take place as the P3DM gets constructed.

Figure 6.14 shows Deneke Bisrat and other participants putting pins onto the landscape. Since Deneke Bisrat participated in the legend building, she was able to direct the putting of the right pins to the right places. The pins were put in after the painting of the polygon was finished. To the right of Deneke's shoulder is a young student. He is observing where the pins are being put and at the same time, he is learning about the points on the landscape. He later said:

> I could see that the elders have identified sacred places and rivers and other parts of the landscape. I tried to do that but I could not. They could use colours to differentiate among places. I was surprised that there were plenty of colours. I did not think that there are so many colours. Elders could identify these lots of colours.

In Figure 6.14, it is possible to see groups of white pins indicating a village. A single village has between 80 to 100 households. In this way, the pins can indicate the population of an area.

Figure 6.15 below shows a close-up of just one area of the completed Telecho map. On this map it is possible to see the complex knowledge that people have of their landscape and the biocultural diversity that exists there.

Figure 6.15: *Close-up of the Telecho map, showing the rich knowledge of landscape and biocultural diversity of Telecho community members*

The photo shows a detailed understanding of the soil of the area by the local community. The dominating brown red soil is what they call *dimile*, which is agricultural land. To the left is black soil called *koticha* locally. Upper left is another soil called *borille*. The yellow stripes are another soil called *ofi* .To the right side is a dark colour which they call *werebo*. This is where rivers start as is shown by a river starting and join the bigger river indicated in dark blue. We have seen in this section talking about the legend that these soils are associated with a particular crop even though there is an overlap in a kind of crop that can grow here. We also see different shades of green. The one in the middle is an indigenous forest. We can see much darker green colours indicating a thick forest. The thick forest is found on the side of a cliff indicating that it has been saved due to its inaccessibility. On the right side is a light green colour indicating a eucalyptus plantation. To the far corner both on the left and right, we see a yellowish green strip that indicates grazing lands. The white lines are footpaths. There are different coloured pins. To the far left are white pins indicating settlement. There is a lone white rounded pin indicating a church. The

blue flat topped pin is *melka*, a crossing point, and the yellow pin indicates a bridge. The green pin rounded on the top shows a sacred site while the long necked pin indicates a farmers' training centre. The red pin with yellow paint on top indicates the house of the spiritual leader. He is usually responsible for maintaining social order, which, within the concept of biocultural diversity, has implications for order in an ecosystem.

- **Educational processes**

Figure 6.13 shows members of the community around the table interacting with different tools. They are using paint to indicate agricultural lands, forested areas, wetlands, etc. They are also differentiating between different kinds of forestlands and agricultural lands. They have never used colours for this purpose before, a process that they had to learn from those who constructed the legend. They are also using yarn to mark areas that they will be painting. They have used yarn before, but not for this particular purpose. The relationship and interactions between them, the facilitators and the tools that they are using to put their knowledge on the model constituted an educational process.

In Figure 6.14, those gathered around the table are using pins to mark points, after the painting is completed. The use of pins to indicate places on the landscape is also a new experience for the participants. Dmeke is explaining the use of the pins and what colours and features they indicate to those around. There is a considerable amount of discussion before any pin is placed on the map. This is another example of an educational process, involving participants, pins, meaning making, and guided support or scaffolding from Deneke, the co-facilitator.

- **Learning processes**

As was the case in Bale (see Section 6.4 above), the model building process created an opportunity for the people from Telecho to reflect on the change in the landscape and connect it with their livelihoods, as reflected in this statement from Gonfa Feyisa, who said:

> When we started to work on the model, we had no clear idea of what we were expected to do. But gradually things became clearer and we identified

> the features of our land. So we put the rivers, religious sites, cultural sites, forests and roads easily on the model. While doing so, we recognized that the area has shown big change within a short period of time. The environment now is by far different from what we knew a couple of decades ago. The change is alarming. That is what we are observing on the model. Once we are aware of the problem I think we will work toward the solution. We are the causes of the problem and we should also be the solution.

Biritu Moti, a community member from Adea Berga *wereda* said this about participation of women, showing inclusivity in the learning processes:

> Even though we, women, have no less knowledge about our environment than the males of our age it is not usual for us to participate on such kinds of discussions about our area. We are happy that we are here to contribute our part. The model is a beautiful thing. It represents our area. We are happy to be part of the making of it. By participating on the process we have also got some additional experiences about our area. We learnt about other things in some other areas. We have also learned the scale of the loss of forest.

The model has given people a wider perspective of their landscape than their village. It has also mobilized feelings of loss, change and pain, and a determination to correct the situation. This is expressed by Diriba Bedada, a community member from Adea Berga *wereda* who said:

> The model shows the land, as we know it. We are putting our relationship with the land on the model by using colours and pins. It is a very enriching process. We got ideas on what our area has and what we are lacking. We also learned that most of the land is being tilled for agriculture and there is little or no place for forest and grazing. This is not good. We should have a forest area, as agriculture cannot be effective without forest. We may not produce much by having wide agriculture land. But if we have forest and appropriate climate for crop production, we can get good produce from a small piece of land. So we have to think of that and come to agreement as a community and the model helps that.

Students from the local junior secondary school also participated in the process, as mentioned in Section 5.8. The picture shows one of them observing others putting coloured pins on the model, and learning about place names at the same time. Students learned the model building process, with support from facilitators as described in Section 5.4.3. They were divided into four groups: those who corrected the defects in production of the cardboard by making sure that each were exactly 120cm by 280cm, those who traced the base map onto the cardboard, those who cut out the traced cardboard, and those who built the model from the cut out

cardboard pieces. The students appreciated the division of labour, and the different learning opportunities. A student called Mamo Assefa reflected on this, by saying:

> We learnt how to play with map scale. We know how to grow and minimize map with scale. I was surprised to see how a long distance on land becomes a centimetre on the map.

Through their participation in the process, the students also had the chance to get to know their landscape better. Many said they had learned many features that they did not know existed before, as reflected in this comment from Askale Debele:

> I knew only one river. I thought it was the only river. I was later told by elders and saw on the model that there are other rivers and their source is Foata.

Most were surprised by the knowledge of the elders. They said their respect for elders had increased as a result of the map building. Askale Debele summarized the feeling of everybody when she said:

> They know a lot. I saw the blank white model. I was wondering what they are going to do. They did go to school. Some have some education but the majority are illiterate. I could not identify from the model where I was living till they came and told me. They used colours to tell us what is located where. They came and told us about rivers and other cultural places. I was surprised. We felt we know more than them. But they know more than us. They told us what we did not know. I could see that they are like books. They know what was there and what was not there. They could identify all that. I felt it a lot. I wish they could come and teach us more.

The students also felt motivated to change their landscape. They felt that they should not wait to see it totally degraded. Abebe Bekele said:

> We could see that our land looked like a man without cloth. We felt about that a lot. So the local community has arisen to reclaim their land. We felt we should support them. Those who participated in SEGNI are planting. I came from Adere. I used to refuse when I was sent by my family to participate in soil and water conservation activities. I did not participate. I did not want to participate. Now, due to the model, I could see that I have to change. I remembered what they were saying to me. If we did not change now, we cannot change in the future. We learnt how to take care of a tree nursery in the training organized by MELCA-Ethiopia and using that skill we can start a tree nursery and use the seedlings to rehabilitate our degraded area. We are changing from inside.

6.4.3 Sketch mapping activities

As in the Bale case, sketch mapping formed part of the case study, although the processes were implemented in different sequences. As the P3DM process was the core focus of the research, I presented it first in Section 6.3.2 above.

Figure 6.16 shows members of the Telecho community doing 2D sketch mapping (see Section 5.8 for detail of the processes followed).

Figure 6.16 below shows members of the Adere community who participated in the first 2D scale mapping activities (see Section 5.8), on 7 February 2010. In this process, maps of the past, present and future were developed (similar to the Bale case).

Figure 6.16: *Members of Telecho community doing 2D scale sketch mapping*

Figure 6.17: *Eco-cultural map of the past showing the fauna and flora*

- **Biocultural landscape**

The community developed a map of the past, the present and the future. The Telecho *kebele* was covered with vegetation in the map of the past. There were trees on hills, on grazing lands and on either side of the rivers andscattered among farms. There were over 25 tree species and 22 sacred sites. The spiritual leaders were feared and respected and were able to manage the relationship of the people with each other and their land. The number of households was limited and there was a vast amount of land which was not covered with agricultural land. There was wildlife in the forest including hyena, antelopes, baboons, monkeys and leopard. The farmers had 18 barley and six wheat varieties which shows the high level of diversity in crops. There were also 12 traditional vegetable varieties. These all shows the detailed knowledge that people had about the biodiversity in their biocultural landscape. The map of the present showed a grim picture: most of the wild animals already gone, forests degraded, rivers and wetlands dried and the number of both crop and vegetable varieties decreasing (see Appendix 6).

The elders could identify varieties both in plants and animals and explain their cultural significance and what has happened because the increasing degradation of these resources. The degradation has happened in less than 30 years.

- **Education**

As reported in Section 5.8, a 'No Man's map', a scaled map of the Telecho area with a scale 1:2,500, was digitized from the topo map which is 1:50,000. The digitized map included rivers and roads only. The community looked at the map and was silent for about an hour as they were trying to locate themselves and relate it to their land. One of the elders from the community acted as a facilitator and helped the community locate itself in relation to the Telecho Gebriel church and the river Mintile. Then slowly they started locating themselves in relation to the roads and some of the rivers. Then they located the Foata Mountain and marked it on the map. Then they were asked to put the map of the past on the map.

The elders took the centre stage in this process, as the younger community members had very little idea of what was previously on the landscape. Through the facilitation

of the elders, the other participants, who were adept with using colour pens and pencils, placed what the elders were saying onto the map. As the maps started to fill, elders gave more and more information to the young people to put onto the map. They could also narrate the history of the landscape as they did so. They were telling the younger members of the community, for example, how the loss of the forest is due to the change of regime and the wanton destruction that followed. This interaction between the elders as facilitators and the youth as learners, using the map as a media, constituted the education process.

The technical support provided by me and some of the MELCA-Ethiopia staff also provided scaffolding for the learning process. For example, we brought the No Man's map and explained how the mapping activity should proceed. We provided with the colouring and other materials. We also facilitated the discussion that followed.

- **Learning**

During the first scale mapping process, members of the community completed amap of the past, the present and the future. After completing the map of the past, the youth said that they could see what their land looked like some years ago. They said they were able to learn that their land was covered with forest and that there were plenty of wild animals. In contrast, they could see that on the map of the present there wereno wild animals and most of the indigenous trees were gone, and they could only see patches of eucalyptus tree. The map of the present also showed dots of indigenous patches of trees. The young people said they were told that the landscape had started to change dramatically 23 years ago when the previous regime changed. People were prosecuted and fearful of cutting trees in the previous regime. After the regime changed, people started cutting trees and using them indiscriminatelyfor construction and as a source of income. They learnt that the rivers and streams that they see as dry or seasonal used to befull of water. The banks of the rivers and streams were covered with trees and shrubs. Now these have gone. They could also see that some of the seed varieties had been lost. They could see that a few years ago their land was not full of gullies and eroded stones. The elders and adults also told them that the productivity of their land is decreasing. Soil is

washed away every year and this is continuing. They said they were shocked and asked “why did all this happen?”

6.4.4 Agency emerging from the mapping processes

As in the Bale case, I tried to follow up the mapping activities with reflective interviews or discussions that probed what agency had emerged in relation to the mapping activities. As in the Bale case, it was possible to see that agency for map building and mapping had developed, but this is not the main focus of agency development as discussed here. As indicated in Chapter 5 in the methodology section, it is also difficult to attribute direct causality between a mapping activity and a particular social change. As in the Bale case, however, there are some indications that such relationships do exist, or at least are emergent (see Chapter 7 for a more in-depth discussion).

Figure 6.18: *Members of Telecho discussing agency one year after mapping*

Figure 6.18 shows a reflective discussion on agency emerging from the mapping process, held specifically for this purpose on 24 February 2011. Almost a year had elapsed between the first 2D mapping events and this workshop, and a few months had elapsed between the P3DM building and this reflective session. As in the Bale case (see Section 6.3), a time lapse after the mapping activities seems to be important to understand agency and its emergence.

The people in Figure 6.18 above, are sitting in a hut built by the school SEGNI club. This is a club established earlier by MELCA-Ethiopia which involves taking children on

a five-day forest excursion in which they experience nature-culture relationships (see Section 1.3.2). As part of their school environmental education activity, they built huts and these are used for meetings and to display cultural materials collected from local communities. They also display seeds and artwork in these places. Members of the local community who had previously been involved in the 2D and 3D mapping activities came to the school for the meeting. They are sitting in a traditional circle and are reflecting on the mapping that they did some time ago. They are meeting to reflect on the changes that have occurred after they did the first scale map.

The farmers reflected that, after looking at map of the past and the present, they were asked to produce a map of the future. They had held very serious discussions before they were able to put their vision on the map, as explained in Section 5.8. Following these deliberations, they then decided to form an association and put a structure in place to organize themselves and they called the name of this association Adere Environmental Protection Association. The Institute for Sustainable Development managed to secure funding from the Environmental Protection Authority of Ethiopia and MELCA-Ethiopia organized an experience exchange visit for them to Tigray and Amhara regional states. The sites visited were good examples of where farmers had managed to reclaim their land from gullies and soil degradation. They said the visit inspired them so much so that they started to do Soil and Water Conservation (SWC) on their communal lands and on their farms. After coming back, they kept up their association, and have held meetings on a monthly basis where they continue to discuss what to do. MELCA-Ethiopia supported some of their actions, and brought vetiver grasses[14]. Some used this, and have planted them alongside the Soil and Water Conservation structure that they built.

The soil and water conservation actions that they had implemented, they said, were bearing fruit. The structures managed to reduce the loss of soil. They even

[14] According to Vetiver Network International (http://www.vetiver.org/), Vetiver (*Chrysopogon zizanioides*), is a non fertile, noninvasive Indian clump grass cultivated for centuries for essential oil. Vetiver is central to a wide range of applications, generally installed as narrow linear barriers (hedgerows): its roots hold soil in place and dense ground-level stems restrain sediment flows.

mentioned that some streams that had been dry for a long time are showing signs of coming back, although it could not be established if this was a direct causal relationship or not. They had also decided to halt cutting of trees and this they said, had significantly reduced the cutting of trees. They planted some seedlings and there was now a shortage of tree seedlings.

A farmer called Mekonnen Tafa reflects:

> I am a member of the association. First of all I noticed from the map how our area looked like some years back. The elders explained this to us. We also did the map of the present. In the past the environment was green. Now it is much degraded. We started the rehabilitation work last year right after the mapping process. The elders told us what was in our land. We are working to reinstate that. We started soil and water conservation through terracing. Dried streams are coming back after this. It is showing up on where it used to be. We are not planning to plant tree seedlings on the entire area. If we protect some from livestock and humans, the trees will come out by themselves. Many are doing so. In this way we are planning to rehabilitate the environment to its previous status.

They also reported on some of the challenges that they faced in trying to implement these new actions. The biggest challenge was that some farmers refused to join them and be part of the SWC activity. This meant that, if the non-compliant farmers were on the upper side of the slope, the water came down with force and damaged the structures established down stream. They said they had tried to solve some of the problems through dialogue and engagement with these farmers. They reported saying the following: “Well you can refuse to join but if the water which comes from your farm destroys the farm below, then you have to answer for that”. They indicated that this social approach was working and many more farmers have become involved. They also noted that part of the reason why some did not join mayhave been jealousy as not all were able to get the chance to experience the exchange visits.

Another problem that the farmers reflected on during the mapping process was loss of farmers’ varieties. This they said was because the government was promoting fewer improved varieties and artificial fertilizer. They indicated that they were left with one variety for wheat and another for barley and that other varieties had been lost. One of the organizations that interacted with the farmers was an NGO called

Ethiopian Organic Seed Action (EOSA). This organization works on reviving farmer seed varieties through research, organizing farmers and conducting farm trails. MELCA-Ethiopia organized exchange visits for farmers of Telecho to farmers with EOSA. The farmers were inspired by the visit and they planted the seeds that they got from EOSA farmers. Farmers reflected that they were so happy to do this.

They also visited a site where farmers had managed to save their own seed and who depend on their own seed instead of the government supplied improved varieties. They collected some seeds from them and planted them. One of the farmers, Teshome Tafa reflected on this and said:

> Last time when we visited Chefe Donsa I begged one of the farmers to give me a handful of traditional wheat seed. When I came back I planted it separately on the side of my farm. Finally the wag [a wheat rust] came and totally destroyed the improved variety that I got from the government. Yet it didn't affect the one I got from Chefe Donsa. I didn't even add fertilizer to the traditional one. This showed me how the traditional varieties are strong against unexpected natural calamities.

The section above shows that there is some evidence that the mapping process has contributed to the emergence of new forms of agency amongst the farmers; but also that such forms of agency (that emerge from the mapping) can be further supported through exchange visits (which also seem to be powerful in supporting emerging agency). Importantly, the mapping seems to have stimulated reflection amongst the farmers, and provided motivation for participating in change processes (see Chapter 7 for further discussion on this).

- **Evidence of agency in youth who participated in the mapping process**

The youth started the Lemi Gari Mahiber in 2010 after their participation in the P3DM process. They participated in the SEGNI program of MELCA (see Section 1.3.2). *Lemi Gari* means good generation. They were registered as a legal entity by the local government and were given a 2,000 mere square of land and 11,960 birr (685 USD) for their activity. They were planting medicinal trees and herbs, cleaning the environment and decorating their area of town with various art works. They also have a theatre club and organize art events to improve the awareness of other youth and community on biocultural diversity.

Some also demonstrated a marked behavioural change. For example, Hashim Arebo and Elias Shikur used to gamble and disturb their families and neighbourhood and were frequent visitors to local police station. They also did not attend school regularly. Now they are group leaders and are employed by the local Meseret Kiristos church to act as facilitators of change in HIV/ AIDS patients and orphan children. Although this change is not directly correlated to mapping, the process has helped them to come together with other youth and facilitated the creation of the Lemi Gari Mahiber, which has given them purpose in life.

6.4.5 Reflection on the learning based on the model

As in the Bale case, I followed up with members of the community who had participated in the P3DM processes especially to obtain further insights into their learning during and after the mapping processes. This took place a few months after the P3DM process.

Figure 6.19: *Members of the Telecho community reflecting on the P3DM building process and their learning after 6 months*

Figure 6.19 was taken on 27 April 2011. From left to right are Deneke Bisrat, Diriba Wami, Dugo Ayano and Negesse Merga. They are facing the model. Dereje Dagne and Mulugeta Tafa were also there, although they are not shown in the picture. Even though I interviewed the four of them during the model building process, which took place between 6-22 December, I went back after four months later to further probe their learning after some time had lapsed, and to do member checking. As in the Bale case, it was significant to sit around the model and reflect on the learning, as this allowed us to probe various features of the model reflectively. Similar to the

Bale case, I have also used sub-headings that reflect key aspects of the learning process and learning as expressed in the reflections.

- **Culture, memory and sacred places**

The reflections on learning also showed that the map brought knowledge and awareness of culture to the fore, which was also linked to memory, and to some extent to sacred places, as is indicated in the reflections cited below:

Dugo said:

> Culture comes from knowing places. To know the source of rivers, the place of Mana Ayana was culture. To know where the river goes is also part of our culture. Springs are culture. *Melca* is culture. The name came from our culture. The name for each of the springs, the rivers, and sacred places, knowing all is culture.

Negessa replied, and said:

> We know now where adbars, sacred trees, are located in relation to other places. We have been looking at our sacred trees before but we did not know where it is located in relation to other places. Trees around Adbar are all respected. They are all respected and are not cut. Two trees existing together can also be Adbar. If there is one Adbar tree, the tree around them will be respected. Any thing around Adbar is respected. If it is respected from the beginning, then it remains respected. Even if it is the property of someone, then the man will be afraid to cut it. There are no wild animals as there are only few trees. So they cannot exist. We talked about all this [while] doing the mapping and we learnt a lot.

Dugo concluded "Now we know all our land. We know where our adbar is located and previously we were passing them."

Reflections on the learning also raised a long discussion on sacred sites. There are two kinds of sacred sites. One is called Mana Ayana. The meaning literally means 'The House of God'. This is where the spiritual leader in the community sits. It is a big compound with a big house. The responsibility of this man/woman is mainly to mediate conflict. People come to him over something personal or if they are accusing someone of something. There are police stations and courts but people prefer the arbitration of the spiritual leader as he/she is respected and feared by both parties. People come to the spiritual leader if they are fighting over cattle, women, land, killings, theft, etc. Both parties will accept his/her decision. He/she is

feared so much so that if somebody wants to hit somebody with a stick, the one to be attacked will call the name of the spiritual leader and asks for mercy. The assailant quickly accepts and will not attack.

Diriba said:

> It started from our ancestors. The function of the spiritual leader in the community is to arbitrate among people. If somebody steals from someone, the owner will go to the Mana Ayana. He may not have witnessed when his cattle were stolen. The spiritual leader will call the offender and asks him whether he did it or not. If he accepts, he will pay the punishment and go. If he does not, he will be cursed and might even die.

Dugo gave an explanation as to the value of the Mana Ayana for environmental protection:

> If people call the name of the spiritual leaders and ask the other not to do any thing, they will stop doing it. For example, if the person is going to cut a tree, the one who wants to prevent the action will call the name of the spiritual leader and asks him to stop the action. They can stop anything from happening.

The other sacred site is the *adbar*. This is mostly a single tree. The *adbar* will be celebrated every year around June. The leader of the *adbar* will collect money and kill a black sheep. It is considered sacred and trees around it will not be touched. Negasse, who is also a leader of the *adbar* said:

> Hail comes and destroys their crop around Gena time (June) if people do not contribute money and the adbar ritual is not done. So people contribute money and sacrifice at the tree, and hail will not come.

The head of the *adbar* can also mediate conflicts from time to time by calling the name of the *adbar* and asking people to confess the truth. Negesse added "At the Adbar, if people come looking for justice, the head of the *adbar* will make people confess".

The community said change is happening. People are abandoning their beliefs and trust in these systems. Many people used to believe in the Mana Ayana. Now people go to churches and have stopped going to these places. The protestant churches and the orthodox churches changed people's attachment to these places. The Mana Ayanas have also discredited themselves, as many now only do the arbitration in exchange for money.

Dugo said:

> There is no ethics in them and because of this people are leaving them. Now people go to orthodox and Pentecostal churches. People who used to practice traditional belief go to Orthodox Church and hand over their beads and other ceremonial materials.

The community said the change in the belief system has not brought peace to the community.

> The number of killings and theft has increased. Previously there was a tree called *hinte* and it was associated with the traditional spiritual leaders and respected. You can put your belongings anywhere and put the *hinte* branch on top of it and nobody will dare to take it. Now the tree is not respected. If there is somebody who attacks you and you call the name of the spiritual leader, people stop in their tracks and will not touch you. Nowadays, they will even attack the spiritual leaders. Now crime is increasing. Even if people go to Protestant and Orthodox churches, peace is not reigning.

Mulugeta added:

> If people get sick, they go to churches and get holy water. So when they get cured, they leave the previous belief and hand over their ceremonial materials. Some of the older people do go to Mana Ayana and the young go to churches. It is decreasing a lot now.

- **Landscape relations and change**

An interesting learning reflection also emerged focusing on the relationship among the components of the ecosystem, human activities and changes, and the landscape.

In the ecosystem discussion, as on the map and in the mapping work, the mountain featured strongly, particularly its role in sustaining the water catchment system. It was said that the mountain holds a lot of water, and that the trees use the water, also attract rain and 'feed the mountain'. Water flowing from the mountain combines and creates rivers. The rivers and the streams water the landscape and animals get grass and people get food. This relational knowledge is expressed in the citations below:

Dereje said:

> Water comes from the mountain. The water from the mountain makes the land wet and the land will become fertile. It has a relation with the forest. Mountain without water is useless. If water is not coming from the mountain, nothing will grow. The land will not be fertile without water. The climate will

> stabilize if only there is a forest. The forest will bring rain and the land becomes cool. Rivers do not come from a field. They need mountains. Mountains create the rivers. Forests will not survive without the river.

Legesse agreed:

> The mountain will hold the cloud. The cloud gives rain. Mountain has a lot of springs. All the rivers come from the mountain. Water starts from it. That is how they are related. If there are no mountains, there is no relationship. If there is no mountain and no water, there will not be cattle. The mountain looks also majestic and people are happy to be near it.

This discussion invariably moved towards discussing changes among components of the landscape.

Dereje replied:

> Now, the relationship has changed. The Foata Mountain has lost its forest cover. It has lost its beauty. The land has degraded. There were lots of rivers. The water in the river Mintile has gone down. Some rivers dried and some are very low. The soil is washed and the land is not useful. There was cloud and rain but now there is no forest to attract rain and the cattle are dying and we get little from the farms.

When asked why this might be the case, they reflected a similar explanation to that told within the Bale community. They stated that the Hailesilasie government protected the forests through the system of land management, as no one would cut trees without the permission of the landlords. During the Derg regime, all the traditional landholding systems were abolished and changed. Every farmer was given the land that they were tilling. The rest of the land belonged to the government. Initially, the forests remained untouched by these changes, but then the Derg regime wanted to settle the people, and people were moved to new settlement areas. They needed wood for construction, and local government officials gave permission to cut wood from the forests, but the destruction was not too bad, it was not 'rampant'. After the fall of the Derg regime, people went back to their original areas. They had to reconstruct their houses and maintain their fences. This led to a lot more cutting of wood from the forests, but the forest was still there. However, something changed radically as soon as people started competing for the best wood to sell to the market. Indigenous trees were considered property of the government and were cut indiscriminately. The furniture shops in the towns aided this by demanding

timber for construction and their number has mushroomed as household and market demand has grown with population expansion and associated urbanisation.

Deneke said:

> First, we started cutting trees for charcoal and construction. The people who cut the wood from here and take it to town are taxed and this encouraged further cutting. They say 'we cut and we get taxed so we are allowed to cut'. If the government taxes wood, it is as good as allowing people to cut. So people have cut the trees. A five-year-old boy will go out with an axe and start cutting. Easter used to be great here. We used to hunt and eat wild animals when we were children. Now there is nothing. There were a lot of wild animals around the Mintile River. There is nothing now. Now we have a lot of axes. If I say don't cut, people will attack me. The soil is already taken. There has been drought in the last three years and we have never seen this before. Life is a bit difficult. Our land was fine but not now.

Diriba agreed and said:

> We have planted eucalyptus and we die over it. If people touch it, we fight for it. Nobody can touch it. In the good old days, if the cattle were hungry, there were indigenous trees that we cut and fed our cattle. Not for eucalyptus. Eucalyptus dries the land.

Dereje joined the conversation and said:

> The government officials just looked on while the forest was disappearing. There was nobody to say no from the government. They do not give it attention. There are a lot of offices here related to the forest. But they do not take any measures. They do not ask the source of wood when they see somebody carrying a log or timber. Now we see drought for the first time. The cutting is still continuing.

These citations foreground the role of forests in the biocultural system in the area, and also reflect some of the complexities of biocultural relations; in that the relations are not always locally constituted, but are also interwoven with broader political and economic forces, which are often beyond the control or sphere of influence of the local communities.

- **The 'white landscape' and memory**

Reflecting further on the learning and on their experience of constructing the model, members of the community involved in the interview said that the sight of the white model overwhelmed them. The model was white because, after the contour cardboard shapes had been cut out and put together, it was plastered with crepe

paper and painted white (see Figure 6.20 below). This was the first time that we had painted the model white. It looked liked a big landscape covered with snow!

Figure 6.20: *The 'white landscape' which provided the starting point for the mapping process*

Figure 6.20 shows me explaining the white landscape and the local community and some of the trainees looking and trying to figure out what it means. There are also more community members who are not visible in the photo. The scaffolding that was given by me and the MELCA staff was critical for bridging the gap between those who knew what it represented and those who knew it much more intimately but what have never faced it in this way before.

Dugo remembered:

> When we were first invited to come and work, we were shown a big white model. We were afraid. Then slowly we started discussing identifying certain features. Slowly, it started becoming clearer and easier. Your facilitation helped. Then we started working together. Putting on the paint started. Even after going home on the first day, we were working in our dreams. The next day, we came together again and we could do it. Then we thought 'is it for this that we were afraid?' We even started doing other areas in our neighbours' sections.

Diriba added:

> It was white. We felt like climbing a mountain. Then slowly we felt happy and attracted. We did not want to go for lunch. We knew a lot, like our children going to school. We felt great about it. We have not seen anything like this before. Even our ancestors did not know. From the map, we could know where each of our places is located. How Robe Gebeya and Berga are placed in relation to the other and our village, we know. Learning about the landscape from the map has pleased us.

From these citations, it seems that the 'white landscape' or the open platform created through this strategy, generated a reaction and engagement with the mapping process; the exact significance of this is difficult to establish, but the same response to the 'open platform' was not found in other cases in the same way, where the landscape had not been painted white. Perhaps the white paint shows the 'empty landscape' more clearly, and makes a stronger impression and creates some form of disequilibrium or anticipation that is interesting for the learning process.

- **Learning processes**

Two learning experiences in the map-making process appear to have been particularly significant, namely use of colours to indicate different aspects of the land; and involving a combination of elders and youth. It all started with the making of the legend, as shown by the citations below:

Dereje Deneke said:

> … we did it with elders. We remembered the colours of our land and the colours of the forest. We consulted with the elders and we had to discuss before we select an attribute for the legend. Every decision was made after a long discussion. We were happy that we could identify the colour of the land and pass it to our children. We found out that it motivated us for further work.

Diriba Wame added:

> Our parents did not do this. We indentified what our land looked like. I feel as if I am born as a new person. We know each part of our land now. Now we know what is available in our land and we felt like a student going to school and getting a new knowledge.

Deneke Bisrat agreed:

> I participated in the finding of the colour of the land. I could identify each colour. I participated. I did it with my own hand. Not only talking.

And Negesse said:

> … using colours to identify our landscape including the colour of the agricultural land and grazing land and also the forest type was great. This is cultural as it shows which soil is suited to which crop. We lived with the forest around us but we never differentiated them with colours and bothered about their names. We did not know where the Bergariver starts and we did not know where the source of the Mintile river is and we learnt that. Mintile was flowing all the time but we did not know where it was starting from and which places it was passing. This is culture for us.

- **Learning together and memory**

Reflections on the learning and mapping processes also led to reflections on the learning interactions. Members of the community involved in the reflections, indicated that they had appreciated constructing the model together. It would have been difficult for them to construct the landscape if they did it alone, they said. Doing it together helped them to remember.

As Dugo Ayano said:

> If somebody does it by himself, it will be difficult. We do not know the land in its entirety. People will support each other in remembering. When one does not know, the other will know. Two will discuss and remember together. If one works alone, even if he is strong, he cannot get anywhere. It is like clapping with one hand. It is good to work together.

Dereje agreed:

> If we do it alone, it will be difficult to remember all. Through working together, we can remember what we have forgotten. It also creates an environment where we can work together in the future to bring back what we have lost. Different *weredas* participated and even many villages were involved. Even in Telecho there were places that we did not know. So it is critical to work together.

The above-mentioned citations also show that there is something significant in the relationship between constructing the map together and memory. This will be discussed further in Chapter 7.

- **Past and future**

Reflections on the learning and experience of the mapping also brought reflections on the past and future. Participants said that the experience that they shared during the mapping process had given them a chance to discuss the way in which productivity of their farming is decreasing even if the size of their land is increasing. They attributed this mainly to the loss of soil fertility, which was linked to deforestation, increase in population and the introduction of artificial fertilizers and improved varieties of seeds.

Dugo said:

> Even if the land size has increased, productivity has decreased. Previously, we did not cut trees. The trees used to hold soil. Now the soil is washed and we do not get enough product. We were not also using fertilizers previously.

> Now we get fertilizers. We have to borrow from the government to buy fertilizers. The price is escalating. Even then, we cannot get enough of it.

Negessa added:

> We were previously not using fertilizer and we used to get enough harvest to fill our Gotera (a traditionally built container with a capacity between 5-10 quintals) from a handful of seeds. Now there is fertilizer. Soil is washed. Even if land is less, soil was good. There were trees. Now the number of people have increased and trees are cut and soil needed fertilizer. The fertilizer killed the land. Now the price has increased. We cannot give the land enough fertilizer. So increase in land has not resulted in good productivity. There was fallowing previously.

They also said that the mapping process has motivated them to take action to change both their landscape and their livelihood.

Dugo said:

> We want to plant. We want to improve our life. We have to rehabilitate the land. We identified the land that is cracking. We want to plant seedlings and rehabilitate these gullies. We will work with you. It has motivated us. The map made us realize the condition of our land. We need to plant trees. We asked for seedlings. We will continue planting. We expect you to support us with the things that we cannot do. We will contribute in labour. We have already requested the government to give us seedlings.

The participants concluded the discussion with a sense of hope.

Dugo said:

> Our economy is weakened because of the degradation of our land. We can see how soil can be returned. If we reforest our land, rain will come back and livestock will be happy. The rivers will also come back and all we have lost will come back. The past will come to our children and that will increase our productivity.

Legassa, on a similar note, said:

> We know where our river is located. The land can be returned to us. We did the plantation and if the forest comes back everything will come back and rain will come back. We know why we have lost a lot. Rain comes from the direction of the Foata because it was forested. Now it comes from Mulgeta's side [one of the participants in the discussion has a patch of indigenous trees near his house. The elder was referring to that.]

Mulugeta added:

> [From the map] we could see our land and the state it is in. The rivers have died and this has put pressure on our economy. If the water comes back,

> then we can raise vegetables and we would not wait for rain and this will improve our economy. A stream has revived. There was a stream, which was drying in September, and it stayed till February. This may be because of the terraces that we did. This gave us hope that if we do more, more will come for us.

As was the case in Bale, the learning associated with the mapping activities seemed to have a lot to do with its ability to generate a mechanism or way of reviving and bringing collective memory to the fore. This seemed to provide a way for communities to plan actions for the future, and to recover aspects of their biocultural heritage or practices that are seen to be significant, and also to reflect critically on change, and what the implications of social, political and economic changes are for their continued livelihoods and their farming. As in the Bale case, it seemed that the collective nature of the process was significant to this, and in this case (Foata Mountains), it seemed that the 'white landscape' was also significant for the learning process, as pointed out above.

Next I discuss the eco-cultural calendar, which was constructed after the mapping activities in September 2011, and the reflections on the mapping activities in this case (differently to the sequence of mapping activities in the Bale case).

6.4.6 Eco-cultural calendar

The figures below show the eco-cultural calendar development process (Figure 6.21), and the eco-cultural calendar (Figure 6.22) that was produced in the Telecho community. As described in Section 5.8 this took place In April and September 2011, and involved 15 community members. As in the Bale case, eco-cultural calendars were produced for the past, the present and the future (see Appendix 6). In this section I present the eco-cultural calendar of the past (Table 6.3), and a summary table (Table 6.4) showing the differences between past, present and future, and also including preferred alternative futures, as deliberated with community members during the calendar development process and similarly to the Bale case reported in Section 6.3 above.

Figure 6.21: *Members of Telecho narrating eco-cultural calendars*

Figure 6.21 shows (from left to right) Diriba Wami, Dugo Ayano, Negesse Merga, Mersha Yilma (staff of MELCA-Ethiopia) and myself (with paper and pen in hand), having a discussion about the eco-cultural calendars.

Mersha Yilima (right) works with MELCA-Ethiopia as an information management officer. He speaks the local language Oromifa well, and here he is seen translating what is being said so that I am able to understand the discussion (see Section 5.4.1 where I discuss language and translation of interview data). We are sitting at Telecho School in the hut that was made by the school nature club, described above. This is also where the eco-cultural calendars were developed theperiod of one day. A second round of eco-cultural calendar making was organized in September 2011 by MELCA staff and Tables 6.3 and 6.4 report the synthesis of the calendars developed at both times. Nine elders and four youth participated in the second event.

In Figure 6.21 we are discussing the seasons that people recognize in their landscape, as this is an important starting point for the development of an eco-cultural calendar. It took some time to agree on the naming of the seasons, and how the year is divided by these seasons. After this discussion, the year was divided into six seasons.

The MELCA staff scaffolded the process by timing the process and asking questions. The first to be completed was the calendar of the past. The facilitators asked

repeatedly for the meaning of each of the statements and recorded the interaction (see Appendix 6). They also facilitated the comparison between the past and the present and asked what changeswere foreseen for the future if things continued as usual.

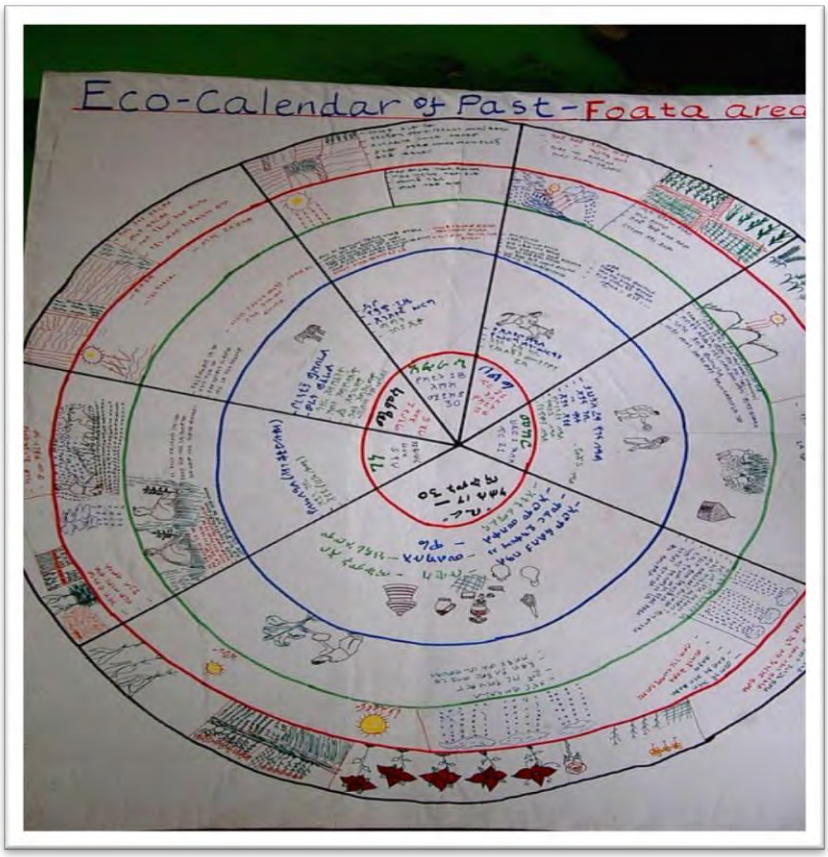

Figure 6.22: Eco-cultural calendar for the past of the Telecho kebele (see also Appendix 6 for a larger version of this)

	Bira **August 17-October 31**	**Meker** **Nov 1- Jan 21**	**Belg** **Jan 22- Feb 17**	**Arfasa** **Feb 18-April 30**	**Chamsa** **May 1- June 5**	**Gana** **June 6-August 16**
Culture	Oromo Filseta was celebrated on August 17. *Mofar Denkersa*, a ritual for blessing farm materials, was celebrated. *Meskel Oromo* and *Atete Fecha Fecha*, women rituals, were celebrated to receive the new year. Girls would go to the river to collect fresh grass singing. They had a ritual called Melcabu'a (people go to *melka* for the ritual) and young people would go there and stay for five days with cattle to pray for them. A celebration for cattle only, called *Ayana Waree* was celebrated. An orthodox church celebration was also held around this time and there was a horse riding competition. Children had their own celebration called *Hidari Oromo* where they gave a broom that they made to neighbours and they were given a reward.	*Hidari Oromo* extends into this season. *Ayana Nebi, Ayana Qalu, Ayana Atete* are celebrated (these are the names of the spiritual leaders and people go to these places for doing the rituals). All were celebrated at sacred sites. *Ayana Boranticha* (celebrated at the spiritual leader and black sheep is killed) was also celebrated at the sacred site. A kind of hockey called *Tapha Qille* was played by children. After *Tapha Qille*, everyone ate from the same plate and the father blessed the table.	A famous wedding celebration called *AsteroBe'a*l was celebrated and boys and girls met here. Ayana Oda Nebi (name of the spiritual leader and people go this place for ritual) is celebrated at this time and families visit each other.	As there was a lot of work, people worked in groups called *debo*. This was also a time of festivity. This was also a weeding season.	The main *borenticha* holidays were celebrated at this time. They ate and drank with others in the neighborhood under sacred trees. There were no wedding ceremonies or holidays at this time because it was the most dangerous time culturally. *Borenticha* (killing of black sheep for ritual) was celebrated in this season	This was the time for the 'Oxen Holiday' or what was called *Ayana Bukula*. There was also a ritual called which was done at *melka*. At this time people ate *bunakela* (they roasted eight coffee beans and if they cooked very well they said the god had accepted the offering and the family shared each of the beans.) Women did another round of *Atete Fecha Fecha* but it was different from the main one done during *Bira*.

	Bira **August 17-October 31**	**Meker** **Nov 1- Jan 21**	**Belg** **Jan 22- Feb 17**	**Arfasa** **Feb 18-April 30**	**Chamsa** **May 1- June 5**	**Gana** **June 6-August 16**
Livelihood	This was a time of fattening oxen, and getting sheep ready for the market. Most people would keep themselves busy with cattle and the butter trade as there was plenty of grass. They started ploughing. Fodder for the horses was also prepared at this time. They stored grass, butter and other materials. They also cultivated vegetables.	This was a very busy time for farmers. Harvesting, thrashing and storing took place. They needed to watch their cattle closely also as they could be found eating crops.	They prepared the land for cultivation since there was some rain. Crops like maize and pot sorghum were planted. They did house maintenance.	They ploughedtheir land repeatedly at this time. Cattle stayed in communal grazing areas. They were also involved in taking their goods to the market.	At this time people would complete preparation of their agricultural fields for planting.	This was the time for preparing seeds.Every crop was ready for plantation. A lot of work was needed at this time, and people were involved in agricultural practices, day and night.It was a critical time for farmers as their cattle could easily die from *amagixa*(a type of grass which kills cattle).Vegetables were also planted at this time.
Nature	Land was green because of crops. Rivers were fuller. Grass and crops flowered. At the end of the month, the land looked yellow because there were so many flowers.	There was grass in some areas but the land looked yellow because of plants that were ready to be harvested.	It started raining at this time so most of the land became green. The land also became very attractive.	The land looked red as most of it would be covered by ploughed agricultural fields.	This time was sunny and land looked dry. Only ploughed agricultural land was seen.	Because of the rain the land became green again. It was difficult to see the mountain as there was so much rain.

	Bira **August 17-October 31**	**Meker** **Nov 1- Jan 21**	**Belg** **Jan 22- Feb 17**	**Arfasa** **Feb 18-April 30**	**Chamsa** **May 1- June 5**	**Gana** **June 6-August 16**
	Some land was tilled so the landscape would have different colours and it was attractive.	The rest of the land started drying except for areas near the rivers.		Only the banks of rivers looked green.	The water in the river became very low. Crops planted during Belg would be ready for harvest.	Water in rivers was muddy. A lot of flooding occurred.
Climate	There was continuous and heavy rain during this time. Because of the rain people wore *gesa* (rain clothes made from grass) from morning to night. The weather was difficult for human beings and animals but it was better for crops. It was cold. Rain stopped at the end of this season, which was good for both crops and humans.Sometimes it became sunny.	This was a very cold time. Water became icy in the morning. It was cold and windy and during day time, and it was seen as a good time for crops. The weather was good for agriculture.	The cold decreased and rain started. Sometimes it was sunny. The air was good for everything. The wind was described as being wet.	At this time it was 'sometimes rainy, sometimes sunny' In the morning it was cold. Sometimes it was sunny.	Most of the time it wassunny and windy. The land was dry. This was a difficult season. Strong winds occurred whichmoved dust. But it is a season that was conducive for agriculture.	It was 'full of rain' at this time. It was also cold. Because of the rain, moving on the landscape was difficult. Sometimes it became dark during the daytime due to thick cloud cover.

Table 6.3: *Eco-cultural calendar of the Telecho kebele*

Table 6.3 shows a number of different rituals, celebrations, games, livelihood activities and provides insight into people's responses to changes in the environment. This is described in more detail below, using categories in the table.

Culture: In the past many different rituals were observed which were also linked to celebrations, including those for farming materials, for cattle, by women for the health of the community, and for praying for the land and for the community. Rituals were a very strong feature of the culture, and changed as the seasonal year progressed; and in many cases were closely tied to the changes in climate and the landscape. Children used to play traditional games and courtship took place at traditional and sacred places between boys and girls. Some of the rituals were celebrated alongside the Orthodox church rituals, showing religious tolerance and an intermingling of belief systems. Ceremonies were practised which increased the cohesiveness in the community and people visited each other, which pointed to traditionally constituted cultural strategies for facilitating unity in the community.

Livelihood: Livelihoods revolved mainly around agriculture and livestock. People understood the seasons and their lives revolved around them. There were many associated activities, which at certain times of the year increased in intensity (e.g. in the *Gana* season), except when they rested for about a month between June and May. Women generally had a lot of work to do.

Nature: The land was green because of the trees. There was wildlife. The rivers were also full at certain times of the year, and most of the streams flowed. Colours in the landscape changed as the seasons changed. There was an abundance of flowers which were good for honey making.

Climate: Climate was highly variable and it ranged from very cold to hot. Explanations showed too that the climate changed unpredictably even though a broad pattern of stronger rainy seasons was reported. Even in a day the climate could change, illustrating the challenges people faced to adapt to the weather patterns. There was substantial rain at different times of the year which made life difficult for people, but which was good for agriculture.

The next table, Table 6.4 considers how things have changed, based on an analysis of the three eco-cultural calendars.

	Past	Present	Future – if things continue as usual	Desired future
Culture	There were many rituals and celebrations for farming materials, for cattle, for the health of the community, and for the land. Children used to play cultural games. Some of the rituals were conducted before or alongside the main Orthodox Christianity holidays, showing tolerance for traditional beliefs. There was more love and unity in the community. People visited each other and worked together.	Most of the rituals have weakened or have ended. Children no longer follow their parents' religion. *Oromo* celebrations are substituted by national celebrations. This is influenced by the church. Cultural games have also weakened. Wedding ceremonies still happen in a cultural way. Some of the seasons were feared, and no marriages took place during these seasons, but now marriages take place in these seasons.	Most of the rituals will no longer take place. The next generation will not want them. Most of the cultural rituals will be replaced by the Orthodox church rituals and celebrations. Wedding ceremonies will still continue. Cultural activities/celebrations of girls will also stop.	The majority of cultural activity will be stopped. Most of the children will be educated so they will not accept their parents' ideas. Christianity will spread. The spiritual leaders will abandon their practices as they will not find followers. Modernization in the form of roads, electricity and telephones will come to the community.
Livelihood	Life was based on agriculture. There were a lot of cattle and things seemed cheap. Farming involved a lot of work. There was also a lot of communal work called *debo*.	Agriculture is the same, but fertilizers are used now Youth go to town to live and hired labourers do most work. The communal working habit *debo* still exists. Women work much more now, as there is a shortage of labour.	There will be a continuing of agricultural activities. Contractual labour will be used for agriculture. Families will have a big workload. Artificial fertilizer will be used.	There will be more changes in agriculture. Families will have a lot to do, as children will go to school. Planting of tree seedlings will be introduced. Conventional forms of agriculture will happen.

	Past	Present	Future – if things continue as usual	Desired future
Nature	Colours in nature followed the colour of the seasons and it was greener when the crops had grown. The land was covered with forest and there were a lot of wild animals.	Nature is much more erratic. Most of the land is covered by agriculture and is degraded. There are few wild animals because of deforestation and it is impossible to imagine the survival of these kind of animals in the future. Nowadays people are cutting down the trees on sacred sites so it will be difficult to predict the future. People are competing with each other to cut trees down for the market and for other uses.	Nature doesn't stay as it is; most things will be changed. The green colour of most areas will decrease. The landscape will dry out because of loss of soil. Most of the land will be covered by agricultural fields. The flowering time will continue as it is. The majority of the land will continue to be green in *Gana*, *Bira* and sometimes in the *Belge* seasons.	Nature doesn't stay the sameand most things will change but degraded land may come back to normal if water and soil conservation is practised. The green colour of most areas will be seen again if different kinds of trees are planted. Most of the land will be covered by agriculture except for forest areas. The forest that was known 30 years ago may come back if there is a commitment from the whole community. Sacred trees will not be cut.People should stop participating in deforestation; rather they should participate in afforestation
Climate	Nature was erratic and unpredictable. Rain came at different times, although there were wetter seasons and dryer seasons, and sometimes it got dark during the daytime due to heavy cloud cover.	Rain is not periodic. There is a lot of flooding.The weather has completely changed. It is not as cold as before but it is changing. Disasters have increased because of unexpected weather conditions.October November and December were the coldest months of theseason but now it is only cold in the morning. There is strong sunlight every day, particularly at midday and this is not healthy.	Erratic rainfall.Flooding will be dangerous. Weather will completely change. Disasters will increase because of unexpected weather conditions. October, November and December were the coldest seasons of the month but it will be warmer. There will be strong sunlight every day, particularly at midday and this will not be healthy.	The rain should be periodic. Runoff will not be dangerous since the community will practise soil and water conservation activities. People will be more prepared for disasters should they occur.

Table 6 4: *Eco-cultural maps combined for Telecho*

Based on the analysis of the past and present eco-cultural calendars, it is possible to indicate that there is both cultural and social-ecological change taking place at Telecho. The change in cultural activities appears to be more marked than the change in the other categories. However data on, for example, the weather pattern changes, or data on the actual demise of cultural practices was not verified using other methodologies, for example accessing climate data records for the area. However other broader contextual data, as well as data from conversations during the other mapping activities, corroborates much of what was highlighted in relation to the changes taking place as expressed in the eco-cultural calendars. From the above analysis, the following seem to be the main changes taking place that are relevant to the biocultural diversity, learning and agency dimensions of this study:

Culture

From the analysis shown in Table 6.4 above, it appears that people in the Telecho community are abandoning many of their traditional rituals and celebrations, an exception being wedding ceremonies. The major reason given for this is the influence from both Orthodox and Protestant Christianity, and the generation gap, in which the new generation is said to have lost interest in traditional cultural practices. Rituals are demonized and people, especially women, give their ritual materials to churches. This is considered as a release from demons and a process of entering into new liberation from the shackles of Satan. Wedding ceremonies will continue but traditional games and celebrations will be substituted by what is standardized and acceptable to churches and schools.

Livelihood

The main livelihood activity, agriculture, seems to be a constant in the Telecho community. People also want to continue having cattle. The big change, however that has occurred is in the type of agricultural practice. As indicated earlier, the policy of the government has been to increase productivity through conventional forms of agriculture where artificial fertilizer and improved seed varieties replace farmer's seed varieties; consequently farmers farm with less diversity, and with more inputs, on more degraded land than before. Women and families have much more work as children leave their parents for towns; agriculture also becomes more expensive, as there is higher reliance on the hiring of external sources of labour, and more inputs that need to be purchased. This in turn affects the forests, as

people sell wood to raise funding to supplement the pressures of a changing agricultural economy.

Nature

Earlier, the land was covered with both indigenous fauna and flora. Now eucalyptus is replacing indigenous forest and the land is degraded. Indigenous forest has decreased dramatically. Soil erosion has increased and productivity has decreased. There are few wild animals. However, there is a commitment to address the problems of loss and degradation, and there are plans to plant trees and do soil and water conservation activities, and this, people said, would "bring back colour to the landscape".

Climate

As indicated in the descriptions of the eco-cultural calendar, it appears that the rain pattern in the area is changing. Previously, the weather was described as being cold and rainy for most of the year. It was even dark sometimes in the day due to the heavy cloud cover, but now it this is changing. Rain is erratic, there is too much flooding, and the days are warmer, and more sunny. Community members also projected that the flooding would worsen without conservation activities. As in the Bale case, it would have been interesting to validate these insights through, for example, comparing them with longitudinal weather pattern data for the area, should such data be available at the micro-scale accessed through the eco-cultural calendar mapping.

6.5 Chapter summary

This chapter has presented the data generated through three different participatory mapping processes in two different community contexts in two different mountainous areas in Ethiopia. Both are rural areas, but the communities differ in their agricultural practices, with the Bale community being more agro-pastoral than the Telecho community. The data was presented using 'photographic cues' which allowed me to communicate aspects of the process, while also presenting a rich, thick description drawing on interview, observation and focus group data. The data presentation was arranged according to the four main categories of analysis: biocultural landscape, educational processes, learning, and agency.

Under the category biocultural landscape, some of the features seen on the photographs are explained, but this serves only to provide access to wider insights relevant to the biocultural landscape and changes associated with this landscape, as reflected in the wider data sets. Under the category education processes, I explained the interaction among the models/maps, community members involved in the mapping activities, and the facilitators. This was an important category necessary to make the facilitation interventions more visible, and also to show up dynamics of the participatory process, as well as to shed light on how the learning associated with the mapping was scaffolded and supported by myself, MELCA-Ethiopia staff members, and members of the community as they learned from each other. The learning that occurred was discussed under the category 'learning', and the agency that emerged in relation to these processes (at least as far as could be established) through this research within the time limitations of the study (see Chapter 7 for more discussion on this).

In general, the chapter showed how both the knowledge and the biodiversity in the two areas under study are declining and changing, and how participating in the practice of mapping has helped communities to construct their knowledge, to remember, and to claim agency for bringing about changes to the current status quo. Much was learned in and through this process, including at the inter-generational level. The next chapter discusses the data in more depth, drawing on theory and wider contextual knowledge, as presented in the first four chapters. It addresses the research questions by summarizing the main findings of the study, and discussing these critically.

Chapter 7: SYNTHESIS: PARTICIPATORY MAPPING, BIOCULTURAL DIVERSITY, LEARNING, AGENCY AND RESILIENCE BUILDING

7.1 Introduction

This chapter provides a more in-depth analysis of the data reported on in Chapter 6. It draws on theory to provide an abductive analysis in which data is recontextualised using theory in relation to context, as explained in Chapter 5 (see Section 5.9). It addresses the research questions directly and synthesises the study.

The chapter starts by answering the first question on the role of participatory mapping in mobilizing knowledge and practice related to biocultural diversity. The linkages are analysed drawing on Pretty et al.'s (2008) four bridges linking biodiversity and culture, namely belief and worldviews, livelihood, language and knowledge, and norms and institutions (discussed in Section 2.3). I will reflect on these linkages and their role in enabling adaptability and resilience building by referring to the data presented in Chapter 6.

The learning that has taken place is analysed in more depth, drawing on Wals' (2007) perspectives on dissonance in learning, discussed in Section 4.2. The discussion on learning will also draw on theories of learning that rely on the acquisition and participation metaphors, which are described in some detail in Section 4.3 (Sfard, 1998). This section will also reflect on how mapping as a tool has mediated the learning and explain, using Vygotsky's theory of a Zone of Proximal Development (ZPD) (discussed in Section 4.3.1), how the support given by elders in the community, and the MELCA-Ethiopia facilitation team was important for learning and change.

The identity building and meaning making which emerged in the course of the learning process will be used as central analytical focus for examining the learning that took place, and its implication for change.

As explained in Section 4.5, Archer's (1995) theory of morphogenesis provides theoretical lenses to analyse change processes. This chapter reviews change processes at the levels of ABN, tracing how activities at this level triggered the mapping process at MELCA-Ethiopia, and how this in turn shaped learning and action at the local community level in the two case

study sites. The data presented in Chapter 6, (drawn from the full record which is available in Appendix 6 as a CD Rom) will be used to clarify and illuminate this analysis.

Using a series of analytical statements, I synthesise the insights gained through this study. These represent the claims that could be made from the particular cases under study, and illuminate how the learning and change emerged in relation to the mapping practice, and its potential for building resilience in the community contexts under study.

As indicated in Chapter 5, understanding the relationship that exists between participatory mapping, learning, agency and change, requires analytical and explanatory processes that take account of causality. The study, and this chapter, does not seek to produce correlational forms of causality, but rather *explanatory* analyses of causality, which is consistent with a critical realist framework. As mentioned in Section 5.9, Danemark et al. (1997) explain that "if we wish to understand the dynamic dimension of reality" [in which this study is interested] then a type of causal analysis is needed that explains "*...* why what does happen actually does happen" (p. 52, see Section 5.9). Such explanations recognize that causes are about relations, and the nature of relations, and about *how objects work* (for example, how the maps and models and mapping processes work to enable learning and/or change and/or resilience to emerge). This is the focus of the analysis in this chapter, which seeks to make explicit the *causal powers* that exist within the participatory mapping processes as they relate to learning, agency development and resilience building. In this chapter I also use the concept of **resilience building,** as the mapping, learning and agency processes may *contribute to* social-ecological resilience. It was not possible to *achieve* social-ecological resilience through a process such as mapping (at least not in the short term). As indicated in Chapter 4.7, achieving social-ecological resilience is a longer term, more complex process that exists between people and their environments and involves longer term structural, cultural and ecological changes that occur through ongoing systems of feedback and adjustment (see Section 7.6 below). Adaptability, and increased capacity for adaptability (as discussed in Section 4.7.2.4) is key to resilience building, and in the sections that follow, I often use adaptability in close association with the notion of resilience building. Learning and agency development in turn (often conflated and expressed in the notion of social learning, see Sections 4.3 and 4.6), are important social processes

contributing to adaptability; hence in many ways these concepts are related, yet distinct social change concepts.

The chapter will end with a conclusion and recommendations, which also includes recommendations for further research.

7.2 Mapping the biocultural landscape and its implication for learning and change

This section addresses the first research question: 'What biocultural knowledge and practices related to landscape does participatory mapping mobilize in local communities?'

As indicated in the introduction above, to address this research question, I draw on Pretty et al.'s (2008) four key bridges, which interlink nature with culture (Section 7.1).

As discussed in Chapter 6, there were many apparent relationships between cultural diversity and biodiversity, a linkage which requires further comment in this study, particularly as it pertains to participatory mapping. Chambers et al. (2004) comment on the role and value of mapping in social-ecological contexts, when they say:

The documentation of place names, land management techniques, rituals, sacred sites, histories, and multiple other features, when recorded on maps, can contribute to the preservation and renewal of languages and cultures. Documentation of information as fundamental as traditional place names is of great cultural importance. (p. 21)

This is discussed in more detail in Sections 7.2.1 to 7.2.4 below.

7.2.1 Participatory mapping, world views and belief systems

Analytical Statement: Participatory mapping identifies spiritual places and mobilizes the knowledge and memory about them, which can contribute to adaptability and resilience building

Sacred sites were one of the areas identified on the maps and models in both study sites, showing people's attachment to them. In Bale, 23 sacred sites were identified in Horo Soba alone, and, of these, almost half (12) were highly forested while two of them were boulders. This shows how critical these places were for the conservation of forests and how respected they were by the local community. The 23 Bale sacred sites were differentiated into four

place types: *Melkas*; sacred trees; sacred boulders; and other sacred sites, including wetlands and groups of trees (see Section 1.5.1.1). In the Telecho community, 22 sacred sites were identified and they are differentiated in to mainly *Adbar* (a sacred tree which may have other trees around), *Mana Ayana* (the home of the spiritual leader) and some *Melkas*.

As reported in Chapter 6, people in the communities under study, indicated that they went to these places to conduct rituals when they had problems and when they wanted to ask for help regarding the health of their community and the environment, and for the productivity of the cattle. They did this more so in the past than in the present. For example, women went to *Melka* in Horo Soba, Bale, when there was a shortage of rain (see Table 6.1). Some of these practices have been forgotten and some participants said the mapping process gave them an opportunity to learn both the names of these places and the practices related to them.

Students from both Bale and Telecho (see the interviews with Abdurahman Aman from Bale and Askale Debele from Telecho reported in Sections 6.3.5 and 6.4.2) said that what they appreciated from the mapping process was that they could learn the names, the distribution and the significance of the sacred sites in their biocultural landscape. This has given them respect for their traditions and a new insight into their biocultural landscape.

Interviewing Hule Uture and others from Bale (Section 6.3.3) and Gonfa Feyissa, among others, from Telecho (Section 6.4.2) showed the spiritual, social, economic and ecological importance of these places. This shows how mapping can mobilize the memory about these places that may contribute to resilience building.

The eco-cultural calendars of both the Horo Soba and the Telecho community (see Appendix 6) show that both communities were deeply attached to their traditional rituals, which were and are (to some extent today) mostly performed at sites put on the map. They used these places to pray for the health of their cattle, for the production of their crops, for the health of their family and community, and for the health of the land. They even had rituals for their farm materials before they started working on their fields. They mediated conflict using the power of these places and the community respected this. Now, mainly due to the mainstream religions of Islam and Christianity, the migration of youth to urban areas and formal education, people are abandoning these rituals. The rituals are now often regarded

as Satanic practices, and in some cases conducting rituals at these places is regarded as devil worship.

When asked about the future, the Telecho community said that due to religion, urbanization and modernization, they do not see a future for these rituals (see Table 6.4). The Horo Soba community are much more hopeful and wanted to revive these older, more traditional religious practices (see Table 6.2).

There are various authors who support the claim that sacred sites are important for the worldviews of local and indigenous communities. In particular many claim that in addition to their spiritual value, there is an increase in interest in these places for their value as a place of biodiversity conservation and a site of spiritual activity (Posey, 1999; Thorley & Gunn, 2008; Dudley, Higgins-Zogib & Mansourian, 2009; MELCA-Ethiopia, 2007).

In the context of resilience, which is discussed in Section 7.5 of this chapter, Berkes et al. (2000) regard rituals as one of the key elements for adaptability in order to survive in a changing social-ecological environment. They identify rituals and sacred sites, and the knowledge and memory of these (as mobilised through the mapping processes) as potentially significant for resilience building.

In the Ethiopian context, a group of participants from government, universities and civil society organizations that gathered in July 2010 to discuss the value of Sacred Natural Sites, agreed that these places have many uses. They protect and preserve healthy ecosystems and environments, including forests, rivers, wetlands, animals and plants; have a high cultural and spiritual value for local communities; bring unity among people through strengthening community governance systems and serving as conflict resolution centres; keep the social balance and natural order; bring about healing and health for the local community through the health of their cattle and crops; are centres for the knowledge and practice of traditional medicine; serve as sites of research into the evolution of community identity, from a historical, cultural and spiritual and political point of view; serve as a source of traditional ecological wisdom and endogenous knowledge; ensure sustainable endogenous livelihood options; are home to critical species and ecosystems; maintain Earth's natural balance locally, regionally and globally; are the origin and centre of customary laws; bring health and fertility to the people, cattle and crops; are prayer places

where they praise their creator and entreat the creator to protect their land, environment, crops and cattle from natural disasters; and, most importantly, they have a high aesthetic value (MELCA-Ethiopia, 2010).

In summary, while it was not possible, in this study, to establish whether sacred sites do all of the above, it was possible, in the context of the two case studies to establish that mapping of biocultural diversity mobilised memory, knowledge and appreciation of such sites; and their relationship to the biodiversity of the area, particularly trees. The analysis also pointed to the loss of cultural value associated with these sites over time, which can potentially reduce social-ecological resilience, if relational connections between people and their landscapes are lost.

7.2.2 Participatory mapping and livelihood

Analytical Statement: Participatory mapping mobilizes discussion around issues related to livelihood and this learning has the potential to contribute to adaptability and resilience building.

Reflective interview data, reported on in Chapter 6 in the context of both the Bale and the Telecho communities (particularly the reflections from Aman Mame and others) (Section 6.3.3) and the eco-calendars (Sections 6.3.4 and 6.4.6) show how people manage their livelihood according to the seasons and the changes in their biocultural landscape.

The Horo Soba community in Bale were agro-pastoral before becoming increasingly agricultural. The maps and the calendars show how they used to move with their cattle in their biocultural landscape in response to the change in seasons and unexpected social-ecological changes. The seasons and their movements were interspersed with rituals and other celebrations. The maps and the calendars of the present show how this livelihood system is rapidly changing and how, and raise an awareness of the possibility that if no actions are taken to reverse the situation, this breakdown and transformation of both the social and the ecological system will continue, with continued loss of cultural diversity, biodiversity and social-ecological resilience, which is intimately related to their livelihood practices (Section 6.3.7).

The mapping activity has shown that the livelihood of the Bale Mountains community was based on agro-pastoralism (see Section 1.4.1). Agro-pastoralism is a kind of livelihood that

mixes sedentary forms of agriculture with occasional pastoralism in search of pasturelands and water points (Owen, 2007). Community members involved in the mapping of the Bale mountains identified degradation of their forest, drying of rivers and wetlands, conversion of grazing lands to agricultural landscapes, decrease in the productivity of their cattle and erosion of their culture as their main concerns in relation to maintaining their livelihoods.

The Telecho community are mainly agricultural, although they also keep animals (see Chapter 1, Section 1.4.2.1). The maps and eco-cultural calendars show the complex system of managing the land for agriculture and cattle and how this responds to the change in the ecosystem (Appendix 6). The year was also punctuated with rituals.

Phillips and Stolton (2008) say that among the striking features of traditional agricultural landscapes across diverse settings are their sophistication, complexity and resilience. Landscapes that are rich in agro-biodiversity are often the product of complex farming systems that have developed in response to the unique physical conditions of a given location, such as altitude, slopes, soils, climate and latitude, as well as cultural and social influences.

After the participatory mapping processes, members of the community indicated that they were more aware of the changes that are occurring in the biocultural landscape. They identified degradation of land and forest and the drying up of rivers as the main cause of the decrease in the productivity of their land; identifying these as critical issues relevant to maintaining their livelihood (see Chapter 6.4.3). They also appeared to realise that if no actions are taken to reverse the situation, this breakdown and transformation of both the social and the ecological system will continue, with continued loss of cultural diversity, biodiversity and social-ecological resilience, including their livelihoods.

In summary, such dialogues on livelihoods, as mobilised through the participatory mapping process in the two cases, can therefore potentially contribute to awareness of changes, and 'what's going wrong', and associated decision-making around rehabilitation actions, which in turn can contribute to adaptability and resilience building.

7.2.3 Participatory mapping, language and knowledge

Analytical Statement: Participatory mapping revitalizes language and mobilizes knowledge, which can contribute to adaptability and resilience building

As reported in Chapter 6, many of the participants in the mapping process in both the Bale and Foata mapping contexts, said that participating in the practice helped them find out place names and explore why the names were given (Section 6.4.2). For example, Abdurahman Aman, after participating in the participatory mapping process, wanted to find out the meaning of some of the place names, so he asked his father and the father explained to him (Section 6.3.5). He felt that the maps 'talk', as they bring about questions. Seeking answers to his own questions about the names of places helped him understand the history and the cultural significance of the places. The understanding of these names and the stories associated with them initiates agency in people, as evidenced by the statement from Abdurahman, who promised to teach his child about these names and their significance (Section 6.4.5.3). On the importance of recording the names of places on maps for posterity, Chambers et al. (2004) say:

Indigenous toponyms are often made up of a series of words that give meaning to and hold valuable information about specific places. Mapping place names, therefore, indirectly records histories and traditional associations, for example, between natural features and boundaries. (p. 21)

The mapping and recording of histories and traditional associations can increase the lexicon and possible range of meanings and associations between people and their landscapes, and as shown in this study, this is particularly important in the context of inter-generational learning (where youth often mentioned that they had not known about many of the place names or associations – see Sections 6.3.3 and 6.4.2); and in conceptualising re-orientation or rehabilitation. This, as expressed by Aman Mame, is not always an easy process, as he indicated that he found the remembrance painful, but he appreciated the mapping process for what he had learnt from it (Section 6.4.5).

In summary, the capacity that mapping processes have for expanding biocultural diversity lexicons, meaning making processes and broadening the knowledge of the landscape and landscape relations amongst generations and in relation to rehabilitation and possible

change, shows the potential of mapping for contributing to adaptability and resilience building processes.

7.2.4 Participatory mapping norms and institutions

Analytical Statement: Mapping reveals historical and cultural governance of the biocultural landscape, which can contribute to adaptability and resilience.

The mapping activity in both case study sites revealed that the relationship between the people and the landscape was intimately linked to governance patterns, which had brought about significant changes in the biocultural relations that exist (see Sections 6.3.7 and 6.4.5). The mapping activities showed that this biocultural relationship had been governed in two ways. One was the land tenure system that put land under the tenure of the landlords during the reign of Hailesilasie. This tenant system, although it was not always democratic and could even be described as being 'cruel' to people as it maintained particular forms of power relations and servitudes, ensured that the forest was protected and the ecological integrity of the biocultural system was maintained. Elders had a role in assisting the landlord. The spiritual leaders in the community had much more control. The change in the biocultural landscape came after the demise of the regime, when all rural land was given to the tillers in 1974 (Rahmato, 2009) (see also Section 1.4.2). Even at that stage, the rampant cutting down of the forests had not begun: that came later under the Derg's resettling campaign when there was a need for construction. Forest degradation accelerated under the new regime and trees became everyone's property. Despite repeated attempts to reverse the forest destruction, things did not change. The mapping activity provided a focus that enabled the local community to deliberate on these issues. This in turn brought about a determination to stop the decline in the biocultural landscape (see Sections 6.3.6 and 6.4.4).

In relation to mapping and supporting the above assertion, Crawhall (2007, p. 8) writes:

> Tacit and explicit governance rules guide a community in how to benefit from ecosystem abundance and how to constrain overexploitation. Where overexploitation is happening, the mapping can help show where the social rules are breaking down or are being undermined; it can also reveal if external drivers are impacting the social ecology. Landscape mapping is thus as much about culture and society as it is about nature.

In summary, developing deeper understandings of governance systems and how they relate to changes in biocultural diversity and livelihoods and natural resource management systems, as shown via the mapping activities in this study, can provide spaces for deliberation on new forms of governance that can be oriented towards rehabilitation, change and/or adaptation and resilience building. It is in this way that mapping can potentially contribute to adaptability and resilience building.

7.2.5 Concluding comment

Claim: In conclusion, based on the data presented in Chapter 6, which was reviewed in Sections 7.2.1 to 7.2.4 above, drawing on Pretty et al.'s (2008) theory that describes biocultural diversity linkages, it is possible to claim that participatory mapping (at least in the two cases under study) can mobilize the knowledge of local communities in respect of their world view, their livelihood, their language, and their institutions and norms. As discussed above, all of these processes have potential value in relation to adaptability and resilience building. As will be shown in Section 7.6 of this chapter, excavating and learning about the knowledge that resides in a community's collective memory builds identity and acts as a precursor to socio ecological resilience. This claim is further taken up in the morphogenetic cycle (Section 7.4 below).

7.3 Participatory Mapping Learning Interactions and Agency

This section will discuss the learning activities and interactions that emerged in and from the mapping practices. It will answer the question: 'How did learning interactions take place during participatory mapping to influence agency?' Many of the learning interactions were described in Chapter 6, but in this chapter they are analysed in more depth, using Wals' (2007) framework (see Section 4.2); Vygotsky's theory of semiotic mediation and Zone of Proximal Development (see Section 4.3.1); and theories of situated learning, mainly Wenger's communities of practice theory (see Section 4.3.2). As in the section above, I use a series of analytical statements in this section, which contribute towards establishing the 'claims' that can be made from this study, which are substantiated through referring to the data reported on in Chapter 6 and associated data contained in appendices one to six.

7.3.1 Learning through creating dissonance

Analytical Statement: Participatory mapping creates dissonance by introducing new ways of looking at the landscape and this stimulates learning and agency for change.

As shown in Chapter 4, Section 4.2, Wals (2007) sees dissonance as a prerequisite for the social learning process. He offers a framework suggesting how dissonance should be organized for maximum effect and what should be done to facilitate the process and how to follow up after the process has ended. He presents a learning process depicted in Figure 7.1, which, in combination with his framework, highlights the major processes through which learning takes place.

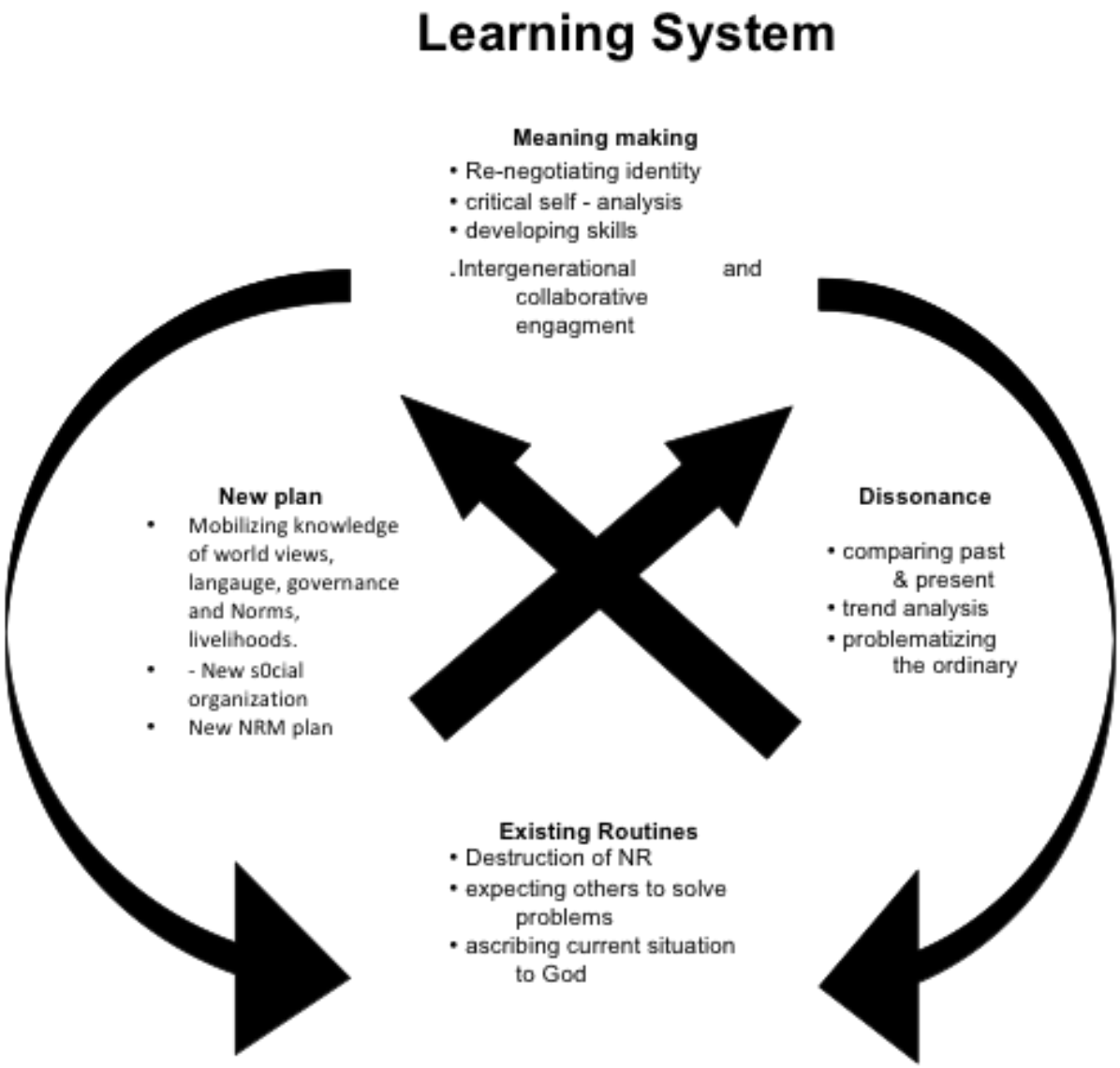

Figure 7.1: *Learning system emerging from the mapping processes in the two case study contexts* (adapted from Wals et al., 2009; based on Hurst, 1995)

Figure 7.1 is an adaptation of the Wals et al. (2009) framework, drawing on the key learning processes associated with the participatory mapping in this study. It illustrates how routines (existing knowledge, fixed habits and norms, systems and training conditions) are put into a crisis situation (deconstruction, chaos, dissonance) through, in the case of participatory mapping, historical analysis and past-present comparative activities; and how new learning takes place through meaning making processes that involve mobilising and challenging existing knowledge, worldviews, institutions and norms; and enabling emerging knowledge, new relationships, emergent norms and values, and experimenting to exist. This in turn becomes embedded in new knowledge, relationships, norms and values and routines. Put into a cycle, this involves ongoing processes of disruption and dissonance; demonstrations of how new knowledge becomes embedded and routine; and how, once subjected to dissonance, the result can be learning and a new form of embedding.

Of significance for this study is the manner in which the mapping processes appears to have created dissonance within such a learning cycle. An interview with Aman Mame of the Bale community (Section 6.6) explains clearly that participation in the mapping process has created dissonance in the community; but this is also evident in other data (see Sections 6.3.5 and 6.4.3) in both case study sites. In both cases, members of the community were not feeling the degradation of their land and forest to the extent that they did after the mapping process. Comparing the map of the past with that of the present in the 2D sketch mapping activity and in the eco-cultural calendar development processes seemed to be of most significance here, as the explicit visualisation of past, present and future created dissonance. This same comparative process appeared, however, to take place in the dialogue and discussions during the P3DM processes: people discussed how things were then, and how they are now, and what has been lost or what has changed on the landscape (see Sections 6.3.5 and 6.4.3).

In terms of the situated learning theories of Sfard (1998) and Wenger (1998) the learning became part of the community, as the existing norms and practices were challenged and responded to, for example in the case of Telecho where the farmers formed the Adere Environment Protection Association in which they wanted others to participate in the soil and water conservation practices; and in the case of Bale where the communities decided to

stop cutting trees on their farm and rehabilitate their land, and new tree planting practices were initiated. These decisions were made after realisation of the dissonance. Participation in the mapping activity created determination within the group and a sense of identity, expressed in these collective responses. Through this, it is also possible to see that the landscape is much more meaningful to them now and the processes of participation and reification in which knowledge of the landscape, norms and practices were mobilised, helped to create this meaning.

To further explicate the role of mapping in creating such dissonance within a cycle of meaning making and new knowledge embedding, I draw on Wals' (2007) social learning process framework, as it provides for further detailed description of how the mapping process creates dissonance in a cycle of new learning and agency creation. As shown in Chapter 4, Section 4.2, this framework has six processes: orientation and exploration, (self) awareness raising, de-framing or deconstructing, co-creating, applying/ experimenting, and reviewing.

Orientation and Exploration: In the mapping exercise, the processes of orientation and exploration (as described by Wals, 2007) can be viewed as pre-mapping activities, of which the legend building seemed to be particularly significant, as reported in Sections 6.3.1 and 6.4.1. The building of the P3DM model and orienting members of the community to the concepts and techniques of mapping also appeared to be important, as was the work undertaken to establish the participatory process (liaison with communities prior to the mapping). In this process the role of facilitators is important, as shown in Chapter 6. These can be external facilitators (e.g. MELCA-Ethiopia) who played a key role in establishing the participatory process; or the international partners who helped to source some of the equipment needed for the P3DM; or people with technical expertise (GIS specialists); or members of the community (the elders who first constructed the initial legends). Trust and established relationships also seemed to be important to this orientation phase.

Self awareness raising, de-framing or deconstructing, and co-creating: The actual mapping process seems to be best explained by the middle three social learning processes in Wals' (2007) framework: (self) awareness raising, de-framing or deconstructing, and co-creating. Some of the orientation activities such as legend building also involve these same processes,

which illustrates Wals' point that learning does not happen in a sequential manner and some of the processes can occur simultaneously.

What became increasingly evident is that *self-awareness raising* and *de-framing* and or *deconstructing* happened simultaneously as dialogue around the mapping practices emerged. For example, in Section 6.4.2 it was evident that community surrounding the Foata Mountain was becoming aware of the scale of the deforestation and the scope of the changed landscape as the P3DM revealed the whole landscape. This created dissonance (de-framing and deconstruction), and concern for alternative practices (co-construction). The mapping of the past and the present and the comparative analysis created awareness about the historical and cultural significance of the biocultural landscape and the drastic social-ecological changes that are occurring. Seeing the trend created dissonance because historicizing it challenged the beliefs that members of the community held about the past. The map of the past showed a relatively intact ecosystem while the one of the present depicts a degrading biocultural landscape. The past, as portrayed by those constructing the map, was less than 40 years ago. The level of destruction within the last 40 years deconstructed the community's sense of normality in relation to the present and pointed to what was perceived to be an even more dangerous trajectory of change in the future. Awareness of this trajectory of events has motivated community members to take action, indicating the awakening of a sense of agency (see Chapter 6.4). Community members said the process was both painful and enlightening, and the youth and adults in particular, felt it strongly, as they had previously had no idea of what the landscape had looked like in the past. As mentioned already, after deliberating on the change and the measures that they needed to take, in Telecho members of the community formed an association and are acting to reclaim the land, and in Bale, a group decision, as explained in the reflective interviews probing learning and agency (reported in Sections 6.3.6 and 6.4.4). This point will further be elaborated upon when the morphogenesis process is explained in Section 7.5 of this chapter.

Application and experimentation: As Wals (2007) notes, the processes of self awareness raising, deframing and reframing are followed by application and experimentation, which in the case of the two communities that were involved in the participatory mapping, would

involve carrying out the decisions that were agreed upon as a result of the mapping process. In the interviews focussing on agency development, it appeared that such processes were occurring, as acts such as tree planting, water and soil conservation had taken place (see Sections 6.3.7 and 6.4.4). I was able to establish this by following up with communities *after* the mapping had taken place.

Reviewing consists of looking back at the mapping activity and following up on the result after the activity is done; which in the case of this study was done through reflective interviews. It is also a process that could be continued into the future, as also pointed out in Sections 6.3.7 and 6.4.5 in Chapter 6.

7.3.2 Learning through semiotic mediation in Zones of Proximal Development

Analytical Statement: Participatory mapping helps participating individuals to acquire knowledge about biocultural diversity mediated by the knowledgeable others and artefacts.

As indicated in Chapter 6 there was evidence of participants in the mapping process acquiring new knowledge of the landscape. Acquisition, according to Sfard (1998) is an important dimension of the learning process and should not be ignored (as discussed in detail in Section 4.3.1). For example, a student participant called Jibril Umar talked about how he had gained a higher level of understanding of geography due to his participation in the mapping practice (see Chapter 6, Section 6.3.1. He explained how, prior to the mapping activity, his geographical knowledge was limited to reading books and lessons but he gained a much more nuanced understanding of contours, contour line and landscape structure through his involvement in the participatory mapping activity. The cultural significance of places that he did not know was also brought to his attention by elders and he developed respect for their knowledge because of his participation. There are other such examples (see Sections 6.3.2 and 6.4.2 of knowledge acquisition through the mapping process). In many instances the elders said that the map gave them a focal point around which to construct knowledge of the landscape.

Knowledge acquisition, cannot be separated from meaning making, and Lemke (1997) comments on the meaning making processes that occur as new knowledge is constructed. He says:

> Semiosis is meaning making; it is taking one thing as a sign for another, construing a thing, event, process, or phenomenon in relation to one or more others. Semiosis is selective contextualization; it is making something meaningful by seeing it as a part of some wholes rather than others, as being an alternative to some options rather than others, as being in some particular relation to some things rather than others. (p. 4)

As Lemke implies, maps represent the biocultural landscapes, allowing participants to use signs of the landscape, engage in 'selective contextualisation' and seeing elements of the biocultural landscape in relation to each other, and to the whole. One function of mapping is representation and the other is agential (Corner, 1999). Therefore, maps serve to construe the historical and cultural meaning of the biocultural landscape. As this is dependent on the subjectivities of those involved in the mapping processes, as well as the technologies and support provided, much depends on the choice and interest of the participants. Selective contextualisation is therefore an important feature of participatory mapping. Through the mapping processes, members of the two communities were able to define what is important to them, represent it on the map, and through this create meaning in their community context. For example, the Bale community showed the significance of agro-pastoral practices whereas the Telecho community emphasised agriculture.

From this review it is possible to suggest that the maps, as a social learning tool, mediated learning and meaning making amongst members of the communities involved. Vygotsky (see Section 4.3.1) talks about semiotic mediation being important for knowledge construction. This form of mediation connects the external, the social, and the individual. In the case of the mapping process, individuals could connect with what is outside their immediate social environment and existent knowledge (e.g. to gain access to views of the wider landscape; or the knowledge held by the elders) through the use of the maps as semiotic mediation tools.

As described in Chapter 3, participatory mapping as a method is the result of long years of experimentation and the rules and regulations and materials that come with it, carry the

thinking of their creators; thus the knowledge constructed by community members in cases such as the Bale and Foata mountains is also influenced by the mapping processes and technologies. For example, the use of a wide range of colours allowed for expressing different soil varieties; while the different coloured pins (and the encouragement to express both cultural and biodiversity features) allowed for representations of culturally significant sites; building the contours from cardboard allowed access to the wider landscape view, while the eco-cultural calendar's structure and comparative technologies allowed for expressions of socially meaningful seasonal and cultural changes. Salmon and Perkins (1998) talk about how artefacts (such as the mapping technologies used in this study) carry the wisdom and hidden assumptions of their creators and how learners interact with this wisdom and these assumptions when they interact with artefacts. As explained in Chapter 3, participatory mapping emerged from combinations of Participatory Learning and Action (PLA) and Geographic Information Technologies (GIS) (Rambaldi, Chambers, McCall & Fox, 2006). Rambaldi et al. (ibid.) further explains that "PGIS is an emergent practice in its own right".

As indicated in Chapter 3, there is little explication of the role of mapping in learning and agency development. This study has identified that participatory mapping tools are important for semiotic mediation; supporting meaning making processes that can move the knowledge and awareness of the participants from a lower level of understanding of their biocultural landscape to a higher level; and this semiotic mediation process is shaped by the assumptions that underlie the participatory mapping tools and their construction. It is in this sense that knowledge acquisition is culturally, historically and socially mediated by influences and artefacts (e.g. the mapping technologies) that are often beyond the immediate social interactions that exist between people present. As indicated in Chapter 4 (Section 4.3.2), this is a differentiating feature of participation in learning, which distinguishes participation in learning from a politics of participation in which presence is most highly valued.

Mediation of the nature described above, and the knowledge construction and acquisition process, occurs within what Vygotsky termed a 'Zone of Proximal Development (ZPD)' (see Section 4.3.1). The Zone of Proximal Development (of an individual learner) can be considered as a place where the individual and the social meet. This theory of learning views

learning as distributive, interactive and contextual. It implies support to the learner from those who know more, so that the learned can progress from the actual to the envisaged development level (Chaiklin, 2003). In this study there were many instances where various levels of scaffolding were constructed and provided during the participatory mapping practices; most are captured in the sections on 'educational processes' in Chapter 6.

For example, as the main facilitator of the participatory mapping processes, I provided considerable support in the form of introducing the materials, demonstrating how to use them, following up to see how they were being used, managing the relationship between the trainees and the community (this is critical, as some formally educated participants may consider themselves more knowledgeable than elders) (see interview with Endale Sahilu, Section 6.5.3), sharing stories from other communities to encourage them, and training others to do the facilitation. There were numerous subtle, yet important scaffolding 'acts' that I created; for example to support the elders to construct the legend, and to present it to the incoming community members (rather than doing it myself); and hosting reflective discussions using probing questions (to facilitate ongoing meaning making and reflections on the mapping activities) which have contributed to the learning processes, as shown in Chapter 6. In this research this required ongoing reflexivity and a careful noting of my role in the process (as discussed in Section 5.11).

However, as shown in Chapter 6, I was not the only person facilitating the process. Members of MELCA-Ethiopia and the community also provided support and scaffolded the learning interactions and processes. The scaffolding support that we provided was therefore technical, but also conceptual, as we encouraged community members to express their knowledge of the landscape in terms of biocultural diversity and not only in terms of natural features of the landscape. We were, however, not the only ones providing conceptual or knowledge support, and as shown in Chapter 6, this was provided by those who have both the history and the cultural understanding of the biocultural landscape. They scaffolded the mapping process by providing key information, understandings and interpretations so that others could see what they were seeing in a new way. MELCA-Ethiopia employees with local knowledge of the area played an important role in scaffolding the learning of others; as did the elders, as was explained in Chapter 6 (Sections 6.3.1 and 6.4.1). On the significance

of scaffolding and semiotic mediation in the learning process, Chaiklin (2003) says: "Successful (assisted) performance can be used as an indicator of the state of a maturing psychological function" (p. 11). This can be seen in more depth, through the example of a female student who was involved in the mapping process: Askale Debele, reflected on how, before the mapping process, she took no notice of what her parents and grandparents were saying. After the experience she gained new respect for the elders. She said "they did in one day what we could not have done in a week" (see Section 6.4.2). From this, and similar learning experiences amongst other youth participating in the process (see Sections 6.3.4 and 6.4.2), it is possible to suggest that the transformation in Askale (and her peers) is situated in the psychological context of her generation, where youth have lost respect for elders and where, because of this, they are losing their connection with their biocultural landscape. Through the mapping processes, and their observations of and interactions with the elders' experience and knowledge, they were 'moved' from a disconnected place, 'lost' in terms of the cultural histories of their own communities, to a place in which they could begin to understand the social-ecological environment and context of their village better. As we shall see in Section 7.6 of this chapter, this knowledge is critical for the resilience of communities.

In summary, the focus on this section was mainly on the knowledge acquisition and construction process, where the emphasis is on one agent helping another, through semiotic mediation using and supported by artefacts or more experienced others. The section has shown that the mapping processes and technologies are important 'semiotic mediation tools' for knowledge construction. This section has, however, failed to discuss the collective learning from a wider, more sociological perspective; as it has focussed more on the acquisition dynamics of learning.

In the next section, therefore, I will explain how learning has taken place in the context of participation in a practice. Solomon and Perkins (1988) talk about such learning as being related to "collective agency, which, as a collective, acquire more knowledge, understanding, skill, or a different climate or culture" (p. 7).

7.3.3 Learning in a Community of Practice

7.3.3.1 Education and identity

As shown in Chapter 6, I worked with education processes as one of the categories of analysis. Education was understood as the interaction between the facilitator, the learner and the object of interaction (Bol & Foranzi, 2003), which in the case of this study are the maps. As shown in Section 7.3.3 above, the education activity can also be interpreted through the concept of ZPD, as the material artefacts and facilitators scaffolding the learning practice. In Chapter 6, and in the discussion above, I have illuminated a number of educational interactions (involving a diverse range of facilitators) that occurred around the models, the sketch maps, the legends and the ecological calendars. In this section I discuss the education process further, within a collective social and situated learning framework, particularly the implications of the education process for identity building, using the framework provided by Wenger (1998; discussed in Section 4.3.2). Wenger says:

> Education, in its deepest sense and at whatever age it takes place, concerns the opening of identities – exploring new ways of being that lie beyond our current state. Whereas training remains to create an inbound trajectory targeted at competence in a specific practice, education must strive to open new dimensions for the negotiation of self. Education is not merely formative – it is transformative. (p. 263)

Drawing on data reported on in Chapter 6, and Wenger's (1998) explanations of identity formation; I now explore how the participatory mapping education processes influenced identify formation; and whether it was formative or transformative. Wenger (1998; see Section 4.3.2) provides a more refined language of description for explaining identity formation in the form of three frameworks, which he calls 'learning architectures', to explain the role of education in the formation of an identity. He calls these *engagement, imagination and alignment* (see Figure 7.2). These are useful for 'unpacking' the role of mapping in identity formation, which is otherwise difficult to establish or explain. Figure 7.2 shows an adapted version of Wenger's concepts, informed by evidence from the two case study sites. Again I use the strategy of formulating analytical statements to clarify the role of participatory mapping in learning (and identity formation).

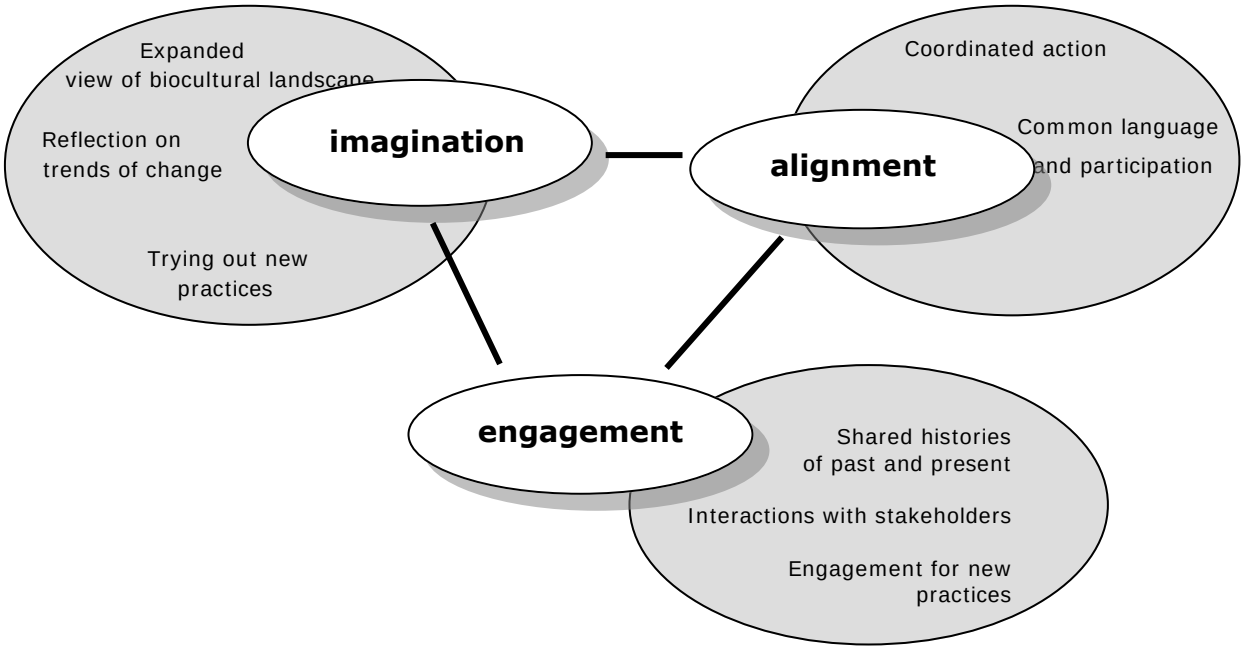

Figure 7.2: *Identity in education* (adapted from Wenger, 1998)

- **Mutual engagement**

Analytical Statement: Participatory mapping creates a space for engagement in educational practice for identity building.

'Mutual engagement' refers to the engagement of those who are involved in a process whose aim is to benefit all. In the context of the study, there was mutual engagement during various processes. The engagement started between the MELCA-Ethiopia team, international partners (including ABN and GAIA) involved in participatory mapping where knowledge of the processes of participatory mapping was developed. Furthermore a very important engagement process that occurred was between MELCA-Ethiopia and the government. This was important for two reasons. The first is that the government is a key partner in the future implementation of decisions that may emanate from the mapping exercise and the second is that, in the Ethiopian context, no activity can take place without the government agreeing to it. There was also repeated engagement with the local community to explain the purpose of the mapping, to select participants in the process and to deliberate on the result (see Sections 5.7 and 5.8). The most significant engagement (in relation to the research question) was the mapping activity itself. Here, there was mutual

engagement among participants, between MELCA-Ethiopia and the community and between myself (as participant researcher and Director of MELCA-Ethiopia) and all participants.

Mutual engagement gave participants the opportunity to generate a common understanding of their landscape and a renewed identity (see interviews with a range of community members in Chapter 6 (Sections 6.3.2, 6.3.7, 6.4.5 and Appendix 6). For example, Adem Hassan appreciated that there was a mix between those with formal education and those who had not gone to school, and Aman Mame found women's engagement to be critical, while Elias Nur felt respect for elders after his engagement with elders in the practice. In all these cases it seems that new relational dynamics were important to this process.

There was also engagement with artefacts. Some of the members of the community participating in the process had never seen topographical models, coloured pens, and had never used paints and coloured pins in the way in which they were used in the mapping activities before. The engagement with these materials, mediated by the knowledge of how to use them, and the actual use of these artefacts in building the maps and models, created confidence, and a sense of agency that community members have the means to use this practice in future.

There was also continuity in the engagement associated with the education practice among the people who participated in the mapping processes. As reported in Chapter 6, the first round of mapping processes led to further actions focussing on the solving of socio-ecological problems.

- **Imagination**

Imagination, as discussed by Wenger (1998) emerges when the education process encourages and allows for development of trajectories of what is possible through an understanding of who they (participants in the educational process) are and their capabilities. Wenger talks about three aspects of imagination: *orientation, reflection and exploration*. ***Orientation*** involves obtaining wider perspective of the situation, in Wenger's

(1998) words 'direction and trajectories'. It is about identity formation "*as an expanding image of the world"* (p. 272, emphasis mine).

Analytical Statement: Participatory mapping expands the view of those participating in relation to their biocultural landscape, thus shaping their identity and awakening the will for change.

As reported in Chapter 6 (Sections 6.3.1, and 6.3.2) in the legend-making process, elders and other members of the community involved in the mapping process identified areas that they never thought existed. The classification of different kinds of agricultural lands using paints was also a new experience for them – a new way of relating to the landscape. The mapping processes also expanded views of changes taking place on the landscape, and the reasons for these changes; it additionally expanded views of the 'whole landscape' which previously had not been accessible to community members, who were mostly used to locally experienced views of the landscape at a smaller geographical scale. For example, Hassiya Haji from Bale reflected on how shocked she felt when she saw the bigger landscape, since, to her knowledge the landscape was limited to what was immediately around her. A teacher called Abdalla Muhammed was astonished that the year could be divided into five rather than four seasons (Section 6.3.4).

As reported in Sections 6.3 and 6.4, the mapping activities, in both case study contexts, also provided community members with an opportunity to understand the relationship between the components of the biocultural landscape from different perspectives: a temporal and social-ecological relational perspective; a spatial, geographical perspective; as well as a cultural change and intergenerational knowledge perspective. As reported on in Chapter 6, these processes generated a stronger sense of collective identity and will to act. Understanding this relationship is fundamental for working towards resilience (Berkes et al., 2000).

Reflection involves looking at the situation with new eyes. It is about "taking a distance and seeing the obvious anew. It is about being aware of the multiple ways that we interpret our lives. In this sense it is about *identity as self-consciousness*" (Wenger, 1998, p. 272, emphasis mine).

Analytical Statement: Participatory mapping provides people with a focus for reflecting on their land, land use practices, and biocultural diversity; and this experience shapes their identity.

As reported in Chapters 5 and 6, the mapping processes in the two case study sites were followed by reflection sessions in which participants in the process reflected on the history and the change in the biocultural landscape and their place in it. Chapter 6 revealed that these reflective processes were important to consolidate the learning and value of the mapping processes (Sections 6.3.7 and 6.4.5). The reflective processes also appear to have a role to play in identity formation. For example, Adam Bira from Bale felt that he was seeing his village with a new eye, and this made him feel much more that he was part of the land; and a student from Telecho called Abebe Bekele recalls how he was refusing to be part of social activities and how, knowing the history and the culture of the community has made him regret his actions (see Section 6.3.3).

Exploration, according to Wenger (1998) is about experimenting, or, as the term implies, exploring new ways of becoming better informed through our orientation to the situation and our refection about it. In Wenger's (1998) words, "it is daring to try something really different, to open new trajectories, to seek different experiences and to conceive of different futures. In this sense *it is about identity as a creation*" (emphasis mine, ibid.).

Analytical Statement: Participatory mapping creates an opportunity for conceptualising and trying out new ways of practice, thereby contributing to new identity formations.

As reported in Sections 6.4 and 6.5, there were a number of instances where exploration or new ways of doing things through practice occurred. One example in the Telecho community was the creation of an organised association to carry out the decision that they had made). Another example is Lemi Gari, an association created by the youth who participated in the modelling programme. The local government has recognized this association and its members have been given land, which they are rehabilitating (see Section 6.4.4). Both examples illustrate the creation of new collective identities, expressed through the formation of associations to which people belong, and which focus on new practices. As indicated in Chapter 6, however, creating such new identities and practices is

not without difficulty, as not all farmers are willing to change their practices to include rehabilitation.

- **Educational alignment**

In referring to 'educational alignment', Wenger is essentially talking about agency; and how educational processes 'align' with actions in communities of practice, in other words, doing something after understanding the context and the problem. This involves crossing the boundaries of one's community, engaging with others and creating change. An example of engaging with others is the Lemi Gari group mentioned above. As mentioned in Section 6.4.4, the group was formed after the modelling process, they formed a legal entity, asked for land from the local government, and they are now planting medicinal plants and engaging in a range of other environmental and educational activities, contributing to building up their community (Appendix 6).

I will explore the issue of agency in detail when I talk about change through the theory of morphogenesis in Section 7.5 of this chapter.

In summary, it is possible to state that the capacity of the mapping activities for reflection, to expand views of the biocultural landscape from social and ecological change perspective, to create the spaces for engagement in, and trying out of new practices, seems to have strengthened a collective sense of identity and willingness to act, but not amongst all members of the community (mainly those who were involved in the mapping process).

7.3.4 Meaning making

Analytical Statement: Participatory mapping helped those who participated make meaning of the cultural, ecological and historical significance of their biocultural landscape and this may increase their capacity for adaptability, thus contributing to resilience building.

Wenger (1998) also provides a language of description for collective meaning making (Section 4.3.2.2), which I draw on here to illuminate aspects of the meaning making process emerging from the mapping processes. For Wenger (1998), it is not the engagement that we have with activities that matters, it is the meaning that we produce through this engagement. He uses the following concepts to describe the process of making meaning:

1- Meaning is located in the process of the negotiation of meaning. Meaning does not exist in us, nor in the world, but in the dynamic relation of living in the world.

2- The negotiation of meaning involves the interaction of two constituent processes, which are participation and reification.

3- Participation and reification form a duality that is fundamental to the human experience of meaning and thus to the nature of practice. (see Section 4.3.2.2)

Data in Chapter 6 reflects that engagement in the participatory mapping activities led to meaning making amongst those who participated. I reported in Sections 6.4 and 6.5 that there was continuous negotiation and debate about each component of the landscape before members of the communities came to a consensus and put the names and the features they described on the maps. They ended up agreeing on what would go onto the map and how it would be depicted. The map embodies their consensus, and the achievement of accord constitutes meaning making. There were lots of 'Aha' moments in the mapping practice. These ranged from community members wondering about their ability to identify points and polygons representing places on the map, to the youth and adults attesting that the elders were the ones who knew, to the elders saying that during the process they had remembered a lot and were capable of knowing because of working together. For example, a participant from Telecho, Deneke Bisrat, reflected on how working together helped them identify places and construct their history and their biocultural landscape (Section 6.4.5). MELCA-Ethiopia staff members reported that the process had expanded their understanding of traditional ecological knowledge and biocultural diversity on the landscape (Appendix 4); many other such examples exist. Meaning making did not, however, only result in agreement and new knowledge of the landscape, but extended to conceptualising and agreeing on pathways for action and rehabilitation.

Meaning, according to Wenger (1998) involves the interplay between participation and reification. Figure 7.3 shows how participation is experienced through the map-making process, through interacting with the group and through practising rehabilitation. The participation process is reified, as it is expressed in maps and documented in the form of photos and videos, which provides a focus for discussion that can also be used as an instrument for further action. The next section elaborates on how meaning was made through the interaction between participation and reification in the participatory mapping activities.

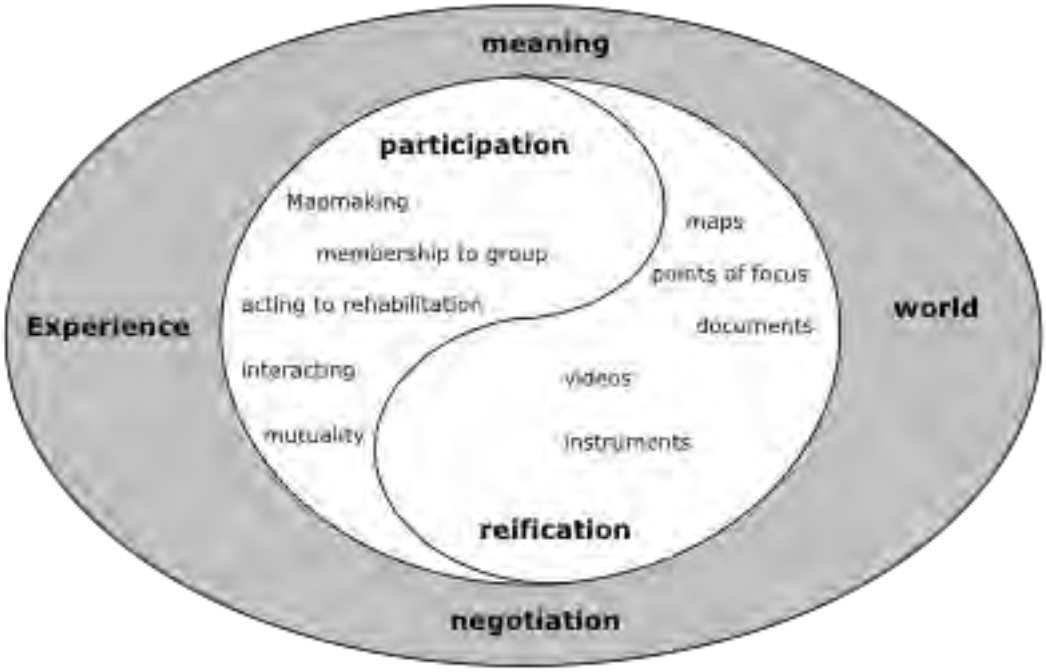

Figure 7.3: *The duality of participation and reification* (adapted from Wenger, 1998)

- **Participation**

Regarding participation, the topic of this section, Handley et al. (2006) say:

> Participation can be understood to denote meaningful activity where meaning is developed through relationships and shared identities. Participation is membership in social communities and involvement in social enterprises. It is personal and social. It is a complex process that combines doing, talking, thinking, feeling, and belonging. Participation is always based on *situated negotiation and renegotiation of meaning* in the world. (p. 651, my emphasis)

The statement from Handley et al. implies that, in the context of learning, participation can be shown to have taken place if those who were present can attest that their involvement helped them to make meaning of their practice and if this involvement has an implication for their identity.

Analytical Statement: Participatory mapping creates an opportunity for new forms of relationship and meaning making which can contribute to resilience building.

As indicated in Sections 6.3.4 and 6.4.5, there were various instances where community members were able to express how participation in the mapping process was meaningful. For example, after participating in the mapping process, Gonfa Feyissa from Telecho said that he was convinced that elders knew. He appreciated working together with elders as

this was educative, necessary and harmonious and said “if we take this relationship to the next level, I think we change a lot” (see Section 6.4.2). This shows how participation was meaningful to him and could contribute to agency, adaptability and resilience building.

As data in Chapter 6 demonstrates, by participating in a mapping process, those who are new to the history of the landscape and those who had not previously reflected on the changes as the others had, develop an awareness of their day to day practice in their environment “and thus come[s] to understand and engage with [or adapt and transform] this way of life as expressed in various tools, language, role-definitions and other explicit artefacts as well as various implicit relations, tacit conventions, and underlying assumptions and values” (see Handley et al., 2006, p. 645). This participation was both social and personal.

- **Reification**

As discussed in Section 4.3.2.2 Wenger (1998) describes reification as the process of giving meaning to our experience by producing objects that congeal this experience into ‘thingness’. It creates a focus where the negotiation of meaning is organized. Reification in this sense is understood in the broader context of making, designing, encoding, and describing as well as perceiving, interpreting, using, re-using, decoding and recasting (pp. 58-60).

Analytical Statement: Through the practice of participating and producing maps, a new form of relationship is established among those participating in the process and with their biocultural landscape, which contributes to resilience building.

The production of the legend and the P3DM landscape mapping, the sketch maps and the eco-cultural calendar all demonstrate the interplay or the duality between participation and reification. The two processes integrate as groups working together to generate artefacts in the form of maps and models. Dialogue, mobilising knowledge and memory leads to representation and vice versa. Testifying to this are comments from community members who said that working as a group had helped them a lot. They also said that people would come with their own memory which was not complete; but when they came together, they remembered together and put their common understanding of the biocultural landscape on the map (see Section 6.4.6).

In summary, and as will be seen in the section discussing resilience, memory is an important factor in building socio-ecological resilience, and meaning making through the process of participation and reification, which the mapping activities facilitate, can help build resilience.

7.3.5 Summative discussion: Learning and Identity

In Sections 7.3.1 to 7.3.4 above, I have discussed mapping and learning, one of the dimensions of which is identity formation. As this seems to be central to the mapping and learning relation, I return to a summative discussion on this here. Identity formation as an outcome of mapping has been mentioned by a number of authors including Rambaldi (2010); Crawhall (2009); Muchemi et al. (2009); Di Gessa, Poole and Bending (2008) (see Chapter 3). However, none of these authors describe how identity is formed as part of the participatory mapping process. Section 7.3.4 above has provided a more nuanced understanding of this process; and it has shown that learning and identity formation are intertwined processes. This section clarifies this a little further; and summatively reviews the role of participatory mapping in this complex social process, as established in the two cases under study.

Analytical Statement: Participatory mapping creates an opportunity for identity renegotiation.

During the mapping process, in which the residents of the Horo Soba in Bale and Telecho in Welmera came to populate the map with their cognition, it became clear that the various groups that make up these communities have different understandings of their landscape. The differences are due to several factors including age, gender, occupation (e.g. whether farmers or herbalists etc.), social and economic status. During the mapping process, people came to the process with their own stories. Children and youth had very little knowledge of the past history of the landscape. Producing maps of the past and discussing these, or producing maps of the present and using these to reflect on the past, helped participants to visualize the cultural and historical heritage of their people and their area (see Chapter 6). In all mapping activities, those around the mapping table had a chance to share their stories. Resulting from this, in both cases, most people re-aligned themselves with their social-ecological history; although in the Telecho case, people did not visualise a return to this

history; although there were elements of it that they wanted to retain. A renewed or new commitment to the social-ecological history, was most evident among the elders who were deeply concerned about the changes taking place, and amongst the youth who 'discovered' new cultural connections to their land through the mapping processes (Crawhall, 2009; Bates, 2009; Zent, 2009).

Related to this, Barab and Duffy (2000) say that

> A community has a significant history, a common cultural and historical heritage. This heritage includes the shared goals, belief systems, and collective stories that capture canonical practice. These shared experiences come to constitute a collective knowledge base that is continually negotiated anew through each interaction. (p. 36)

As shown in the data presented in this study, participatory mapping creates an environment for sharing experiences of the cultural and historical heritage of communities involved in the processes. It also creates an opportunity to negotiate and develop the knowledge base of communities and thereby influences identity. Barab and Duffy (2000) contend that:

> It is through this legitimate participation in the greater community, and the community's legitimate participation in society, that communities and identities are formed. These practices, including the adoption of particular goals, belief systems, and cognitions, are ordinarily framed and valued by this greater community, and it is through the carrying out of these practices that an individual binds himself to this community. (p. 37)

Learning is not simply about developing one's knowledge and practice, it also involves a process of understanding who and what we are and to which communities of practice we belong.

In his work on identity and learning, Wenger (1998, p. 163) identifies six characteristics of identity in practice: lived, negotiated identity, social, a learning process, nexus, and local global interplay; three of these are particularly relevant to the role of mapping in enabling learning and identity formation in contexts of biocultural diversity loss. I discuss them each briefly below, in relation to the data of the study.

- **Lived Identity**

Wenger (1998) states that:

> Identity is not merely a category, a personality trait, a role, or a label; it is more fundamentally an experience that involves both participation and reification. Hence it is more diverse and more complex than categories, traits, roles, or labels would suggest. (p. 163)

This has been discussed in the section on meaning making above (see Section 7.3.4.2). The mapping process (as explained in Chapters 5 and 6) was undertaken in a participatory manner, the final result is a reified map or model. The subtlety of the lived identity formation process is, however, difficult to grasp at the nexus of participation and reification. The best direct evidence of this (in this study) was found in the reflective interviews, for example, when Aman Mame (in an interview statement recorded in Section 6.2.6, talked about how, through working together, they could remember toponyms and how that process of remembering helped them to excavate the history of the biocultural landscape. This process in turn made them remember their ancestors and showed them some of the important identity features of their communities, and what was being lost. This example shows how through participation and reification in the mapping process, identities are shaped in relation to lived experience.

- **Negotiated identity**

Identities are, however, also negotiated and ever-changing as explained by Wenger (1998) when he states that:

> Identity is a becoming; the work of identity is ongoing and pervasive. It is not confined to specific periods of life, adolescence, or to specific settings, like family. Identity is fundamentally temporal and the work of identity is ongoing. Our *identity is something we constantly renegotiate during the course of our lives.* (p. 163, emphasis mine).

This statement implies that the identity of individuals is not limited to their role in life or their habits and their family. It is temporal and it can change. It can also be experienced and can change or be re-negotiated in a particular practice such as participatory mapping. Sections 6.3.4 and 6.4.5 report that members of the communities involved in the mapping activities indicated that participation gave them a new perspective on their lives and that they felt a renewed connection and relationship to their land and its biocultural diversity. For example, interviews with Hule Utara from Bale, and Diriba Wame from Telecho both show that the identity of the individuals as belonging to the cultural and socio-ecological heritage to the community was at least partially shaped by their experiences in the

participatory mapping. Prior to this, they didn't know the names of the components of the landscape and their history; knowledge that was used to reflect on, and renegotiate their identities in the context of the biocultural diversity of the area.

- **Identity as an ongoing learning process**

Reflecting further on the changing nature of identities within a temporal, emergent and inter-generational learning frame, Wenger (1998) sees identity as an ongoing learning process. In this regard, he states that:

> We are always simultaneously dealing with specific situations, participating in the histories of certain practices, and involved in becoming certain persons. An identity is a trajectory in time that incorporates both past and future into the meaning of the present. Different generations bring different perspectives to their encounter because their identities are invested in different moments of that history... With less past, there is less history to take into consideration. With less future, there is less urgency to reconsider history... Yet, the perspectives of old-timers and new comers are not so simply delineated. (ibid., pp 155 – 157).

As explained in Sections 5.7 and 5.8, a key feature of participatory mapping, as practised also in this study, is the involvement of different generations; genders; and people with different life and livelihood experiences. In Chapter 6, I reported that, in the P3DM activity, youth who built the model stayed behind to learn from the elders. In the sketch mapping process in particular, there was a build up of the map of the past before the map of the future was done. The elders took the centre stage in this process. They know the past and the names of most of the places so they helped the youth to move to the centre or into the cultural historical knowledge sphere of the community thereby shaping their identity. The adults and the youth were active in the build up of the map of the present and the future. This is because they know the history of the land and they also have a stake in the future. Through this, different generations and groups were able to bring different perspectives to the process; and it was also clear that they brought their stories and identity experiences to the process from different 'historical moments'. This 'mixing' of diversity helped to shape emerging identities through encounters with different knowledge and experiences. For example, interviews with Fuad Abubakar and Remedan Hussein from Bale (Appendix 6) shows how a realization of the wisdom of the elders has helped them appreciate the knowledge bases of their community. Through this new understanding of the biocultural

landscape, they feel that they have become members of the knowledge of the community, and this has shaped their emerging identities in this context.

From the above, it is clear that the mapping activities have a valuable, if nuanced role to play in supporting learning processes and interactions that also shape lived, negotiated and learning oriented aspects of identity formation. These processes also influence social identities (i.e. identities at a community level or at a community of practice level e.g. identities of farmers or youth groups) as has already been explained in Section 7.3.5 above. In the context of biocultural diversity there is also a local/global element to such identities although this was not examined in great depth except through the maps of the past and the present. These were the best tools (of those used in the study) for bringing issues of wider social-ecological, social-economic and political change to the fore.

The nexus of identity formation was difficult to pinpoint in this study as Wenger rightly points out that identity formation is a complex social process; but there were clear indicators that the interfaces that exist between participation and reification; past, present and future; and historically constituted dissonances, are productive 'spaces' where learning and identity formation come together. In summary then, participatory mapping can help to create the spaces for identity renegotiation.

7.3.6 Conclusion (of this sub-section)

This sub-section (Section 7.3) has discussed the learning that emerged in and through the mapping processes used in this study in some depth. To do this, I drew on languages of description provided by learning theory, mainly social and situated learning theory. These theoretical lenses were most helpful for communicating the complexity and the nuanced processes at work as meaning is made, and as identities are renegotiated through the participatory mapping activities. They have also helped to shed light on *how* the learning processes were supported; how community and communities of practice were formed; and how new practices were conceptualised in and through the learning processes They have further helped me to communicate that learning is not just about knowledge acquisition (although this is important); it is also about wider social and collective processes in which individual, socially located identities are negotiated and renegotiated.

Throughout the sub-section I have tried to retain a strong focus on the role of participatory mapping in facilitating such learning processes through the use of analytical statements. In essence, these represent some of the important findings of this study. As mentioned in Chapter 1, understanding the role of participatory mapping in facilitating learning and agency development is currently a gap in the knowledge of participatory mapping.

As this sub-section has only dealt partially with agency development within a broader context of social change, I turn, in the following section, to a more in-depth discussion on the *wider processes of agency development and change,* as they relate to the mapping activities; and their location in a wider social-ecological context. Here I draw mainly on Archer's (1995) theory of morphogenesis, as it provides a nuanced theory of social change (as explained in Section 4.5) and it also provides a language of description that can help explicate the role of participatory mapping in supporting agency and emergent change.

7.4 Morphogenesis

Analytical statement: Agency, learning and change emerging from the mapping activities at community level is influenced by structural elaborations at other levels.

To shed light on processes of agency and change related to the participatory mapping activities described in Chapters 5 and 6, this section will analyze the structural elaboration (Archer, 1995) that took place at three events. As explained in Chapter 4, Section 4.6.2, it explores the change that has come about due to the engagement of the actors in the participatory mapping activities and asks whether structural elaboration has come about due to the action of actors on structure (ibid.). It separates the agency of the actors through time and explores their interaction and finds out whether morphogenesis (structural elaboration), or morphostasis (structural reproduction) has resulted. Figure 7.4 shows three levels of interaction: at African Biodiversity Network (ABN) (as mentioned in Chapter 1, referring to ABN includes the Gaia Foundation), MELCA-Ethiopia and at community level (discussions at this level refer to the two case study contexts reported on in Chapters 1, 5 and 6). The discussion that follows elaborates on Figure 7.4 and shows how the structural elaboration at ABN has acted as structural conditioning for MELCA-Ethiopia; and in turn how the structural elaboration at MELCA-Ethiopia has combined with the structural conditioning in the social-ecological contexts of the communities; and how this interacting process over

time resulted in some morphogenesis, but also some morphostasis. In contrast to Section 7.3 that described the learning and agency development (via processes such as identity formation) in micro-level detail, this discussion adopts a wider vantage point and perspective.

The discussion on morphogenesis starts at the African Biodiversity Network level (Level A in Figure 7.4). This is for three reasons. To begin with, it is ABN that created the opportunity for me to experience mapping (see Section 1.2). In this way, this network started the chain reaction for the actual mapping processes to happen as described in Chapters 5 and 6. The second reason is that ABN organized a series of training opportunities and visits that sharpen my, and MELCA-Ethiopia colleagues', understanding of mapping and broadened our view of what it means for local communities to engage with such activities. The last reason is that the mapping process also had an impact on ABN as an institution. MELCA-Ethiopia's practices influence ABN's practices: it was explained in Section 1.3.2 that MELCA-Ethiopia often hosts participatory mapping training for ABN members (to date four such training programmes have been hosted). I also serve on ABN's board of directors and am involved in designing its programmes. My engagement in the planning and execution of ABN's decisions means that the impact of MELCA on ABN could be direct. Therefore, I hope that by starting with a morphogenetic analysis of the ABN's engagement with mapping and my role in it, I will be able to provide a more complete picture of the learning, agency and change relations than would be possible if I only analysed these at the level of MELCA-Ethiopia and the community alone. It also provides further methodological tools for causality descriptions as required by critical realism, which expects descriptions of why things happen the way they do, rather than simply what happens as a result of another action (see Section 5.11 and Section 7. 1 above).

The second level of discussion on morphogenesis will be at the MELCA-Ethiopia level (level B in Figure 7.4). This discussion will show how the structural elaboration of ABN forms part of the structural conditioning for MELCA-Ethiopia and what and how social interactions take place as a result. The morphogenesis that occurred will be explained, including the institutionalization of the method and the increased capacity of the staff. Morphostasis elements will also be explained where relevant.

The last level of discussion on morphogenesis will be at the community level (Level C in Figure 7.4). The social-ecological contexts of the communities involved in this study will be discussed (see also Section 1.5), as this is part of the structural conditioning that influences community learning and agency development and resultant morphogenesis/morphostasis.

The process is not as linear as it appears, however. It is iterative. The process that happens in the community, for example, will affect what is happening at ABN level; and what happens at community level affects MELCA-Ethiopia etc. (see Figure 7.4). This will be explained in more detail below.

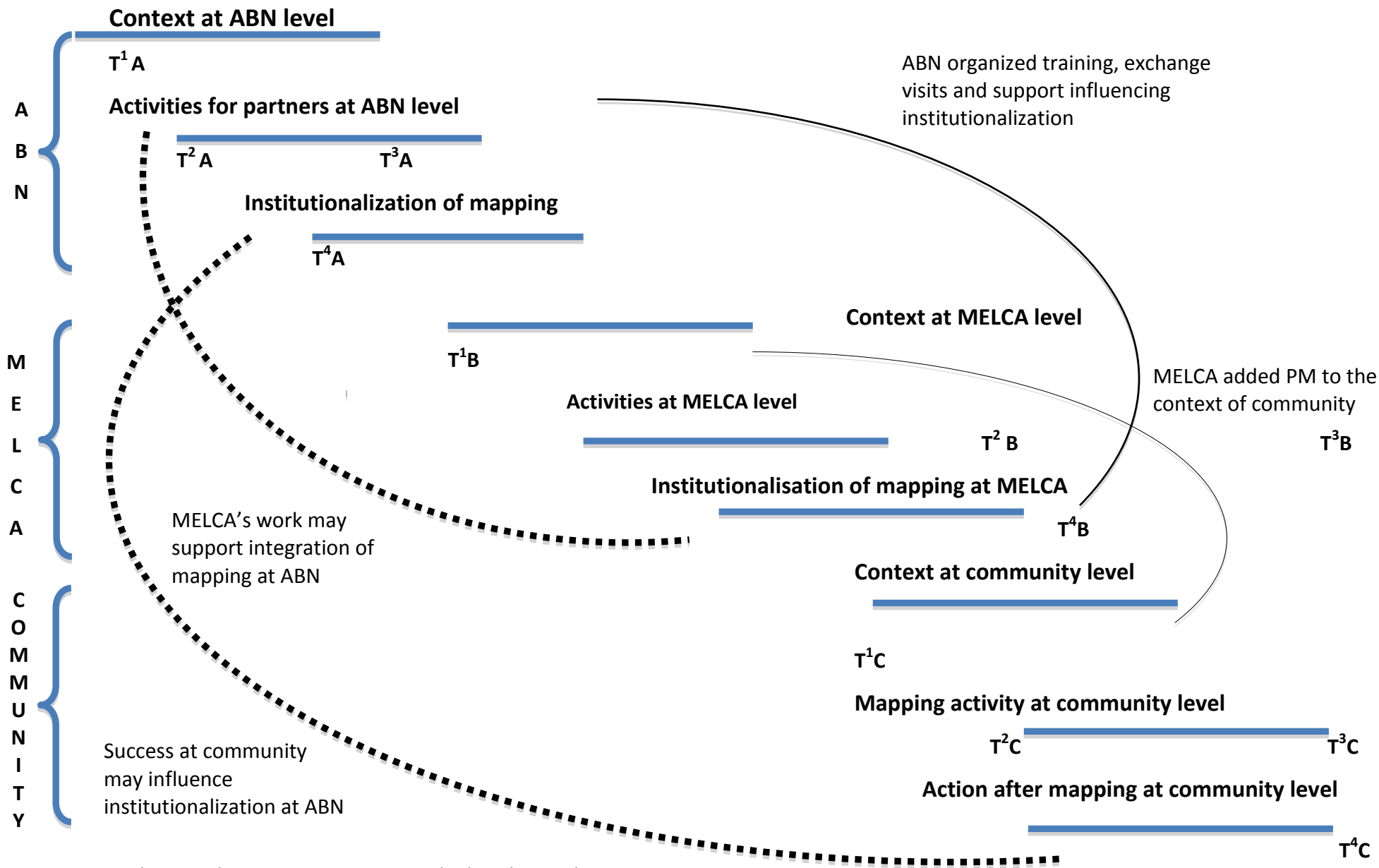

Figure 7.4: *The Morphogenetic Sequence applied to this study*
(adapted from Archer, 1995)

7.4.1 Morphogenetic cycle 1 (T^1A –$T^1$4) – the ABN level

- **T^1A – Structural conditioning at ABN**

As Figure 7.4 shows T^1 A is what ABN is and what it stands for and its reason for engagement in mapping (reported in detail in Section 1.3.1). In short ABN is an African network working on biocultural diversity. It was established to address issues including: the loss of biodiversity and the culture associated with it; the influence of Western policies and strategies which impact negatively on Africa and the lack of capacity to counter these forces in African civil society organizations. It works with 28 NGOs in nine African countries. The main activities are network development, catalyzing wider action and coordination and capacity development. It is through ABN's capacity development exercise that I was introduced to mapping. ABN is engaged in mapping to increase the capacity of its members to use this methodology so that they can strengthen mobilization of local communities to recuperate their cultures (where relevant), support processes of intergenerational transfer of biocultural diversity knowledge and practices through learning, and rehabilitate degrading ecosystems in order to enhance social-ecological resilience. Their work is influenced by wider issues associated with biodiversity loss at a planetary level, and modern epistemological patterns that have separated culture and nature, treating them as dichotomous aspects of life, rather than as integrated (see Section 1.3.1).

- **T^2A - T^3A– Social Interaction at ABN**

Two critical processes occurred in 2006 with ABN, which led to my, and MELCA-Ethiopia's interest in mapping, and which ultimately led to this research. One of them was the trip to Colombia which I reported on in Section 1.2. I could see in Colombia how local actors from communities, in collaboration with an NGO called Gaia Amazonas, used participatory mapping to mobilize their community for education, management of the environment, health and governance. The reason why ABN organized this meeting was to introduce African NGOs to the thinking and philosophy of the Amazonians and to share their experience in using tools, including mapping for social mobilization and environmental protection. In 2006, through ABN, I also participated in P3DM building in Kenya, also reported on in Section 1.2. This experience was foundational to MELCA-Ethiopia's efforts to

try out P3DM in Ethiopia. I went back to Colombia in 2008 and this time I was introduced in a very direct way to how mapping was used for developing curricula (reported on in Section 3.5.3). This deepened my understanding of the purpose and the process of mapping, and raised an interest in the role of mapping in facilitating learning and agency development. This ten-day experience gave me the practical knowledge of how to build a P3DM. This was the precursor for T^2B (activities at MELCA level) to be explained later. ABN also organized two mapping processes, one in Venda, South Africa and another in Tharaka, Kenya. Trainees of partners of ABN participated in these meetings, including MELCA-Ethiopia. A training manual is being prepared for partners to use when working with communities. ABN has also launched an eco-cultural calendar study in three countries, Kenya, South Africa and Ethiopia, and MELCA-Ethiopia is hosting one of these studies. These social interactions are building the capacity of the staff of MELCA-Ethiopia, which has translated into MELCA-Ethiopia's work and its engagement with communities, as described in detail in the two case studies (see Chapters 5 and 6).

- **T^4A – Structural elaboration at ABN**

ABN has now made participatory mapping one of its methodologies. Therefore, we can see that over the period of time (2006 – 2011; T^1A – T^4A) the mapping experience has changed ABN and now participatory mapping is becoming central to ABN's methodologies for working with communities. Mapping related activities are increasingly reflected in ABN strategy meetings and in its documents, including its plans. Quite recently, ABN organized a capacity building training programme based on the concept of resilience, where the relationship between mapping and resilience was discussed (see Section 4.7.2.3). This shows the internal change that has happened in ABN and the structural elaboration that resulted, as participatory mapping is now one of its key methodological tools.

7.4.2 Morphogenesis cycle at MELCA-Ethiopia

- **T^1B – Structural conditioning**

As explained in Chapter 1, Section 1, MELCA-Ethiopia works in three places in Ethiopia, the Bale Mountains, the Sheka Zone and the Menagesha Suba area. It works on three of the seven thematic areas of the Convention on Biological Diversity, namely agricultural

biodiversity, forest biodiversity and mountain biodiversity. It weaves traditional ecological knowledge into all three. At the time the mapping activities started, it had four programme areas, namely environmental education, advocacy and research, rehabilitation of degraded areas, and livelihood activities. MELCA-Ethiopia works to address environmental degradation; loss and erosion of culture; poverty; and, as in case of this research, the failure of local communities to address their problems. Therefore, the mapping project arose in the context of MELCA-Ethiopia seeking a methodology to mobilize the local community both to rehabilitate their degrading land and to halt ongoing erosion of their culture. The idea was that the mapping would result in a management plan.

As part of ABN, and as Director of MELCA-Ethiopia, I have participated in all of the mapping processes organized to date. As mentioned above, MELCA-Ethiopia is also one of the key actors in ABN. My participation in these mapping processes and the exchange visits reported on above, as well as the potential that I saw in these methodologies (when first observed via ABN social interactions) for addressing MELCA-Ethiopia's goals, influenced my decision to focus this research on the mapping processes. It is the added emphasis given to the mapping activities through this research process, that has influenced MELCA-Ethiopia to take up mapping as one of its methodological tools to engage with communities. The morpohgenesis at T^4Ain ABN, partly constitutes the structural conditioning at T^1B in MELCA-Ethiopia, although there are other important facts of structural conditioning in MELCA-Ethiopia that are not constituted directly through ABN's structural elaboration. For example, MELCA-Ethiopia is governed by Ethiopian government policies (which limits the range of involvement by local NGOs); and MELCA-Ethiopia is a funded NGO working at community level in Ethiopia (its practices are influenced by available funds); and their work is also influenced by the social-ecological histories in Ethiopia and responds to the contextual changes and challenges in the country (which is not as direct a feature of ABN's structural conditioning or elaborations).

- **T^2B – T^3B Social interaction**

The staff of MELCA-Ethiopia (other than myself) were trained in P3DM when it was first practiced in Bale in 2009 (Case 1 of this study). That was their first encounter with this

particular tool. As the model building went from one place to another, almost all of them had a chance to be part of it. They also participated in the construction of sketch maps. At first people participated out of curiosity and because I am the director, and was leading the process. They also found the process quite engaging and educative, as reflected in these two quotes from an interview with MELCA-Ethiopia staff (contained in Appendix 4):

Befekadu Refera, programme coordinator of MELCA, was somewhat sceptical in the beginning and said that:

> ... the process was active and real. I saw genuine participation. Result is unique and informative. I felt the power of maps for participation, visualizing biocultural diversity, planning, motivation of both the community and even donors.

Abebayehu Kassaye, environmental education coordinator at Bale an active coordinator, facilitator and trainee of the Bale mapping processes said that:

> I was impressed with the knowledge of elders. Participation affirms MELCA's philosophy and can motivate stakeholders including government. I am now convinced of the power of mapping its value for environmental education and conservation of biodiversity.

We also had discussions on the effectiveness of mapping and in evaluating the impact of mapping at the community level. There were always questions about the established ways of working with communities and what the mapping process had brought. Because the process was intense and required a lot of time, there was also reluctance and weariness on the part of some to track the results of the process. This internal struggle in the organisation to accommodate and learn to use a new, demanding methodology, represented the social interaction that took place in the organization.

Furthermore, there was social interaction with a number of partners and funding organisations as reported on in Chapter 1. As indicated in Chapter 5, these partners played an important role in helping to obtain resources for the mapping activities, and in helping document the processes (as illustrated in the film made on the Telecho mapping process contained in Appendix 6). This extended the social interaction beyond ABN, to other partners and role players.

- **T^4B Structural elaboration**

Mapping has become one of the major activities of MELCA. It is shown in its website as one of the five programmes of MELCA-Ethiopia (see www.melca-ethiopia.org). In Bale, five schools used it as one of their environmental education activities. In Sheka and Bale, it is used for environmental education and every time a training exercise happens at the local level for schools and even for local militias, there is a visit to the model showing its usefulness in generating environmental awareness and MELCA's staff engagement with it. We have started generating funding for ongoing mapping activities, and associated community-based programmes linked to the mapping outcomes (as shown in the Telecho case) as part of the organisation's ongoing programme.

Another significant aspect of morphogenesis in the organisation is the increased capacity of MELCA-Ethiopia staff to support mapping processes within the broader goals of the organisation, and in response to community demands and interests. The eco-cultural calendar mapping process was facilitated by the Bale and Menagesha branch offices and the Sheka branch office has also coordinated a sketch mapping process.

There was also morphostasis, as the following things have not changed as a result of the mapping activities in MELCA-Ethiopia:

- Some of the project's objectives and programmes remained the same as they were before the mapping activities, although a new programme on mapping was added; (an example is the programme that we have for youth which we call SEGNI)
- Some aspects of the organisation's ways of working remained the same (e.g. the way in which they viewed and worked within trusting relationships with communities);
- The funding and governance structures of MELCA-Ethiopia have not changed; as it remains an NGO working outside of government.

7.4.3 Morphogenesis at the local community level

- **T^1C^1 Structural conditioning for community**

As explained in Section 1.4 and as shown in Chapter 6, the local communities in Bale and Telecho have their challenges. In both environments, there is rampant felling of trees and

bush for various purposes including selling to the market, for construction and fuel wood use. Due to this and other factors, their environment is degrading rapidly. Rivers and wetlands are drying up, the size of the grazing area is decreasing, soil is washed away, the gullies are increasing and the productivity of the land is decreasing. Due to 'modernization' of their agricultural system, they are losing seed diversity and control over seeds and the knowledge associated with them. The gap between the youth and the elders is increasing due to many factors including formal education and cultural modernisation, which presents children with different aspirations to those held by their parents. Children are increasingly respecting the knowledge gained at school in preference to that of their elders. Despite all this, there is little evidence that communities are organizing themselves to address these problems. Even though they come to meetings hosted by various government-organized forums for various issues, the relationship is top-down and not based on an understanding of the biocultural and the historical context of their landscape and the knowledge and practice related to it. It is in this kind of context that the social interactions in the mapping activities occurred.

- **T^1C^2 Structural conditioning – MELCA and community**

As shown in Figure 7.4, structural elaboration at MELCA also forms part of the structural conditioning of the local community. This is because MELCA-Ethiopia has experience of biocultural diversity issues and rehabilitation, and methodologies for engaging communities in deliberation and change processes (such as mapping) that are situated in relation to the particular social-ecological contexts of the communities, as described in Chapter 1. Their interest in, and willingness to provide resources for, and engage with communities to address social-ecological degradation issues (through methodologies and approaches such as participatory mapping), formed part of the structural conditioning. The relationship of trust that existed with communities was also an important feature of the structural conditioning influencing the social interactions in the mapping processes. The contact between the two actors and the government participants during the mapping and discussions about the landscape were the initial starting points for social interactions around the mapping.

- **$T^2C^-T^3C$ - Social interaction**

The social interaction taking place in and through the participatory mapping activities is described in great detail in Chapters 5 and 6; and in more depth and detail in Section 7.3 above. In summary, there were three mapping processes that took place in each of the two case study sites. Through these mapping processes, diverse and rich learning interactions and reflections occurred that influenced the identity formation and agency of members of the community involved in the processes (and others who later started to join them); and historical and cultural memory was mobilized. The story that emerged was deliberated upon and adapted and what was agreed upon was reified in the form of 3D models, a 2D maps and eco-cultural calendars (described in Chapter 5 and 6).

The mapping activities have initiated action (see Section 6.3.6 and 6.4.4), at the level of mapping practices, but also at the level of initiating wider changes in community practices.

There were those who supported the action that followed. Both individually and in groups, they started rehabilitating the land. There were, however, also those who wanted to keep the status quo as they benefit from cutting and selling trees and as they were not interested in starting soil and water conservation activities. This led to ongoing social interactions amongst the communities who were originally involved in the mapping activities. There were also further social interactions with MELCA-Ethiopia after the mapping activities, as further support was sought for implementation of the mapping activities; these processes are still ongoing. This continuous social interaction (which is not without struggle) represents what occurred between T^2C and T^3C.

- **T^4C Structural elaboration**

As reported in Section 6.3.6 and 6.4.4, there were changes after the mapping process. In the case of Bale, individuals started raising tree seedlings and planting the seedlings that they have grown. The community has also agreed as a group to stop cutting down trees or in their words “to rest their axe”. This represents a cultural elaboration in terms of morphogenesis.

In the case of Telecho, the community decided as a group to stop cutting down trees on their farm. They also formed an association called Adere Environment Protection Association. As reported in Section 6.3.6, the Association had the chance to visit the northern part of the country after which they started a soil and water conservation activity. They now meet regularly, sometimes losing momentum, as they are busy in their own lives. MELCA-Ethiopia has contributed to the success of these structural elaborations, and has contributed seedlings of vetiver grass that were planted on their farms to stop soil erosion. They have taken undertaken soil and water conservation measures that are helping to stop the erosion of soil. There was also a youth group that was established, and they have engaged in various environmental activities. These all indicate that there was structural elaboration, morphogenesis and social change.

There was, however, also morphostasis (no change), primarily at the broader structural level. For example, it was not possible to change the fact that community members need income for livelihoods (due to the influence of the modern market economy). This led to some people continuing to cut down trees for the market economy. It was also not possible to change government policy on land distribution or biodiversity management (in the short time of this study). Such changes may gradually emerge from the interactions between community forums, government partners, MELCA-Ethiopia, ABN and others, but this remains to be seen over the longer term. Changes observed were primarily therefore short-term changes, visible at the local level. Other aspects such as the durability of the mapping influences on the youth's cultural practices will also need to be monitored over the longer term, as will the sustainability of the associations formed.

7.4.4 Iterative 'little' morphogenic cycles

Analytical statement: Morphogenic processes, while broadly influenced by temporality, are not linear; and require a different, more cyclical concept of time; which influences how agency and learning are conceptualised in and through the mapping processes.

The process of morphogenesis at the three places is not as linear as it looks, although there is a clear pattern of emergence (social interaction emerges from and in relation to structural conditioning, but is not reduced to it; structural elaboration emerges from social interaction

but is not reduced to it); both within the levels described, but also across them. There is also a pattern of iterations that occur across the levels. For example, the mapping processes at the community level have an impact on MELCA; mapping in the Telecho context was different to that of Bale. Based on the experience in Bale, for example, the approach to P3DM was modified. MELCA-Ethiopia is now more in favour of smaller scale models as a result of experience gained over time. The experience gained at community level has been deliberated upon at the ABN level, thereby informing some of the principles of ABN practices, and the direction that ABN aims to take in future. For example, the mapping of MELCA-Ethiopia, Mupo (an NGO partner of MELCA from South Africa) and ICE (an NGO partner in Kenya) was discussed at the level of the ABN partners meeting. This has initiated discussion around the relationship between mapping and resilience, which was also an interest that shaped the latter phases of this research through reflexive engagement with the concepts influencing this research. This shows how the morphogenetic process proceeds in 'little interacting cycles' and how this affects the institutionalization processes at ABN, at MELCA-Ethiopia and also the activity at the community level over time.

Archers' morphogenic theory has been critiqued for being 'linear'; which can result in over-determined or a structuralist bias on views of agency (Bates, 2006; Hay, 2002), but as shown above, this may be because the linearity of representation (as in Figure 7.4 and the broad description in this section (7.5), does not trace these 'little interacting cycles' in enough detail. In this regard, Bates (2006) asserts that:

> … by employing morphogenesis and morphostasis, Archer is unable to provide [complex] concepts with which to explain change. Rather, they merely describe change by allowing the comparison of different historical periods (p. 147; note that this critique was produced before Archer's more refined work on agency and social interaction processes such as identity formation; learning; reflexive deliberation etc. that shape agency).

To address this problem, Bates (2006) suggests adoption of Adam's (1990) notion of *circadian* time. This conceptualisation views the passing of time as asymmetrical repetition with change being seen as rhythmical (not unlike the theorising of change in resilience thinking); which is partly represented by the concept of the 'little iterative morphogenic cycles" that I refer to above. Archer (2000) herself has also addressed some of these

critiques by giving more attention to the processes of social interaction that influence agency (as I have done in Section 7.3 above through unpacking the learning processes that occurred in and through the mapping activities).

Learning and agency development, as influenced by the mapping activities, therefore needs to take account of a more cyclical concept of time, which is nonetheless still influenced by temporality. Given the depth of focus shared in Chapters 5 and 6 describing mainly the social interaction at community level, providing this level of depth of analysis at all levels would fall beyond the scope of a study such as this, as does longer term analysis of the morphogenic process, especially in relation to broader processes of social-ecological resilience, as also pointed to in Section 4.7 where it was noted that resilience requires long term monitoring. However, for this study, it is possible to conceptualise the contribution that mapping may be able to make to resilience building (as already briefly touched on above), to which I turn next before closing this chapter.

7.5 Resilience building

This section will address the third research question "what is the implication of the agency emerged, as a result of the participatory mapping, to the resilience of the community?"

As reported in Sections 1.5.1.1 and 1.5.2.1, in both cases it was evident that the social-ecological condition was such that the systems were on the verge of being transformed into different types of biocultural landscape. A once forested area is now totally deforested, most of the rivers and streams have dried up, most of the wetlands have been desiccated, wildlife has migrated or has been killed, and the productivity of the land has decreased. This was coupled with cultural changes and loss of knowledge and practice.

The question is, did the mapping project create a common understanding and consensus on the reason for this social-ecological transformation and create enough momentum to change the status quo? As was shown in earlier discussions in this chapter, the mapping processes created a shock, or a dissonance in what was once a 'God did it' community psyche, and produced the will and the institutional set-up (at least amongst those who were substantively involved in the processes) to begin to address it. I use a set of analytical

statements to explicate this further, in relation to possibilities for resilience building (which adopts a non-conservative perspective discussed in Section 4.7 which recognises the value of traditional knowledge and practices in building resilience, but does not retreat into them only).

Analytical statement: Participating in the mapping process can create shock or dissonance, which generates an opportunity for learning and change.

As already reported in this study, participation in the mapping process gave people an opportunity to visualize the larger landscape and see the destruction at a bigger scale. This created shock amongst a number of participants. For example, Hadji Aman Husein, a highly respected elder from Bale who is knowledgeable in traditional conflict mediation indicated that he felt sad about the change around his village, Horo Soba, and said they could turn it around if all of the actors, including MELCA-Ethiopia and the government, could work together.

Folke et al. (2010) claim that getting beyond the state of denial, particularly in social-ecological systems with strong identity or cultural beliefs, is not easy and often requires a shock or at least a perceived crisis. Resilience thinking suggests that such events may open up opportunities for re-evaluating the current situation, trigger social mobilization, re-combine sources of experience and knowledge for learning, and spark novelty and innovation, processes which were evident in the two case study sites during and after the mapping.

Analytical Statement: By revealing the extent of destruction occurring, and activating the hidden potential of people, participatory mapping creates the space to evaluate the current situation and prompt change.

Reflecting on the reason for the state of change in the environment is a pre-requisite for adaptive resilience, according to Davidson-Hunt and Berkes (2003). In both cases reported on in Chapter 6, people involved in the participatory mapping activities reflected on the reason for the degradation and felt the will to change within themselves. For example, Muhamed Abda in Bale talked about how the maps have shown how the area was

previously full of fragrance, fruits and forested areas, and how it now looks degraded. He commented on how this reflection has given him renewed determination to get back what has been lost (Section 6.4).

Corner (1999) claims that mapping can be seen as a collective enterprise, a project that reveals and realizes hidden potential. Mapping discovers "new worlds within past and present ones" (p. 213); and mapping "... *inaugurates new grounds* upon the hidden traces of a living context" (p. 214, emphasis mine). This alludes to the potential of participatory mapping for re-evaluating the current situation and re-combining sources of experience and knowledge for learning and change, which are elements of resilience thinking (Folke et al., 2010; see Section 4.7); a process which was demonstrated in the two case studies.

Analytical Statement: Participatory mapping reveals agential factors and relations that constrain or enhance social ecological resilience.

Even if the community wants to act, there are other factors that challenge this action. In both cases the influence of past policies related to land use management (during the Hailesilasie and Derg eras) had significant shaping influence on the actions of people in their environments. Today, there is also the influence of the market, as people cut trees to generate income within a primarily cash economy. Government policy and market forces are therefore influential on people's agency at a local level.

The influence of government was also noted by participants in the mapping activities. For example, Deneke Bisrat talked about how the government indirectly allows the cutting down of trees by taxing people for the wood that they cut and how the number of people who are doing this has increased. She also reflected critically on this, and noted that the government was doing little about it (Section 6.6). Ato Dereje from Telecho reflected that although there were a number of institutions in their village; none of them were effectively acting to stop the tree cutting (ibid.). As reported on in Chapter 5, members of the government were engaged in the mapping process in the consultation stage, as participants, and also during the inauguration process where the model was displayed and presented to local people and government dignitaries. This created a chance for collaboration towards

concerted action involving all role players. This emerging collaboration was also documented in reports of meetings with local government that were held after the mapping process, showing the potential of the mapping process to broaden partnerships for action in resilience building efforts

Analytical Statement: Participatory mapping visualises the knowledge of communities about the relationship between components of the biocultural landscape, which is one of the sources of cultural capital needed for resilience.

As discussed in Section 4.7.2.4 one of the key elements in the concept of resilience is adaptability. Adaptive management implies understanding that the environment is in constant flux, and learning from change is necessary to change ways of doing that fit the new situation. Berkes, Colding and Folke (2003) note that the world is in a continual flux of change, renewal and diversification. They argue that we (humanity) need experience, history, remembrance, and trust to maintain positive forms of resilience in the face of these changes. Furthermore, Berkes et al. (2000) argue that knowing the inter-relationship among the components of the environment is key for adaptability. Berkes and Folke (1998) compare the concept of ecology in traditional societies with that of modern ecologists and conclude that, although there is a fundamental difference in understanding of how ecological change happens, both systems incorporate an understanding of ecology, which means there is a broader opportunity to respond to ecosystem change if both knowledge systems are mobilised

As shown in Chapter 6, both the Bale and the Telecho participants understood the linkage between components of the biocultural landscape. For example, an elder from Bale explained it metaphorically: ‘a man cannot function if his head is cut off’ illustrating the importance of the forest for water and people; and Hadji Nuru Hassan from Bale talked about how the wetland, the rivers, the forest and the mountain are interrelated and how they read the seasons to go along with the changes in the ecosystem (Section 6.3.3).

Analytical Statement: Participatory mapping connects elders and youth and this provides a learning opportunity on biocultural diversity, strengthening the adaptive capacity of the community within an inter-generational frame.

As explained in detail in Chapter 5 and reported in Chapter 6, elders and youth mixed in the mapping process. Mostly, the youth were involved in constructing the model for the elders to paint their cognition onto, or, in the case of sketch mapping, compensate for the loss of dexterity in elders, by doing the drawing. This environment provides an opportunity for youth to interact with elders and learn. They learn about the history, the cultural significance, the cause of the degradation and sometimes the remedial action that they should take. This transfer of knowledge about the landscape is important for creating identity and cohesion both amongst the people, and with the landscape, as already discussed in more detail above in the sections focussing on identity and learning (Section 7.4.3).

In reflective interviews after the mapping process, a number of participants pointed out that one of the strong points of the process that they had identified, was the youth learning from elders. The youth and the staff of MELCA-Ethiopia both indicated their surprise at that scope and extent of the elders' knowledge of the biocultural landscape. Participating adults appreciated working with elders for the same reason. The elders said that what pleased them most was that at least their children could see what they had done and learn from it.

Berkes et al. (2000) talk about social mechanisms behind traditional practices. They include a number of adaptations for the generation, accumulation, and transmission of knowledge for local or traditional practices for ecosystem management. Among these are: multiple species management, resource rotation, succession management, landscape patchiness management, and other ways of responding to and managing pulses and ecological surprises. As shown in this study, the mapping processes have potential to mobilise such knowledge, and to make it accessible to youth and a wider range of community members.

Analytical Statement: Participatory mapping mobilizes memory that can be used by the community for coping with social-ecological change.

Discussing memory, Adger et al. (2005) say that social memory comes from the diversity of individuals and institutions that draw on reservoirs of practices, knowledge, values, and worldviews and is crucial for preparing the system for change, building resilience, and coping with surprises. Folke et al. (2010) add that it is from the memory and experience of the resilient system that adaptability comes in times of change.

As demonstrated in this study, participatory mapping gathers old and young to talk about their biocultural landscape. In developing a map of the past, the elders co-construct their memory using colours. While they are doing so, discussion ensues and they explain what they are portraying. In this way they impart knowledge while they are making the map, complementing each other. They put their memory on paper and discuss it. As shown in the two cases, memories were mobilised on how they used to manage the landscape; the rituals that helped order their territory; the food that they ate; the medicinal plants that they used; how they adapted to climate variability; and how the landscape was green, wildlife was abundant, streams and rivers were flowing abundantly and people were healthier and happier in the past. These memories of biocultural landscape management can be taken forward to deal with social-ecological change.

Memory is a key component of resilience. It supplies the experience of previous self-organization and the ingredients for new self-organization embedded in historical and evolutionary contexts (Folke et al., 2003). Folke et al. (2003) add:

> Social memory is the arena which captured experience with change and successful adaptation, embedded in deeper levels of values is actualized through community debate and decision making processes into appropriate strategies for dealing with on going change. It is part of the cultural capital of human society. Social memory embeds long-term cultural and historical observations of which cultural and diversity and diversity of worldviews linked to cultural evolution may play an essential role in nurturing resilience for adaptive capacity. (p. 367)

As shown in the eco-cultural calendars, the past was full of rituals. Communities involved in the study had rituals for every season (see Tables 6.1 to 6.4). Most of these rituals are either forgotten or are practised by only a few people from the local community, showing cultural erosion and change over time, and an associated loss of memory.

In terms of the importance of memory for the adaptability of local communities and for the internalization of that memory into the cultural system, Berkes and Folke (1998) emphasise ritual, ceremonies, and other traditions. They say:

> Rituals help people remember the rules and appropriately interpret signals from ecosystem change. Ritual obligations, rights to community resources, management obligations, taboos and other regulations are *critical social mechanisms* for resource conservation, and have the potential of building resilience in [social-ecological] ... systems. (p. 1258; emphasis mine)

In conclusion, and as shown in this study participatory maps contribute to building adaptive resilience by: creating social cohesion, mobilizing memory, creating a focus for dialogue and inter-generational knowledge exchange, and through mobilizing people's will to act.

7.5 Conclusion

This chapter has addressed the research questions through in-depth discussions of the data using a language of description provided by theories of learning, agency development and social change, and social-ecological resilience. It has shown up relationships that exist between participatory mapping, learning, agency development and resilience building in a context of biocultural diversity, where much of this diversity is being degraded and lost. The chapter has sought to do this not through linear, positivist causal mapping, but rather through critical realist causal explanations which reflect on why things are the way they are, and how the object (in this case participatory mapping) functions to create and support changes (or not). In the next and final chapter, I share final reflections on the study, and make recommendations.

Chapter 8: SUMMATIVE PERSPECTIVES, RECOMMENDATIONS AND CONCLUSION

8.1 Introduction

This chapter concludes the study. It provides summative perspectives, recommendations and conclusions, and clarifies the contribution of the study to new knowledge. It also provides insight into the limitations of the study, and presents recommendations for further research.

8.2 Brief summary of the study

As indicated in Chapter 1, this study set out to investigate the learning and change that emerged in and through participatory mapping in the context of biocultural diversity and resilience in rural Ethiopia. It did this through examining the learning and agency emerging from three participatory mapping practices (P3DM, sketch mapping and eco-cultural calendars) using two case study sites, located in the Bale Mountains and the Foata Mountains in Ethiopia. The study focused on in-depth reflective processes in two community contexts located within the broader case study sites, namely Horo Soba in Bale, and Telecho in the Foata Mountain complex.

The study used qualitative case study research methodology underpinned by critical realist philosophy, and used photographic 'cues' to structure the reporting on the cases in Chapter 6 which provided a means of communicating both the process elements of the mapping activities, as well as the outcomes. It used four categories of analysis: biocultural diversity, educational processes, learning and agency in the first instance to report on the interactions associated with the participatory mapping practices (Chapter 6). Following this, in Chapter 7, was an in-depth discussion on the participatory mapping and biocultural diversity; participatory mapping and learning, with emphasis on acquisition; meaning making and identity formation processes. This was followed by analysis of broader change processes that led to the social interactions in the mapping activities, and the resultant morphogenesis, showing that morphogenesis, while broadly temporal, is not linear, and involves 'little iterative morphogenic cycles'. These insights are interesting for

understanding how mapping contributes to learning and agency development. These insights were then used to interpret how participatory mapping contributes to resilience building in a context where social-ecological resilience is increasingly required, particularly in contexts such as those in the study sites, where social-ecological degradation is highly visible and is occurring rapidly. The in-depth discussions drew on social and learning theory, and theory of biocultural diversity and social-ecological resilience (discussed in some detail in Chapters 2, 3 and 4).

The study's contribution to new knowledge lies in relation to the role of participatory mapping in facilitating learning, agency and change, which, to date, appears to be under-theorised and under-developed in the participatory mapping and environmental education literature (discussed in detail in Chapter 7). As such, the study findings provide in-depth insight into how participatory mapping methodologies may 'work in the world', in contexts such as those presented in the two cases under study. I now present some short summative perspectives on the study, followed by recommendations and some critical reflections on the limitations of the study. Finally, I make some recommendations for further research.

8.3 Summative perspectives

These summative perspectives do not intend to repeat the main findings of the study related to participatory mapping, learning and agency development in the context of biocultural diversity and social-ecological resilience building as these are carefully explicated through a set of analytical statements in Chapter 7. These summative perspectives are therefore oriented towards broader insights associated with participatory mapping and the key interests of this study, and for participatory mapping practices more broadly.

8.3.1 Reviving Traditional Ecological Knowledge

As indicated in Chapter 2, traditional ecological knowledge is a key aspect of biocultural diversity, and has also been identified as being significant to social-ecological resilience building. Chapter 6 indicated that those who participated in the mapping processes learn names of places on the biocultural landscape called toponyms. Toponyms are like threads that tie together elements of the biocultural landscape (Chambers et al., 2004). Unravelling

the meaning of places reveals stories and histories about the relationship of people with their environment. The knowledge of the people, specific to the context of the places to be mapped, is uncovered and this provides an opportunity for the community to learn about Traditional Ecological Knowledge (TEK). TEK is dynamic in that it includes adaptability, mobility, transformation, innovation, hybridization, incorporation of non local fragments, sensitivity to surrounding factors, and fragility in the face of globalization and revitalization efforts (Zent, 2009; Maffi, 2005; Zent 1999). Therefore, bringing out the TEK that is in the process of eroding and increasing its value in the eyes of youth may contribute to socio-ecological resilience.

Comparing the conventional resource management system, which stems from the Cartesian world view, with TEK, Berkes et al. (2000) say:

> By contrast, there are lessons from systems of Traditional Ecological Knowledge and practice that may be characterized as "resource management from a resilience point of view," such as: (1) management may be carried out using rules that are locally crafted and socially enforced by the users themselves; (2) resource use tends to be flexible, using area rotations, species- switching, and other practices (3) the users have accumulated an ecological knowledge base that helps respond to environmental feedbacks, such as changes in the catch per unit of effort that help monitor the status of the resource; (4) a diversity of resources are used for livelihood security, keeping options open and minimizing risk; and (5) it is carried out using qualitative management wherein feedbacks of resource and ecosystem change indicate the direction in which management should move (more exploitation/less exploitation) rather than toward a quantitative yield target. (p. 1259)

As shown in this research, participatory mapping has the capacity to make this visible through the discussion that ensues during, and following the mapping practice. The resources available, the management techniques, and the rules that were applied become visible during the participatory mapping processes, and if converted into planning, may help communities to adapt in times of crisis.

8.3.2 Supporting learning and innovation

As shown in this study, knowledge of the biocultural landscape among local communities is not uniform. It depends on the age, gender, occupation and responsibilities of different members of the community. By creating an environment where more knowledgeable

members support the learning of the others, and where the young can learn from the old, and where men can learn from women (and vice versa), participatory mapping creates an opportunity for members of the community to learn from each other. Everybody has a contribution to make. Traditional herbalists know where certain herbs are found and the changes in the distribution and amount of the herbs; youth and children can talk about grazing areas and modern institutions such as schools; women can contribute knowledge about the state of water points, their gardens and the state of the biocultural diversity near their households; elders bring historical and cultural information and deliberate on past, comparing it with the present to visualize the future. The interaction between all these elements makes the information rich and the learning both relevant and interesting.

MELCA-Ethiopia played a significant role in supporting the learning. We challenged members of the communities by asking questions and facilitated the usage of new tools and mapping technologies to help bring out as much information as possible. It is possible, for example, to create a map of the present while discussing the past; however, the visual power of mapping the past and the present and comparing the two is lost if the discussion is based only on a map of the present. This shows the supportive role that we played in the learning of the community (Salomon & Perkins, 1998). As indicated in Chapter 7, scaffolding of the learning process is both complex, multi-dimensional and relational, and requires ongoing engagement throughout the process and involves a mix of artefact mediated learning, and social interactions that mediate learning.

8.3.3 Creating communication channels

Participatory mapping, as illustrated in this study, creates new and important communication channels that complement and extend local community communication channels. Local communities communicate through various channels in their daily life. Mundy and Compton (1999) identify six indigenous communication channels, which are: folk media (festivals, plays, storytelling and others); forms of indigenous organization or gatherings; deliberate instruction (at family level or artisans); records; unstructured channels (this includes communication at markets, on roads and during work); and direct observation (pp. 115 – 117).

As a mediation tool, participatory mapping serves as a communication channel among those who participate and beyond. As reported in Chapters 5 and 6, communities involved in the study had never come together to talk about their past, the present and the future of their biocultural landscape using models or sketch maps. Using the maps as a tool, elders were able to communicate among each other and with adults and youth. Knowledge within communities is both stable and dynamic. Stable implies that it stays the same and seldom changes. Stability is needed to ensure the continuity of the culture and there is a need for certain cultural information to be repeated so that it is not forgotten. This is particularly so if it is deemed to have value in the present and future, and increasingly if it is deemed to have value for social-ecological resilience, given the modern condition and ongoing environmental degradation which influences livelihoods at community level in diverse and not always positive ways. Cultural reproduction or continuity is achieved either through practising knowledge or through communication or both (Mundy & Compton, 1999). Mapping facilitates the transfer of this knowledge to the next generation as it helps repetition.

However, indigenous knowledge and culture is also dynamic. Dynamic implies that it is changing through adapting to, and assimilating ideas and practices that come from outside, and learning new modes and models of practice about the changing day-to-day environment (e.g. the conservation rehabilitation practices that members of the community chose to implement following the mapping activities). The ability to learn, adapt and change is also one of the criteria for resilience (Adger et al., 2011). This involves new forms of agency, and morphogenesis (as illustrated and discussed in Chapter 7).

As shown in this study, participatory mapping practices give local communities a chance to interact with outsiders and learn new techniques and ways of thinking. In the two cases reported on in this study, there were trainees who came from outside who participated in the practice; and external partners who supported the process. The participants appreciated the interaction that they had with this group and said they benefited from their interaction. The process was mediated through artefacts, in the form of paints, coloured pens and pins. These ways of mapping can be considered as communication processes

amongst those who generated and used these tools. Members of the communities involved used the maps to communicate their issues to other actors, including government, and gained respect for their knowledge, understanding and support for their initiatives. Examples are how they were able to visit other communities that had managed to rehabilitate their ecosystems through support from the government. However, as noted, participatory maps are often confined to usage within the space in which they are produced, particularly the P3DM as they are large and cumbersome to move. By digitising the knowledge using GIS (see Appendix 3), the communication value of these maps can be enhanced, but this comes with ethical responsibilities for *how and for what purpose* the knowledge is used.

8.3.4 Dialogue creates cohesion and understanding

As shown in this study, participatory mapping gives people a platform to project their discussion and knowledge onto an object outside themselves through intertwined processes of participation and reification, and to test the consistency of their ideas (Tversky, 2002) while being engaged in meaning making. This process of dialogue creates understanding and appreciation for each other's views, which is a precursor for social cohesion and trust. Trust is a key element in social cohesion. Johnson (2001) says safety and trust within a community of practice are important for developing a learning environment. Edmondson (1999) cited in Johnson (2001) found that the various teams' capacity to interpret each other's intentions and work in a trusting environment was important for continual change and experimentation. Likewise, by acting as a place for projection of people's feelings and memories, maps help build trust and cohesion among people, which are critical for resilience, as discussed in Chapter 7.

As revealed in the two case study sites, the social fabric of many communities is challenged due to various internal and external forces, including urbanization, globalization, formal education, religion and change in policies. The cultural practices that ensure social cohesion, including rituals, ceremonies, working practices and plays, are eroding. Due to this, families are challenged to act together to adapt to the changing socio-ecological environment. By bringing people together to reflect on these issues and excavating memories of past

practices that used to assist in social cohesion, participatory mapping has potential to increase determination to act together. Cohesiveness among members of the community is a key element for joint decision-making and implementation of adaptation projects.

8.3.5 Reaffirming connectedness among people and land

As illuminated in the two case study sites, and through broader literature review work, the forces of globalization, modernity, formal education, urbanization, politics and religion have played a great part in challenging people's attachment to land. Children spend most of their time in schools and this corresponds with less time spent in natural settings doing what their parents are doing (Wongbusarakum, 2009). This reduces their knowledge of their biocultural landscape, as they have no incentive to know the name of its components or the meaning thereof. As new aspirations of modern urban lifestyles are presented to hold higher social values, rural life and the knowledge associated with it are considered to be 'backward' and both parents and children see working in urban environments as better for the family. This is partly true, as children working in an urban environment send money to the family or cover the cost of agricultural inputs. These changes are unavoidable as monetary economies and modern market replaces earlier forms of economy. But people become detached from land and cultural practices, and this has implications for ongoing social-ecological degradation and risk.

As shown in this study, participatory mapping has the potential to temporarily reverse this situation by bringing elders and youth together and by revealing the name and value of these places and discussing their social, cultural, ecological and historical significance. Those who participate also understand the connection among the components of the ecosystem and this improves their comprehension of their biocultural landscape. This comprehension is one of the critical factors for adaptability in times of social-ecological change (Berkes et al., 2000; Gunderson, 2003), and is likely to require renewed attention in future education and learning processes.

8.3.6 Renegotiating identity and reaffirming their relationship with each other

As shown in this study, identity is as much related to land as it is with belonging in the community or being part of the social psychology. The study has also shown that those who

participate in the practice of participatory mapping can accentuate the meaning of their landscape and their sense of belonging to the land, as its cultural and ecological history is revealed. Through expanding their view of the biocultural landscape and increasing their engagement with each other, the mapping practice helps the youth to respect the elders and the elders to respect each other's views. Participatory mapping amplifies the importance of some of the places on the landscape, including sacred sites, from which some of the community members, spiritual leaders, get their power. As such, it helps with negotiating and re-negotiating identities. Such renegotiated identities may help the building of the community, as the elders with their newly gained authority might support the rehabilitation of degraded lands and the continuation of cultural elements that should continue if the community is to have a particular identity. Identity formation processes such as these are intertwined with learning processes, as illuminated in Chapter 7, and also have implications for agency development, including collective forms of agency (e.g. the establishment of new associations and practices that are collectively valued).

8.3.7 Intergenerational learning – connecting youth with elders – negotiation among generations

The study has also revealed that inter-generational learning is possible through participatory mapping. Several authors report an increase in the gap between elders and the new generation (Maffi & Woodley, 2010; Zent 2009; Bates, 2009; Batibo; 2009; Belay et al., 2002). They cite forces of globalization, urbanization, formal education, modernity, climate change, forest and land degradation, deforestation and religion as reasons. Many are trying various projects to try to connect the two (Batibo, 2009; Ishizawa & Rengifo, 2009; MELCA-Ethiopia, 2011b). By bringing elders and youth together in the participatory mapping activities, ample opportunity is provided for the youth to learn about their biocultural landscape and for elders to pass on their historical and cultural understanding while getting the opportunity to learn from youth about new ideas or ways of doing things, as discussed in detail in Chapter 7. Due to mainly formal education, which forces children to study other cultures and spend much of their time in schools, children do not get sufficient chance to interact with the knowledge holders in their community (particularly as their traditional games and rituals also disappear) and this contributes to a erosion of cultures, and adaptive

capacity (although it does expose them to other forms of knowledge and technologies which also have adaptive value potential). Achieving a broader 'knowledge exposure' environment for youth is important in contexts of social-ecological degradation, as a wide range of cultural knowledge and practices may be called for in times of crisis for adaptation or resilience (Berkes et al., 2000).

8.3.8 Remembering the past has a unifying element

As explained in Chapter 7, social-ecological memory has a critical contribution to make to the resilience of communities. Memory is important for ecological resilience and social resilience aids ecological resilience through adaptive practices, including leaving places fallow and alternating use of the biocultural landscape (Folke et al., 2003). As shown in this study, participatory mapping has the capacity to unearth memories of practices, which has helped local communities in the past to respond to social-ecological changes, climate variability and shocks. These memories of the past tend to be increasingly neglected or cast aside by communities as they are influenced by mainstream modernity. However, as shown in this study, these are still valued, and can be found buried in the recesses of those who have the remembrance of their biocultural landscape. Participatory mapping excavates these memories of management and puts them in the open for reconsideration by the wider community and stakeholders in processes of learning and agency development.

As shown in this study, one of the seemingly meaningful memories visualized is rituals, which are linked to sacred sites, and in this study, these were closely associated with trees and forests. Rituals are important elements for remembering the rules and appropriately interpreting signals from nature (Berkes et al., 2000). Participatory mapping, especially the eco-cultural calendars and the placing of meaningful sites on the P3DM, has helped unearth memory of rituals and sacred sites, and the meanings previously attributed to them. The study also pointed to the possibility that if there is sufficient consensus within the community to defy current pressures from the main religions, they can be revived in the context of resilience building (as was the case in Bale). Berkes et al. (2000) says "Ritual obligations, rights to community resources, and management obligations are all inter-

linked" (p. 1258). However, the study also showed that communities may not always be interested in reviving these rituals (as was the case in Telecho).

8.3.9 Creation of alliance among stakeholders

As shown in this study, the mapping activities brought together local community members, the government and MELCA-Ethiopia (supported by a wider range of partners). These actors participated in the planning of the mapping practice, including selection of an area and the places to be mapped, and refining the purpose of mapping. All of the actors came with their own perspectives on how rural development should take place. The government wanted to see how the mapping activities could support its policy of rural development. MELCA-Ethiopia's stated mission is endogenous development, which implies that people determine what kind of development they want. The organization employs mapping as one of the tools to mobilize communities to chart their own development pathways. The community, as shown in this study, is able to employ its agency under the government structure, but is heavily influenced by what government wants.

By bringing these different communities together, participatory mapping creates an opportunity for interaction among these actors, which can be translated into joint planning and implementation. As reported in Chapter 6, this is beginning to happen among the Telecho community, MELCA-Ethiopia and the Welmera *wereda* in projects ranging from soil and water conservation to income generating activities. From a social learning perspective, Reed et al. (2010) write that social learning implies learning as an individual in the context of social groups, learning as a group and networking with other communities of practice. In the context of the study, individual community members were learning in the context of the larger community and the community linked with the government and MELCA, which also have their own networks or linkages, to bring about broader social change.

8.4 Recommendations

This section provides recommendations emerging from the study. The recommendations are based on the insights gained from the work in the two case study sites, and are not meant to be generalised to the broader population, but may be drawn on for further

analysis, hypothesis development and further research, as is the tradition with case study research.

8.4.1 Taking time

This study has shown that there is a need to take time to ensure participation, meaning making, learning and agency development in and through participatory mapping. Most participatory mapping practices happen within a short period of time. It is impossible to do P3DM in this short period even if one wishes to. Sketch maps can easily be misused. If the purpose is for learning and change, as in the context of this study, mapping practices should be undertaken which allow sufficient time for community and stakeholder consultation, dialogue and reflection. There should be enough discussion on the purpose of the practice, who should get involved and how to use the maps once they are made. Clarity at this stage will avoid most of the pitfalls of participatory mapping, including developing maps, which are not used after they are finished. Processes at community level take time. It is necessary to work at the pace of people on the ground.

Time is also needed to historicise the present. The past has to be excavated to serve as a mobilizing agency for correcting what is not going well in the present. Therefore time should be taken before the actual mapping to discuss with elders the history of the biocultural landscape. As shown in the two case studies, this can be done through sketching the origin of the community and talking about it. This helps with actual mapping, which should be done in stages. First, the past should be mapped. Mobilizing the past puts the present in perspective and creates the necessary shock or dissonance discussed in Chapter 7, which was identified as an important element and condition for learning and agency development. Then the mapping of the present can be done and compared with the map of past. As shown in this study, this is a fertile ground for meaning making and renegotiating identity. The map of the future can be then done in two scenarios. The first is the future if 'business' continues as usual. As shown in this study, this can show a bleak future, which if carefully mediated with maps of the future that show how improved biocultural landscapes can be established, has the power to mobilise individual and collective decision making and agency

for change. As this map of the future is based on community members' vision, sufficient time should be given to this process.

As shown in this study, time is also needed to build rapport between community members and with those who will work with them to visualise, and also to actively create a better future through establishing new practices. Staying and sharing with the community the pain of the shock created by the surfacing or visualizing of the past may create a strong bond among the participants, but this should also be followed through with viable action plans and institutional forms that can 'carry the agency forward'. In the case of this study, new associations seemed to provide such a mechanism.

8.4.2 Involving the larger community

This study has shown that the making of maps involves selected members of the community. It is impossible to bring all the community members around a table. Therefore, it is important to find ways of incorporating the participation of others. This can be done from the beginning. Organizing a bigger community meeting, explaining the purpose and asking for the community to select those who would represent them, is the first process. It is also important to encourage members of the community to come to the mapping place and observe what is happening. To begin with, if they come to observe, they may contribute in the identification of places that the initial participants did not remember. Secondly, they feel part of the process and may own the decision reached by those who are actively participating. They will also learn about the techniques through their fringe participation. Then, after those who participated have finalized the maps, it is important to invite the larger community and let those who constructed the map explain what they have done. As shown in this study, this provides opportunities to generate discussion and ask whether the larger community endorse decisions made by those involved in the mapping. Using different types of mapping activities with different groups from the community is also a useful strategy for broadening participation and learning from the mapping process.

8.4.3 Using P3DM with other complementary methods

It is preferable to use P3DM in collaboration with other methods. As shown in this study, supporting the P3DM with 2D scale mapping and the building of eco-cultural calendars

helped to mobilize wider knowledge of the community, and especially provided a means of accessing past, present and future perspectives. The latter is not easy with the P3DM tool, as it requires a high level of investment and it is expensive to build more than one such a model. In the case of this study, it would have been difficult to get the full picture of the rituals that were practised and the detailed understanding of the changing trends, and the processes of managing the landscape, if the calendars had not been used. Supporting P3DM with eco-cultural calendars and other strategies that facilitate mobilisation of temporal knowledge would seem to be important to get a fuller picture and deeper understanding of the biocultural landscape. As shown in this study, the mapping activities become richer and more relevant if temporal aspects of landscape and culture are included.

Furthermore, as shown in this study, contextual profiling of the social-ecological environment in the study areas was also useful. I used past project reports of MELCA-Ethiopia, which used Wiggins' (2009) tool for Climate Change and Environmental Degradation Risk Assessment (CEDRA) to produce the contextual profiles (Section 1.5.1.1 and 1.5.2.1). This helped to situate the mapping in the wider context of social-ecological change and increased degradation and loss of culture and natural resources. Therefore, it is important to explore which PRA tools can be used in respectful and complementary ways with P3DM to gain a fuller understanding of the situation, and to support community learning and agency.

8.4.4 Reflexivity

By reflexivity I mean the constant questioning of self on the purpose of the exercise, the wider context in which the mapping tools are employed, the tools that are used, the processes of using them, and the actual implementation of the decisions reached, in order to take forward the results of the mapping. Archer (2003, cited in Carter & Sealey, 2009) explains that reflexivity is "an active process in which we continuously converse with ourselves, precisely in order to define what we do believe, do desire and do intend to do" (p. 26). Bourdieu (2004) refers to reflexivity in relation to the field of practice, and challenges researchers to think of how their research is situated in the world (see Section 5.11). Participatory mapping methods can fall into the trap of becoming self-referential and

delusional, if reflexivity is not practised in an ongoing manner. It is possible that all those who participated may be positive about their participation, and report on sadness and shock at the realisation of the changes occurring around them, and express a willingness to act in response (as was the case in this study). The organization that has commissioned the mapping may get beautiful photographs and films of the mapping activities and feel that the job is done. But, as the data in this study shows, this is only part of the work. In fact it is the only the start. As reported in Chapter 6, not all community members were able to do what they had said they would do, and the anticipated changes did not emerge as easily as was anticipated. It also became clear that further interactions were needed to extend and support anticipated change activities.

It also became clear that it takes time even for the value of the mapping to sink in both at community level and at the level of MELCA-Ethiopia, and for an understanding of the potential of the mapping to emerge at the level of ABN, as all are learning about the change potential of the mapping activities as they emerge (as explained in the section on morpohgenesis in Chapter 7). MELCA-Ethiopia staff, for example, initially appreciated the mobilizing capacity of the maps, but were not seen using it thereafter, or including future mapping into their plans. Constant reflection and repeated discussion at the organizational level were necessary in order for the process to be accepted as one of the major tools to use within the organization. Therefore, reflexivity both at the community and at the organizational level is needed.

8.4.5 Thinking through the process

As the study emerged, it became clearer that it is very important to think through the mapping process from beginning to end. In some ways, MELCA-Ethiopia (and I) learned this the hard way. As the section on reflexivity implied, MELCA-Ethiopia staff, even after the maps had been completed, were not very clear on how to use the maps once they were produced, and along the way we experienced some problems (for example, when the GIS expert did not deliver the contour maps on time). I too only really began to understand the true value of the maps from a learning and agency perspective as the process unfolded, and as I used literature and analysis to deepen reflexivity on the processes. From these insights

it is possible to identify some questions that can be reflected on: Why are we doing it? Who should be involved and for what purpose? How long should it take? Who will be responsible for making sure that the process is properly documented? And more importantly, as we found out: How are we using the finished product? The community, local actors and the facilitating organization should be clear on all this before they start. Thinking through this process will help avoid frustration due to the delays in the process and the result not being used. From this it is important to understand the full value of the mapping process as both a learning and an agency development tool. Failure to do this may turn the mapping activities into technical activities, which has been a problem with many PRA approaches in the past, as described in Chapter 3. As explained in Chapter 4 and Chapter 7, this requires an understanding of participation in and as learning.

8.4.6 Exploring their use to link community and school

One issue, which was recurrent throughout the mapping process, was the increasing generational gap. In both case studies, the spread of urbanization, forces of globalization, formal education and major religions were the main forces influencing this gap. Environmental education at school level is often de-contextualized (Bates, 2009). Participatory mapping, as shown in this study, has potential to fill this gap, as was shown by comments from youth involved in the process who indicated that the map building helped them to contextualise school knowledge. Even teachers were surprised at the power of maps to do this. There is, therefore potential for school environmental clubs and local communities to undertake mapping of the biocultural landscape around the school. As shown in the two cases under study, members of the communities have knowledge and understanding of both the historical and the cultural importance of the landscape, and can pass this knowledge on to students or younger learners through mapping activities. This study has also shown that this inter-generational learning is for both, as community members make their knowledge explicit on the map, where it is checked by others for its consistency. Through this, they also complete their understanding of the biocultural landscape. As shown in this study, constructing maps of the future together has potential to motivate both young and old to identify future projects that they can work on.

8.4.7 Continuous engagement after mapping

As indicated in this study, continuous engagement with the community is needed after the mapping process. The decisions reached have to be taken forward by all actors. Examples of how to follow up were provided in the Telecho case, where MELCA-Ethiopia organized experience-exchange visits for members of the communities to visit other community members who have managed to rehabilitate their landscape. This helped to strengthen the will of those concerned with the issues, and to show them what can be done. In fact, I would venture further and say that it is not advisable to undertake mapping if one is not committed to also following up on the decisions taken as a result of the practice. Failing to follow up may result in only bringing out the pain and leaving communities with expectations. This may demoralize rather than encourage the realisation of their action plans. From a participatory development and research perspective, this is also an ethical concern, as discussed in Section 5.9 of this study.

8.4.8 Encouraging use of maps for planning and education

As shown in this study, encouragement starts with involving stakeholders right from the planning stage. Participating in the planning and in actual building of the maps may not however always result in the products needed for planning. In the two case studies, the *wereda* officers took part in the P3DM building practice, and they came almost every day to observe the progress. They also participated in adding the names of places on the legend and in the actual model building activity. But their usage of the finished product was very limited. We tried to organize a series of workshops to discuss how to use the maps but this was not readily taken up. The question is 'why?' During the inauguration and the interview process, they would say they would use it for this or that purpose, but in practice they did not. This may have two explanations. One is that they actually want to use the map but they do not know how to, as they have little prior experience of using 3D models or 2D maps in conducting planning activities. This may be a reflection of wider capacity issues and planning approaches amongst government staff, or it may be linked to a broader issue: a weakness in the education system, which relies on rote learning rather than on doing and applying what has been done [fully understanding this issue was beyond the scope of this study]. Or it could be that they consider the P3DM and mapping work as an NGO activity and therefore

expect the NGO to come up with a plan and discuss it with them. A related problem is high staff turnover at the government level; it was observed during this study that most of the staff that were part of the mapping process have either been shifted to other government departments or have lost their positions. They are also extremely busy, swamped by many government meetings. They are required to plan and submit documents within a short time frame and this might not allow them to use the maps as tools for their purpose. While the full reasons for the non-use of the maps were not probed during the study, the study did reveal that there is an ongoing need to encourage the use of the maps for planning, and particularly for encouraging government officials to make use of the maps in local level planning.

8.4.9 Promoting the maps

- **Promoting their use**

Quite recently, one of the 3D models was used by Meta consulting firm (Netherlands) to understand the water system of the Wechecha Mountain complex and advise the Addis Ababa Water Authority. This presents a good example of how the maps can be used after their completion. It is important that their use is promoted through various means for their effective utilization. They can be used for planning for rehabilitating watersheds and for identifying key areas for conservation, including sacred sites.

- **Spreading their proper utilization**.

As mentioned in Chapter 3, the use of Participatory GIS for natural resources planning and for advocacy is spreading in both Ethiopia and Africa. This resonates with increased use of this technique more widely (Corbett et al., 2005). As mentioned in Chapter 3, this presents both a challenge and an opportunity. Participatory mapping can easily suffer the fate of PRA, which has become Rapid Rural Appraisal rather than fully participatory. As mentioned in Chapter 3, a body of critique of participatory approaches have emerged as a result of this. The more PGIS spreads, the more danger exists that it can be used for the appropriation of people's knowledge and practices into the dominant discourse and epistemology. The possibility of this is real: in the mapping process I have observed those who are 'educated' try to influence the process by directing others (who may be less educated) on what to do

and what to include on the map. This calls for constant vigilance: participants from outside the community should not view themselves as 'the knowers' and should seek to recognise community knowledge in all its depth and richness, as shown in this study. Developing a manual which promotes the right kind of usage and conducting training based on this may help reduce the challenge.

There is also the opportunity, in which PGIS tools can help to make community views and epistemologies more explicit, and can therefore provide a wider knowledge base for decision making that integrates the rich diversity of biocultural knowledge and practices that exist at community level. As argued in the study, a wider knowledge base that acknowledges the value and validity of TEK is needed in contexts of social-ecological resilience building. The PGIS versions of the P3DM models (see Appendix 3) shows how this might be done. Supporting careful and respectful use of these models will be important.

8.5 Limitations of the study and recommendations for further research

Convergence and divergence in the learning and agency development processes in different participatory mapping sites: This study was conducted in two case study sites where in-depth mapping activities were conducted over a period of time. Working with two case study sites showed that while there are underlying structural features that shape community action that are similar in both contexts (e.g. the policy influence of the Derg regime and current government policy, current market forces, internal dynamics including population increase and natural resources degradation), there are also differences in different case study sites (e.g. livelihood practices, willingness to return to past cultural practices etc.). Exploring the research questions in more case study sites would have brought out the issues of convergence and divergence more clearly than was possible in this case. Extending the study to more case study sites could be an interesting area for further research.

Participatory mapping, learning, agency and longer term morphogenesis: The study showed that interlinking communities of practice such as ABN, MELCA-Ethiopia and communities at a local level influence each other's learning, agency and changes in institutional forms and

practices in 'small iterative morphogenic cycles', as reported in Chapter 7. The full power and potential of this change process requires longer term monitoring, but early indications based on the time that the mapping practices were first encountered in 2006 in the ABN context, to when they were completed in Telecho in 2011, changes (morphogenesis) had taken place at all three levels. There was, however, also morpohstasis, which significantly was at the broader societal/structural level, which shows that participatory mapping on its own, will not necessarily bring about broad-based policy or structural changes, unless the scale of the mapping activities can be significantly increased within a broad new social movement framework that can influence government, national policies and economic systems. The longer term power of participatory mapping for learning and agency development within a wider social movement context could provide for further interesting research.

Participatory mapping and social-ecological resilience: While this study was able to point to the potential role of mapping in resilience building, the full contribution of participatory mapping to social-ecological resilience remains an open question, as this study has only been able to provide indications of how participatory mapping can *begin to* contribute to resilience building (which itself is a longer term morphogenic process at social-ecological system level).

*Participatory mapping and biocultural diversity***:** The concept of biocultural diversity is quite new. The study was limited to the exploration of the linkage between cultural diversity and biodiversity at the ecosystem level. Participatory mapping can be used for a better theoretical understanding of the relationship between biodiversity and cultural diversity both at empirical and comparative levels. Therefore further study is needed using participatory mapping for viewing at close range how the natural environment shapes, penetrates or even permeates human cultural expressions and vice versa.

8.6 Conclusion

This study tried to answer three research questions related to participatory mapping: its role in mobilizing knowledge related to biocultural landscape, its role in learning and

change, and its value in building resilience. It has tried to demonstrate how participatory mapping has managed to mobilize knowledge related to biocultural diversity, facilitated the acquisition of knowledge and helped members of the community to engage in meaning making activities relevant to their biocultural landscape and renegotiate their identity within the wider community context. It has also shown that dissonance is an important dynamic in the learning process; and that morphogenesis (or change) occurs over time, but also in smaller cycles that interact at different levels; and that participatory mapping cannot, by itself mobilise significant structural change, at least in the short term. It has also shown, however, that learning and the desire for change can emerge from participatory mapping processes, and that this can be utilized to adapt to the changing socio-ecological environment, contributing to longer term resilience of social-ecological systems.

References

Aber, J.S. (2008). *Brief history of mapping and cartography*. Retrieved July 12, 2011, from http://academic.emporia.edu/aberjame/map/h_map/h_map.htm

ABN. (2011). Report on the Workshop on Resilience. 17-22 June 2011, Kenya.

Adam, B. (1990). *Time and social theory*. Cambridge: Polity Press.

Adger, W.N., Hughes, T.P., Folke, C., Carpenter, S.R., & Rockström, J. (2005). Socio-ecological resilience to coastal disasters. *Science, 209*(5737), 1036-1039.

Adger, W.N., Brown, K., Nelson, D.R.,Berkes, F., Eakin, H., Folke, C., Galvin, K., Gunderson, L., Goulden, M., O'Brien, K., Ruitenbeek, J., & Tompkins, E. L. (2011). Resilience implications of policy responses to climate change. *WIREs Climate Change, 2,* 757-776.

Alcorn, J.B. (1999). Ethnobotanical Knowledge systems – A resource for meeting rural development goals. In D. M. Warren, D. Brokensha & L. J. Slikkerveer (Eds.), *The cultural dimension of development (*pp. 1-12*)*. UK: Indigenous Knowledge Systems ITD Publications.

Alcorn, J. (2000). *Borders, rules and governance: Mapping to catalyse changes in policy and management.* Gatekeeper Series 91, London: IIED.

Alvesson, M., & Kärreman, D. (2000). Varieties of discourse: On the study of organizations through dis-course analysis. *Human Relations, 53,* 1125–1149.

Ambrosini, V., & Bowman, C. (2001). Tacit knowledge: some suggestions for operationalization. *Journal of Management Studies, 38*(6), 811-829.

Amin, A*. (Ed). Community, Economic Creativity and Organization.*Oxford University Press, 2003-2011. Retrieved July, 29, 2011 from www.oxfordschoraship.com

Amin, A., & Roberts, J. (2008).Knowing in action*:* beyond communities of practice. *Research Policy, 37(*2*),* 353–369*.*

Ammassari, S. (1995). (PRA for self-reliant rural development: the case of a resettlement area in Ethiopia). PLA Notes, 22, 62-68, IIED, London.

Archer, M. (1995). *Realist social theory: The morphogenetic approach*. Cambridge: Cambridge University Press.

Archer, M. (1998). Realism and Morphogenesis. In M. Archer, R. Bhaskar, A. Collier, T. Lawson, & A. Norrie, (Eds.), *Critical Realism Essential Reading* (pp. 356-381). London: Routledge.

Archer, M.S. (2000). *Being Human: the Problem of Agency.* Cambridge: Cambridge University Press.

Ayele, G. M. (1975). *The forgotten Aborigines: Socio-economic survey in Southern Highlands. A study of farm and livestock systems in Southern Highlands of Ethiopia*. Ethiopia: Imperial Ethiopian Government Livestock and Meat Board.

Aynekulu, E., Wubneh, W., Birhane, E., & Begashaw, N. (2006). Monitoring and evaluating land use/land cover change using participatory geographic information system tools: a case study of Begasheka Watershed, Tigray, Ethiopia. *EJISDC*, *25*(3), 1-10.

Ball, D. L., & Forzani, F. M. (2007). What makes education research "educational"? *Educational Researcher*, *36*(9), 529-540.

Bam, J., & Dyer, C. (2004). Mapping African history: Perspectives, interpretation and construction. In J. Bam & C. Dyer (Eds.), *Educator's Guide to the UNESCO General History of Africa for the FET curriculum*. South Africa: Ministry of Education.

Barab, S.A., & Duffy, T. M. (2000). From practice fields to communities of practice. In D.H. Jonassen & S.M. Land (Eds.), *Theoretical foundation of Learning Environments* (pp. 25-55). Pennsylvania University.

Bassey, M. (1999). *Case study research in educational settings*. Buckingham: Open University Press.

Bassi, M., & Tache, B. (2011). The community conserved landscape of the Borana Oromo, Ethiopia: Opportunities and problems. *Management of Environmental Quality, 22*(2), 174-86.

Bates, S. (2006). Making time for change: on temporal conceptualizations within (critical realist) approaches to the relationship between structure and agency. *Sociology, 40*(1), 143-161.

Bates, P. (2009). Learning and Inuit knowledge in Nunavut, Canada. In P. Bates, M. Chiba, S. Kube & D. Nakashima (Eds.), *Learning and knowing in indigenous societies today* (p. 128). Paris: UNESCO.

Batibo, H. M. (2009). Transmitting indigenous knowledge through the school curriculum in a diminishing biocultural environment: the case of Botswana. In P. Bates, M. Chiba, S. Kube & D. Nakashima, *Learning and knowing in indigenous societies today.* Paris: UNESCO.

Becker, H. S., & Geer, B. (1957). Participant observation and interviewing: A comparison. *Human Organization*, *16*, 28-32.

Belay, M. (2008). *Colombian report 2008*. Report to the African Biodiversity Network, Addis Ababa.

Belay, M., Edwards, S., & Gebeyehu, F. (2005). Culture as an expression of ecological diversity: Integrating awareness of cultural heritage in Ethiopian schools. *Mountain Research and Development, 25*, 10-14.

Berkes, F. (1999). *Sacred ecology. Traditional ecological knowledge and resource management.* Philadelphia: Taylor & Francis.

Berkes, F. (2001). Religious traditions and biodiversity. *Encyclopaedia of Biodiversity,5*, 109-120.

Berkes, F. (2008). *Sacred ecology: traditional ecological knowledge and resource management* (2nd ed.). Philadelphia: Taylor & Francis.

Berkes, F., Colding, J., & Folke, C. (2000). Rediscovery of traditional ecological knowledge as adaptive management. *Ecological Applications, 10*, 1251-1262.

Berkes, F., Colding, J., & Folke, C. (2003). *Navigating social–ecological systems: Building resilience for complexity and change*. Cambridge: Cambridge University Press.

Berkes, F., & Folke, C. (1998). *Linking social and ecological systems: Management practices and social mechanisms for building resilience*. Cambridge: Cambridge University Press.

Berry, T. (2000). *The great work*. New York: Harmony.

BERSMP. (2007). *The significance of the Bale Mountains, South Central Ethiopia*. FARM-Africa/SOS Sahel Ethiopia Participatory Natural Resources Management Unit (PNRMU). Policy Brief No. 1. Addis Ababa.

Bhaskar, R. (1978). *A realist theory of science*. Hassocks: Harvester.

Bhaskar, R. (1998). *The possibility of naturalism* (3rd ed.). London: Routledge.

Bhaskar, R., & Norrie, A. (1998). Dialectic and dialectical critical realism. In M.S. Archer, R. Bhaskar, A. Collier, T. Lawson, & A. Norrie (Eds.), *Critical realism: Essential readings* (pp. 561–574). London: Routledge.

Bishaw, B. (2003). Deforestation and land degradation in the Ethiopian Highlands: A strategy for physical recovery. *North African Studies, 8*(1), 7-26.

Blackmore, C., Chabay, I., Collins, K., Gutscher, H., Lotz-Sisitka, H., McCauley, S., Niles, D., Pfeiffer, E., Ritz, C., Schmidt, F., Schreurs, M., Siebenhuner, B., Tabara, D., & Van Eijndhoven, J. (2011). *Knowledge, learning and societal change: Finding paths to a sustainable future*. Science Plan for a cross-cutting core project of the International Human Dimension Programme on Global Environmental Change (IHDP).

Blau, W, J. (1635) Africa. Retieved on December 10, 2011, from http://commons.wikimedia.org/wiki/File:Africa_1635,_Willem_Janszoon_Blaeu_%283805125-sheet2-verso%29.jpg

Bloor, M., & Wood, M. (2006). *Keywords in qualitative methods: a vocabulary of research concepts*. London: Sage.

Bohnsack, R. (2008). The interpretation of pictures and the documentary method. *Forum Qualitative Sozialforschung/forum: Qualitative Social Research, 9*(3), 26.

Bourdieu, P. (1990). *The logic of practice.* Stanford: Stanford University Press.

Bourdieu, P. (2004). *Science of science and reflexivity.* Cambridge: Polity.

Brockington, D., & Vira, B. (2008). *Biodiversity conservation and resilience of socio-cultural institutions.* Draft paper for the Symposium on "Sustaining Cultural and Biological Diversity in a Rapidly Changing World: Lessons for Global Policy". New York: American Museum of Natural History.

Brody, H. (1988). *Maps and dreams: Indians and the British Columbia frontier*. Long Grove IL: Waveland.

Brown, J.S., & Duguid, P. (1991). Organizational learning and communities-of-practice: toward a unified view of working, learning, and innovation. *Organization Science*, *2*(1), 40-57.

Brown, J., & Kothari, A. (2011). Traditional agricultural landscapes and community conserved areas: an overview. *Management of Environmental Quality*, *22*(2), 139-153.

Buckley, W. (1967). *Sociology and modern systems theory*. New Jersey: Prentice-Hall.

Burns, D., & Chantler, K. (2011). Feminist Methodologies. In B. Somekh & C. Lewin. (Eds.), *Theory and methods of social research* (2nd ed.). Los Angeles: Sage.

Carpenter, S.R. and Brock, W.A. (2008). Adaptive capacity and traps. *Ecology and Society, 13*(2), 40. Retrieved on December 17, 2011, from http://www.ecologyandsociety.org/vol13/ iss2/art40/.

Carter, B., & Sealey, A. (2009). Reflexivity, realism and the problem of casing. In D. Byrne & C.C. Ragin (Eds.), *The Sage Handbook of Case-Based Methods* (pp. 69-83). Los Angeles: Sage.

Chabay, I. (in press) Learning to cope with complexity by understanding models of nature and society. Chapter in review for publication in *Learning for sustainability in times of accelerating change*, A. Wals, & P. Blaze Corcoran (Eds.)., Wageningen: Wageningen Academic Publisher.

Chaiklin, S. (2003).The zone of proximal development in Vygotsky's analysis of learning and instruction. In A. Kozulin, B. Gindis, V.S. Ageyev & S.M. Miller (Eds.), *Vygotsky's educational theory in cultural context* (pp. 39-64). England: Cambridge University Press.

Chambers, R. (1994). Participatory Rural Appraisal (PRA): Analysis of experience. *World Development, 22*(9), 1253-1268.

Chambers, R. (2006). Participatory Mapping and Geographic Information Systems: Whose Map? Who is Empowered and Who Disempowered? Who Gains and Who Loses? *EJISDC, 25*(2), 1-11. Retrieved December, 13, 2011 from http://www.ejisdc.org/ojs2/index.php/ejisdc/article/view/238

Chambers, K., Corbett, J., Keller, C.P., & Wood, J.B. (2004). Indigenous knowledge, mapping, and GIS: a diffusion of innovation perspective. *Cartographica, 39*(3), 19-32.

Chapin, M., Lamb, Z. & Threlkeld, B. (2005). Mapping indigenous lands. *Annual Review of Anthropology*, *34,* 619–638.

Cleaver, F. (1999). Paradoxes of participation: Questioning participatory approaches to development. *Journal of International Development, 11*, 597–612.

Cocks, M. (2006). Biocultural diversity: moving beyond the realm of 'indigenous' and 'local' people. *Human Ecology,34*(2), 185-200.

COMPAS. (2007). *Learning Endogeneous Development: Building on Biocultural Diversity*. Practical Action Publishing.

Cooke, B., & Kothari, U. (Eds.). (2001). *Participation: The new tyranny?* London: Zed Books.

Corbett, J. M., & Keller, C. P. (2005). An analytical framework to examine empowerment associated with participatory geographic information systems (PGIS). *Cartographica, 40,* 91-102.

Corbett, J. M., & Keller, C. P. (2006). Using community information systems to express traditional knowledge embedded in the landscape. *Participatory Learning and Action, 54,* 21- 27.

Corbett, J., Rambaldi, G., Kyem, P. A. K., Weiner, D., Olsen, R., Muchemi, J., & Chambers, R. (2006). Overview: Mapping for change – the emergence of a new practice. *Participatory Learning and Action, 54,* 3-6.

Corner, J. (1999). The agency of mapping: speculation, critique and invention. In D. Cosgrove (Ed.), *Mappings*. London: Reaktion Books.

Cornford, C.S., & Carrington, B. (2006). A Qualitative study of the experiences of training in general practice: a community of practice? *Journal of Education for Teaching*, *32*(3), 269-282.

Crampton, J., & Krygier, J. (2005). An introduction to critical cartography, ACME. *An International E-Journal for Critical Geographies*, *4*(1), 11-33.

Crawhall, N. (2007). *A facilitation guide for a participatory cultural mapping*. Paris: UNESCO.

Crawhall, N. (2009). *The role of participatory cultural mapping in promoting intercultural dialogue 'We are not hyenas'*. Paris: UNESCO.

Crawhall, N. (2010). Preparation of the map legend; Unit M10U03, Module M10: Participatory 3D Modeling. In *Support the spread of good practice in generating, managing, analysing and communicating spatial information.* The Netherlands: CTA.

CTA. (2010). *Introduction to PGIS practice* (DVD). The Netherlands: CTA.

Cundill, G. & Rodela, R. (2011). Under review. A review of social learning in natural resource management. Submitted to the *Journal of Environmental Conservation*.

Danermark, B., Ekström, M., Jakobsse, L., & Karlsson, J. (1997). *Explaining Society. Critical realism in the social sciences.* London: Routledge.

Daniels, H. (Ed.). (2007). *The Cambridge companion to Vygotsky*. London: Routledge.

Daniels, H. (2008). *Vygotsky and research*. London: Routledge Taylor & Francis Group.

Davidson-Hunt, I.J., & Berkes, F. (2003). Nature and society through the lens of resilience: toward a human-in-ecosystem perspective. In F. Berkes, J. Colding & C. Folke (Eds.), *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*. UK: Cambridge University Press.

Del Rio, P., & Alvarez, A. (2007). Inside and outside the zone of proximal development: An eco-functional reading of Vygotsky. In H. Daniels (Ed.), *The Cambridge companion to Vygotsky*. London: Routledge.

Di Gessa, S*.,* Poole, P., & Bending, T. (2008*). Participatory mapping as a tool for empowerment: Experiences and lessons learned from the ILC Network.* Rome: International Land Coalition*.*

Dudley, N., Higgins-Zogib, L., & Mansourian, S. (2009). The links between protected areas, faiths, and sacred natural sites. *Conservation Biology, 23*(3), 568.

Duguid P. (2005), "The art of knowing": social and tacit dimensions of knowledge and the limits of the community of practice. *The Information Society*, *21*, 109-118.

Elder-Vass, D. (2007). For emergence: Refining Archer's account of social structure. *Journal for the Theory of Social Behaviour, 37*, 25-44.

EMA. (1985). The Ethiopian Mapping Agency 1954 – 1984*. Periodical of the Ethiopian Mapping Agency*, 1- 24.

Feoli, E., Vuerich, G. L., & Zerihun, W. (2001). Evaluation of environmental degradation in northern using GIS to integrate vegetation, geomorphologic, erosion and socio-economic factors. *Agriculture, Ecosystems and Environment, 91,* 313-325.

Fisseha, G. (2010, December 11) Program coordinator for MERIT, Amhara Regional Government, Bahirdar. Personal communication.

Flavelle, A. (2010*). Introduction to Scale and Basic Cartography. Unit M09U01.* Italy: CTA, Netherlands and IFAD.

Flintan, F., Worku, C., Dida, W., & Ridgewell, A. (2008). *Livestock and Livestock Systems in The Bale Mountain Ecoregion: A report for the Bale Eco Region Sustainable Management Project*. SOS Sahel Ethiopia and Farm Africa. Addis Ababa.

Flyvbjerg, B. (2006). Five misunderstandings about case study research. *Qualitative Inquiry, 12*(2), 219-245.

Folke, C. (2006). Resilience: the emergence of a perspective for social-ecological systems analyses. *Global Environmental Change, 16,* 253-267.

Folke, C., Berkes, F., & Colding, J. (1998). Ecological practices and social mechanisms for building resilience and sustainability. In F. Berkes & C. Folke (Eds.), *Linking social and ecological systems* (pp. 414-36). London: Cambridge University Press.

Folke, C., Carpenter, S., Walker, B., Scheffer, M., Chapin, T., & Rockström, J. (2010). Resilience thinking: Integrating resilience, adaptability and transformability. *Ecology and Society, 15*, 20. Retrieved on July 30, 2011 from http://www.ecologyandsociety.org/vol15/iss4/art20/

Folke, C., Carpenter, S.R., Walker, B.H., Scheffer, M., Elmqvist, T., Gunderson, L.H., & Holling, C.S. (2004). Regime shifts, resilience and biodiversity in ecosystem management. *Annual Review in Ecology, Evolution and Systematic, 35,* 557–581.

Folke, C., Colding, J., & Berkes, F. (2003). Synthesis: building resilience and adaptive capacity in social-ecological systems. In F. Berkes, J. Colding & C. Folke (Eds.), *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*. Cambridge: Cambridge University Press.

Folke, C., Hahn, T., Olsson, P., & Norberg, J. (2005). Adaptive governance of social-ecological systems. *Annual Review of Environment and Resources, 30,* 441 - 473.

Fossey, E., Harvey, C., McDermott, F., & Davidson, L. (2002). Understanding and evaluating qualitative research. *Australian and New Zealand Journal of Psychiatry, 36*, 717–32.

Fox, J., Krisnawati, S.H., & Hadi, P.A. (2003). *Mapping power: Ironic effects of spatial information technology. Spatial Information Technology and Society: Ethics, Values, and Practice Papers.* USA, Hawaii: East-West Center.

Fox, J., Krisnawati, S., Hershock, P., & Hadi Pramono, A. (2006). Mapping power: Ironic effects of spatial information technology. *Participatory Learning and Action, 54*, 98-105.

Fox, J., Suryanata, K., & Hershock, P. (Eds.). (2005). *Mapping communities: ethics, values, practice.* Honolulu: East-West Center.

Frankfurt Zoological Society (2009). *Implementing effective and sustainable biodiversity conservation in Ethiopia's Afro-montane ecosystems*. European Commission Restricted Call for Proposals 2007 – 2008.

Fuller, A., Hodkinson, H., Hodkinson, P., & Unwin, L. (2005). Learning as peripheral participation in communities of practice: a reassessment of key concepts in workplace learning. *British Educational Research Journal*, *31*(1), 49-68.

Gaillard, J.C., & Maceda, E.A. (2009). Participatory Three-dimensional mapping for disaster risk reduction. *PLA notes, 60,* 109-118.

Gamble, J. (2006). Theory and practice in the vocational curriculum (pp. 87-103). In M. Young & Gamble. J. (Eds.), *Knowledge, curriculum and qualifications for South African further education*. Cape Town: Human Sciences Research Council.

Garay, E.P., & Larrabure, J.L. (2011). Relational knowledge systems and their impact on management of mountain ecosystems: Approaches to understanding the motivations and expectations of traditional farmers in the maintenance of biodiversity zones in the Andes. *Management of Environmental Quality, 22*(2), 213-32.

Gebresilasie, S. (2006). *Land, Land Policy and Smallholder Agriculture in Ethiopia: Options and Scenarios*. The Future Agricultures Consortium meeting at the Institute of Development Studies, 20-22 March 2006, Addis Ababa.

Geertz, C. (1973). *The interpretation of cultures*. New York: Basic Books.

GEF (Global Environment Facility). (2006). *Sustainable Development of the Protected Area System of Ethiopia*. GEF Council Work Program Submission.

George, J. M. (1999). Indigenous knowledge and schooling: A continuum between conflict and dialogue. In M. S. Semali & J.L. Kincheloe (Eds.), *What is Indigenous Knowledge? Voices from the Academy*. New York: Falmer.

Gessese, B. (2010). Review of land degradation and land management in Ethiopia up to 2008/09. In S. Edwards (Ed.), *Ethiopian Environment Review, 1,* 187-214.

Giddens, A. (1984). *The constitution of society: Outline of the theory of structuration*. Cambridge: Polity Press.

Glasser, H. (2007). Minding the gap: The role of social learning in linking our stated desire for a more sustainable world to our everyday actions and policies. In A. Wals, (Ed.), *Social Learning: towards a sustainable world*. Wageningen: Wageningen University Press.

Gooch, M., & Warburton, J. (2009). Building and managing resilience in community-based NRM groups: An Australian case study. *Society and Natural Resources, 22*, 158-171.

Graef, D., Cerezo, A., Dove, M, R., Hays, C., Osterhoudt, S., Padwe, J., & Stoike, J. (2008). *The cultural politics of sustaining diversity.* Prepared for: *Sustaining cultural and biological diversity in a rapidly changing world: lessons for global policy.* New York: American Museum of Natural History.

Greeno, J.G., Collins, A.M., & Resnick, L.B. (1996). Cognition and Learning. In D.C. Berlinger & R.C. Calfee (Eds.), *Handbook of Educational Psychology.* London: Prentice Hall.

Guilio, M. (2003). *Conservation and development in Ethiopia: Issues and perspectives in the Bale Mountains National Park*. Unpublished master's thesis, University of Cambridge.

Gunderson, L. H. (2003). Adaptive dancing: interactions between social resilience and ecological crises. In F. Berkes, J. Colding & C. Folke (Eds.), N*avigating social–ecological systems: Building resilience for complexity and change* (pp.33-52).Cambridge: Cambridge University Press.

Gunderson, L.H., Holling, C.S., & Light, S. (1995). (Eds.). *Barriers and bridges to the renewal of ecosystems and institutions*. Columbia University Press, New York, USA.

Handley, K*.,* Sturdy, A*.,* Fincham, R., & Clark, T. (2006). Within and beyond communities of practice: making sense of learning through participation, identity and practice*. Journal of Management Studies*, *43(3),* 641–653*.*

Harley, J.B. (1992). Deconstructing the map. *Association of American Geographers, 82*(3), 522-536.

Harmon, D. (2002). In light of our differences. In B. Haverkort & R. Stephan (Eds.), *Endogenous development and bio-cultural diversity: the interplay between worldviews, globalization and locality, COMPAS Series Worldviews and Sciences, COMPAS/CDE.* Washington: Smithsonian Institution Press.

Harrington, S. (Ed.) (1999). Giving the land a voice: Mapping our home places (2nd ed.). Saltspring Island, BC: Land Trust Alliance of BC, Salt Spring Island Community Services.

Hart, R., 2008. Stepping back from "the ladder": Reflections on a model of participatory work with children'. In A. Reid, B. Jensen, J. Nikel & V. Simovska (Eds.), *Participation and Learning: Perspectives on education and the environment, health and sustainability*. Netherlands: Springer.

Haverkort, B., & Rist, S. (Eds.). (2007). *Endogenous Development and Biocultural Diversity: the interplay between worldviews, globalization and locality.* COMPAS series on World Views and Sciences, 6.

Hay, C. (2002). *Political analysis*. Basingstoke: Palgrave.

Herlihy, P.H., & Knapp, G. (2003). Maps of, by, and for the Peoples of Latin America. *Human Organization, 62*, 303–314.

Hillman, J. C. (1986). *Bale Mountains National Park management plan.* Addis Ababa: EWCA.

Hoben, A. (1995). Paradigms and politics: The cultural construction of environmental policy in Ethiopia. *World Development, 23*(6), 1007-1021.

Hodson, D., & Hodson, J. (1998). From constructivism to social constructivism: a Vygotskian perspective on teaching and learning science. *School Science Review*, *79* (2), 33-41.

Hodgson, D. L., & Schroeder, R. A. (2002). Dilemmas of counter-mapping community resources in Tanzania*. Development and change, 33*, 79-100.

Hogan, K. (2002). Pitfalls of community-based learning: How power dynamics limit adolescents' trajectories of growth and participation. *Teachers College Record, 104*(3), 586-624.

Holling, C.S. (1973). Resilience and stability of ecological systems. *Annual Review of Ecology and Systematics, 4*, 1-23.

Holling, C.S. (1986). Resilience of ecosystems: local surprise and global change. In W.C. Clark & R.E. Munn, (Eds.), *Sustainable development and the biosphere* (pp. 292-317). Cambridge: Cambridge University Press.

Holling, C. S., Gunderson, L.H., & Peterson, G.D. (2002). Sustainability and panarchies. In L.H. Gunderson & C. S. Holling (Eds.), *Panarchy: understanding transformations in human and natural systems (*pp. 63-102). Washington: Island Press.

Hussain, M., Amjad, M., Fatima, Z., & Rizwan, Y.M. (2005). Participatory surveillance of livestock diseases in Islamabad Capital Territory. *International Journal of Agriculture and Biology, 7*, 567–570.

Ibarra, H. (1999). Provisional selves: experimenting with image and identity in professional adaptation. *Administrative Science Quarterly*, *44*, 764–91.

IBC (Institute of Biodiversity Conservation). (2009). *Convention on Biological Diversity (CBD) Ethiopia's 4th Country Report*. Ethiopia: Addis Ababa.

IFAD (International Fund for Agricultural Development). (2009). *Good practices in participatory mapping*. Rome: IFAD

IMF (International Monetary Fund). (2011). *The Federal Democratic Republic of Ethiopia: Joint staff advisory note on the growth and transformation plan 2010/11–2014/15*. IMF Country Report No. 11/303.

IPCC (Intergovernmental Panel on Climate Change). (2007). Climate Change 2007: Impacts, Adaptation and Vulnerability. In J.J. McCarthy, O.F. Canziani, N.A. Leary, D.J. Dokken & K.S. White, (Eds.), *Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.

Ishizawa, J., & Rengifo, G. (2009). Biodiversity regeneration and intercultural knowledge transmission in the Peruvian Andes. In P. Bates, M. Chiba, S. Kube & D. Nakashima (Eds.), *Learning and knowing in indigenous societies today.* Paris: UNESCO.

Jasminko, N., & Michael, M. (2005). *Collaborative Knowledge Visualisation for Cross-Community Learning.* Retrieved April 17, 2011 from http://netzspannung.org/about/mars/projects

Jickling, B. (2007) Research in a changing world: Normative questions and questions that matter. *Southern African Journal of Environmental Education, 24*, 108-118.

John-Steiner, V. (1995). Cognitive pluralism: A socio-cultural approach. *Mind, Culture and Activity, 2,* 2-10.

John-Steiner, V., & Mahn, H. (1996). Sociocultural approaches to learning and development: A Vygotskian framework. *Educational Psychologist, 31*(3/4), 191-206.

Johnson, C.M. (2001). A survey of current research on online communities of practice. *Internet and Higher Education, 4*, 45-60.

Kalland, A. (2003). Indigenous knowledge: Prospects and limitations. In R. Ellen, P. Parkes & A. Bicker (Eds.), *Indigenous environmental knowledge and transformations: Critical anthropological perspective.* London: Routledge Taylor and Francis.

Kemp-McCarthy, D. (1990). A*n investigation into several aspects of the use of natural mineral springs (horas) within and around Bale Mountains National Park, Southern Ethiopia.* Unpublished master's thesis (Zoology), Leicester University.

King, A. (1999). Against structure: A critique of morphogenetic social theory. *Sociological Review, 47,* 199-227.

Kirsh, D. (1995). The intelligent use of space. *Artificial Intelligence, 73*, 31-68.

Kirsopp-Reed, K. (2001*). A* review of PRA methods for livestock research and development. *PLA Notes CD Rom 1988–2001.*

Kitchin, R., Perkins, K., & Dodge, M. (2009). Thinking about maps. In M. Doge, R. Kitchin & C. Perkins (Eds.), *Rethinking maps: New frontiers in cartographic theory* (pp. 1- 26). London: Routledge.

Kivinen, O., & Piiroinen, T. (2006). On the limits of a realist conception of knowledge: a pragmatist critique of Archerian realism. *Sociological Review*, *54* (2), 224-241.

Knoblauch, H.*,* Baer, A.*,* Laurier, E.*,* Petschke, S.*,* & Schnettler, B*.* (2008). Visual analysis: new developments in the interpretative analysis of video and photography*. Forum Qualitative Sozialforschung/Forum: Qualitative Social Research*, *9*, 14.

Köhler-Rollefson, I. and the LIFE Network. (2007). *Keepers of genes: The interdependence between pastoralists, breeds, access to the commons, and livelihoods.* Jodhpur: New Block Tone.

Kolb, B. (2008). Involving, Sharing, analysing - potential of the participatory photo interview. *Forum Qualitative Sozialforschung/ forum: Qualitative Social research, 9*(3), 12.

Krasny, M. E., Lundholm, C., & Plummer, R. (2010). Resilience in social-ecological systems: the roles of learning and education. *Environmental Education Research*, *16* (5-6), 463-474.

Kvale, S. (Ed.). (1989). *Issues of validity in qualitative research*. Lund: Student literature.

Lasimbang, A. (2004). *Community mapping in Malaysia: The use of community maps in resources management and protecting rights over indigenous people's territory*. Regional Community Mapping Network Workshop. Diliman, Quezon City, Philippines. Retrieved June 27, 2011, from http://www.iapad.org/publications/ppgis/pacos.pdf

Latour, B. (1987). *Science in action*. Cambridge: Harvard University Press.

Lave, J. (2008). *Epilogue: Situated learning and changing practice.* Cambridge University.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.

Lemke, J. (1997). Cognition, context, and learning: A social semiotic perspective. In D. Kirshner & J. A. Whitson (Eds.), *Situated cognition: Social, semiotic, and psychological perspectives* (pp. 37-56). Mahwah: Lawrence Erlbaum Associates.

Lockwood, D. (1964). Social Integration and Systems Integration. In G.K. Zollschan & H.W. Hirsch (Eds.), *Explorations in social change*. Boston: Houghton Mifflin.

Lotz-Sisitka, H. (2001). *Weaving cloths: research design in contexts of transformation*. Paper presented at EECOM, 2001 Conference, Whitehorse, Canada.

Lotz-Sisitka, H.B., & R. O'Donoghue. 2008. Participation, situated culture and practical reason. In A. Reid, B. Jensen, J. Nikel & V. Simovska (Eds.), *Participation and learning: Perspectives on education and the environment, health and sustainability*, (pp. 111–27). Dordrecht: Springer.

Lundholm, C., & Plummer, R. (2010). Resilience and learning: a conspectus for environmental education, *Environmental Education Research*, *16* (5-6), 475-491.

Maffi, L. (2001). Introduction: On the interdependence of biological and cultural diversity. In L. Maffi (Ed.), *On biocultural diversity: linking language, knowledge, and the environment* (pp. 1-52). Washington: Smithsonian.

Maffi, L. (2005). Linguistic, cultural and biological diversity. *Annual Review of Anthropology, 34*, 599-617.

Maffi, L. (2010). What is biocultural diversity? In Maffi, L. & Woodley, E. (Eds.). *Biocultural diversity conservation: A global sourcebook.* London: Earthscan.

Maffi, L., & Woodley, E. (2010). *Biocultural diversity conservation: A global sourcebook.* London: Earthscan.

Mamo, M. (1963). The history of cartography in Ethiopia (brief explanation). *Ethiopian Geographical Journal,1*(2),10-19.

Maru, Y., Alexandridis, K., & Perez, P. (2009). Taking 'participatory' in participatory modeling seriously. In R.S Anderssen, R.D. Braddock & L.T.H. Newham (Eds.), *Proceedings of 18th World IMACS Congress and MODSIM09 International Congress on Modeling and Simulation,* (pp. 3011-3017). Cairns, Australia, 13-17 July 2009.

Masara, C. (2010). Social Learning processes and nature-culture relation of commercial beekeeping practices of small and medium enterprise development in Zimbabwe. *Southern African Journal of Environmental Education, 27*, 9-21.

Maxwell, J. A. (1992). Understanding and validity in qualitative research. *Harvard Educational Review, 62*(3), 279-300.

Maxwell, J. A. (2005). *Qualitative research design: An interactive approach* (2nd ed.). Thousand Oaks: Sage.

McCall, M. K. (2004). *Can participatory-GIS strengthen local-level spatial planning? Suggestions for better practice.* Paper given at GISDECO 2004, 7th International Seminar on GIS for Developing Countries, Skudai, Johor, May 2004.

Mearns, R., Shombodon, D., Narangerel, G., Tuul, U., Enkhamgalan, A., Myagmarzhav, B., Bayanjargal, A., & Bekhsuren, B. (1994). Natural resource mapping and seasonal variations and stresses in Mongolia. *RRA Notes, 20,* 95-105.

MELCA-Ethiopia. (2007). *Forests of Sheka: Multidisciplinary case studies on impacts of land use/ land cover changes.* Southwest Ethiopia: Addis Ababa.

MELCA-Ethiopia. (2010). Proceedings of National Workshop on Sacred Natural Sites and EIA. July 1-2, 2010, Addis Ababa.

MELCA-Ethiopia. (2011a). Baseline data assessment on the climate change hazards and the impact of these hazards on the important resources of the livelihoods in the case of three kebeles of Dinsho woreda namely, Hora-Soba, Abakera and Zalo-Ababo-Karra-Arri, Ethiopia.

MELCA-Ethiopia. (2011b). Report of the digitized P3DM models developed through community participation in Ethiopia. Addis Ababa.

Milton, K. (1999). Nature is already sacred. *Environmental Values*, *8*, 437-449.

MOFED. (2010). *Growth and transformation plan 2010/11 – 2014/15*. Ethiopia: Addis Ababa.

Muchemi, J., Crawhall, N., Pedone, G., Koinante, J., Kiptum, Y., & Kuria, K. (2009). Kenya case study: Participatory Three Dimensional Modeling, African Indigenous Peoples' Workshop on effective use of information communication technology (pp. 35-47). Cape Town: IPACC/CTA.

Mukute, M. (2010*). Exploring and expanding learning in sustainable agriculture practices in Southern Africa.* Unpublished doctoral thesis, Rhodes University, Grahamstown.

Muller, D. & Wode, B. (2003). *Methodology for village mapping using photomaps*. Song Da, Vietnam: Social Forestry Development Project (SFDP).

Mundy, P.A., & Compton, J.L. (1999). Indigenous communication and indigenous

knowledge. In D. M. Warren, L. J. Slikkerveer & D. Brokensha (Eds.), *The Cultural Dimension of Development*. London: Intermediate Technology Publications.

Murphree, M. (1993). Decentralizing the proprietorship of wildlife resources in Zimbabwe's communal areas. In D. Lewis & N. Carter (Eds.), *Voices from Africa: local perspectives on conservation* (pp. 133 145). Washington: World Wildlife Fund.

Namafe, C. M. (2008). What selected basic schools in western Zambia are best at in environmental and sustainability education. *Southern African Journal of Environmental Education*, *25*, 59–80.

Niamir, M. (1999). Indigenous systems of natural resource management among pastoralists of arid and semi arid Africa. In D. M. Warren, L. J. Slikkerveer & D. Brokensha (Eds.), *The Cultural Dimension of Development*. London: Intermediate Technology Publications.

Nonaka, I., & Takeuchi, H. (1995).*The knowledge-creating company: How Japanese companies create the dynamics of innovation.* New York: Oxford University Press.

Norrie, A. (2010). *Dialectic and difference*. London: Routledge.

O'Donoghue, R. (2003). Indigenous knowledge: towards learning materials and methodologies that respond to social processes of marginalisation and appropriation in Eastern and southern Africa*. Australian Journal of Environmental Education, 19,* 47-53*.*

O'Donoghue, R. (2007). Environment and Sustainability education in a changing South Africa: A critical historical analysis of outline schemes for defining and guiding learning interactions. *Southern African Journal of Environmental Education, 24,* 141- 157*.*

O'Donoghue, R., & Neluvhalani, E. (2002). *Indigenous knowledge and the school curriculum: a review of developing methods and methodological perspectives. Indigenous Knowledge and Education*. Howick: Share-Net.

Olsson, P., Folke, C., & Hahn, T. (2004). Social-ecological transformation for ecosystem management: The development of adaptive co-management of a wetland landscape in southern Sweden. *Ecology and Society, 9*(4), 2. Retrieved on October 10, 2011, from http://www.ecolo gyandsociety.org/vol9/iss4/art2

Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. Cambridge: Cambridge University Press.

O'Sullivan, D. (2006). Geographic information science: Critical GIS. *Progress in Human Geography*, *30*(6), 783-791.

Owen, B. (2007). (Introduction to Cultural Anthropology: Class 13. Making a living: agriculture, pastoralism, and agro-pastoralism). Lecture notes. Sonoma State University, California.

PAFID. (2001). National Land Tenure for Indigenous People in the Philippines - Terminal Report. Misereor: PAFID.

Pain, R. (2004). Social geography: participatory research. *Progress in Human Geography, 28* (5), 652-663. Accessed on February 11, 2011 from www.phg.sagepub.com

Patton, M.Q. (1990). *Qualitative evaluation and research methods*. Newbury Park: Sage.

Patz, J. A., Campbell-Lendrum, D., Holloway, T., & Foley, J. A. (2005). Impact of regional climate change on human health. *Nature*, *438*, 310-317.

Paven, A. (2011). Agricultural technology adoption: Issues for consideration when scaling up. *Cornell Policy Review, 1,* 1. Retrieved December, 9, 2011 from http://blogs.cornell.edu/policyreview/2011/07/01/agricultural-technology-adoption-issues-for-consideration-when-scaling-up/

PCC (Population Census Commission).(2008). *Summary and Statistical Report of the 2007 Population and Housing Census. Population size by age and sex*. Addis Ababa: United Nations Population Fund.

Peluso, N.L. (1995). Whose woods are these? Counter-mapping forest territories in Kalimantan, Indonesia. *Antipode, 27*(4), 383-406.

Pemberton, J., Mavin, S., & Stalker, B. (2007). The scratching beneath the surface of communities of (mal) practice learning organization. *International Journal of Knowledge and Organizational Learning Management*, *14*(1), 62-73.

Pesanayi, T.V. (2008). Investigating learning interactions influencing farmers' choices of cultivate food crops. Unpublished master's thesis. Rhodes University. Grahamstown.

Phillips, A. (2005). Landscape as a meeting ground: Category V protected landscapes/seascapes and World Heritage cultural landscapes. In J. Brown, N. Mitchell & M. Beresford (Eds.), *The Protected Landscape Approach: Linking Nature, Culture and Community.* Gland: IUCN –World Commission on Protected Areas.

Phillips, A., & Stolton, S. (2008). Protected landscapes and biodiversity values: An overview. In T. Amend, J. Brown, A. Kothari, A. Phillips & S. Stolton (Eds.), *Protected landscapes and agrobiodiversity values* (pp.8-21). Heidelberg: IUCN and GTZ, Kasparek Verlag.

Pilgrim, S., Cullen, L., Smith, D.J., & Pretty, J. (2008). Ecological knowledge is lost in wealthier communities and countries. *Environmental Science and Technology, 42*(4), 1004-1009.

Pilgrim, S., Smith, D. J., & Pretty, J. (2007). A cross-regional assessment of the factors affecting eco-literacy: implications for policy and practice. *Ecological Applications, 17(*6), 1742-1751.

Pimbert, M. (2009). *Towards food sovereignty: reclaiming autonomous food systems.* London: IIED.

Pimbert, M., & Pretty, J. (1995). *Parks, people and professionals: Putting participation into protected area management*. UNRISD Discussion Paper No 57. Geneva: UNRISED.

Plummer, R. (2010). Social-ecological resilience and environmental education: synopsis, application, implications. *Environmental Education Research, 16*(5-6), 493-509.

Poole, P. (2005). The Ye'kuana mapping project. In J.P. Brosius, A. Tsin & and C. Zerner (Eds.) *Communities and conservation: Histories and politics of community-based natural resource management*. Walnut Creek: Alta Mira.

Posey, D.A. (Ed.). (1999). *Cultural and spiritual values of biodiversity*. London: UNEP and Intermediate Technology Publications.

Pretty, J. Adams, B., Berkes, F., Athayde, S., Dudley, N., Hunn, E., Maffi, L., Milton, K., Rapport, D., Robbins, P., Samon, C., Sterling, E.J., Stolton, S., Takeuchi, K., Tsing, A., Vintinner, E. & Pilgrim S. How Do Biodiversity and Culture Intersect? Plenary paper for *Sustaining cultural and biological diversity in a rapidly changing world: Lessons for global policy,* April 2008, New York.

Prober, S. M., O'Connor, M. H., & Walsh, F. J. (2011). Australian Aboriginal peoples' seasonal knowledge: a potential basis for shared understanding in environmental management. *Ecology and Society, 16*(2), 12. Accessed July 12, 2011 from http://www.ecologyandsociety.org/vol16/iss2/art12/

Rahmato, D. (2009). *The peasant and the state: Studies in agrarian change in Ethiopia 1960-2000s*. Addis Ababa: Addis Ababa University Press.

Rambaldi, G. (2005). Who owns the map legend? *URISA Journal, 17*, 5-13.

Rambaldi, G. (2010). *Participatory Three-dimensional Modeling: Guiding Principles and Applications.* Wageningen: CTA.

Rambaldi, G., & Callosa-Tarr, J. (2002). *Participatory 3-dimensional modelling: Guiding principles and applications*. Los Banos: ASEAN Regional Centre for Biodiversity Conservation (ARCBC).

Rambaldi, G., & Lah, L.V. (2003). The seventh helper: the vertical dimension feedback from a training exercise in Vietnam. *PLA Notes 46*: 77-83, London: IIED.

Rambaldi, G., Bugna, S., Tiangco, A., & De Vera, D. D. (2002). Bringing the vertical dimension to the negotiating table. Preliminary assessment of a conflict resolution case in the Philippines. *ASEAN Biodiversity, 2,* 17-26.

Rambaldi, G., Chambers, R., McCall, M., & Fox, J. (2006).Practical ethics for PGIS practitioners, facilitators, technology intermediaries and researchers. *Participatory Learning and Action, 54,* 106-113*.*

Rambaldi, G., Kyem, P. K., Mbile, P., McCall, M. & Weiner, D. (2006) Participatory spatial information management and communication in developing countries. *Electronic Journal of Information Systemsin Developing Countries, 25*(1), 1-9. Retrieved February 17, 2001 from http://www.ejisdc.org/ojs/viewissue.php

Reid, A., & Nikel, J. (2007).
Differentiating and evaluating conceptions and examples of participation in environ ment-related learning. In A. Reid, J. B. Bruun, J. Nikel, & V. Simovska (Eds.), *Participation and Learning: Perspectives on education and the environment, health and sustainability* (pp. 32-60)*.* Dordrecht: Springer.

Reid, A., Jensen, B.B., Nikel, J., & Simovska, V., eds. (2008). *Participation and learning: Perspectives on education and the environment, health and sustainability*. Dordrecht: Springer.

Reed, M. S., Evely, A.C., Cundill, G., Fazey, I., Glass, J., Laing, A., Newig, J., Parrish, B., Prell, C., Raymond, C., & Stringer, L.C. (2010). What is social learning? *Ecology and Society.* Retrieved April 20, 2011 from http://www.ecologyandsociety.org/volXX/issYY/artZZ/

Rickinson, M., Lundholm, C., & Hopwood, N. (2009). *Environmental learning. Insights from research into the student experience.* Dordrecht: Springer.

Roberts, J. (2006). Limits to Communities of Practice. *Journal of Management Studies,43*(3), 623-39.

Robertson, I., & Richards, P. (2003). *Studying cultural landscapes.* London: Hodder Arnold.

Rogoff, B., Paradise, R., Arauz, R.M., Correa-Chavez, M., & Angelillo, C. (2003). Firsthand learning through intent participation. *Annual Review of Psychology*, *54*, 175 – 203.

Rowley, J., & Terfa, M. (2008). *A study of participatory mapping carried out by SOS Sahel and Save the Children US in Southern Ethiopia.* UK: SOS Sahel and Save the Children.

Salmon, G., & Perkins, D. N. (1998). Individual and social aspects of learning. *American Education Research Association,23,* 1-24. Retrieved February 10, 2011 from http://www.jstor.org/stable/1167286

Sauer, C.O. (1965). The morphology of landscape. In J. Leighly (Ed.), *Land and life* (pp. 315-350). Berkley: University of California Press.

Sawyer, K. (2002). Unresolved tensions in socio-cultural theory: Analogies with contemporary sociological debates. *Culture & Psychology, 8*(3), 283-305.

Sayer, A. (1992). *Method in Social Science. A realist approach*. (2nd ed.). London: Routledge.

Sayer, A. (2000). *Realism and social science.* London: Sage.

Schubert, J. (2005). *Political Ecology in Development Research. An Introductory Overview and Annotated Bibliography.* Bern: NCCR North-South.

Schuurman, N. (1999). Critical GIS: Theorizing an emerging discipline. *Cartographica, 36*(4), 5-21.

Semali, L. M. (1999). Community as classroom: (Re) valuing indigenous literacy. In M.S. Semali & J.L Kincheloe (Eds.), *What is Indigenous Knowledge? Voices from the Academy.* New York: Falmer .

Sfard, A. (1998). On two metaphors for learning and the dangers of choosing just one. *Educational Researcher, 27*(2), 4-13.

Sfard, A. & Prusak, A. (2005). Telling identities: In search of an analytic tool for investigating learning as a culturally shaped activity. *American Education Research Association*, *34*(4), 14-22. Retrieved on 19 December, 2011 from http://www.jstor.org/stable/3699942.

Shava, S. (2005). Research on indigenous knowledge and its application: A case of wild food plants of Zimbabwe. *Southern African Journal of Environmental Education, 22*, 73-86.

Shava, S. (2008). *Indigenous knowledge: A genealogy of representations and applications in developing contexts of environmental education and development in southern Africa*. Unpublished doctoral thesis, Rhodes University, Grahamstown.

Shava, S., Krasny, M. E., Tidball. K. G., & Zazu, C. (2010). Agricultural knowledge in urban and resettled communities: Applications to social-ecological resilience and environmental education. *Environmental Education Research, 16*(5-6), 575-589.

Sherefa, B. (2006). Landuse/landcover changes in Andracha and Masha Woredas of Sheka Zone, SNNP Regional State. In M. Fetene (Ed). *Impacts of land-use/land cover changes in*

Masha and Anderacha Woredas of Sheka Zone SNNP regional state: Case studies on biodiversity, cultural changes and management practices, and analysis of relevant legal and institutional framework. Addis Ababa: MELCA.

Shiva, V. (2002). Monocultures of the mind. In A. Kimbrell (Ed.), *Fatal harvest: The tragedy of industrial agriculture.* Washington: Island Press.

Sinyama, I. 2011. *Enabling social learning as a response to environmental issues through teaching of localised curriculum in Zambian schools*. Unpublished Master's thesis, Rhodes University, Grahamstown.

Smith, M. K. (2003). Communities of practice. In *The Encyclopaedia of Informal Education*, Retrieved March 12, 2008 from www.infed.org/biblio/communities_of_practice.htm.

Sterling, E., Cullman, G., Bick, P., & Wali, A. (2008). *Conserving Biodiversity and Sustaining Cultures: Opportunities and Challenges.* Plenary paper for Sustaining Cultural and Biological Diversity in a Rapidly Changing World: Lessons for Global Policy, New York.

Temesgen B., Mohammed U., & Korme, T. (2001). Natural hazard assessment using GIS and remote sensing methods, with particular reference to the landslides in the Wondogenet area, Ethiopia. *Physics and Chemistry of the Earth,* I (9), 665-615.

Terre Blanche, M., & Durrheim, K. (1999). *Research in Practice: Applied methods for the social sciences.* Cape Town: University of Cape Town Press.

Tewolde Berhan Gebre Egziabher (1991). Diversity of Ethiopian Flora. In J.M.M. Engels, J.G. Awkes and W. Melaku (Eds.), *Plant Genetic Resources of Ethiopia* (pp. 75–81). Cambridge: Cambridge University Press.

Thomas, G. (2011). *How to do your case study: A guide for students and researchers*. Thousand Oaks: Sage.

Thorley, A., & Gunn, C.M. (2008). *Sacred sites: An overview.* London: Gaia Foundation.

Tobler, W.R. (1976). Analytical cartography. *American Cartographer*, *3*(1), 21-31.

Turner, N., & Berkes, F. (2006). Coming to understanding: developing conservation through incremental learning in the Pacific Northwest. *Human Ecology, 34*, 495-513.

Tversky, B. (2002). What do sketches say about thinking? In T. Stahovic, J. Landay & R. Davis (Ed.), *Proceedings of AAAI spring symposium on sketch understanding.* Menlo Park: AAAI Press.

UNDP. (2011). Ethiopia Country brief 2011. Program Advisory Unit, last updated 2011.

UNEP. (2008). *Mainstreaming Environment and Sustainability in African Universities. Phase 1 Report*. Nairobi: UNEP.

UNESCO. (2007). *Links between cultural and biological diversity.* Report of the international workshop organized by UNESCO and the Christensen Fund. Paris: UNESCO.

, D., & Eyzaguirre, P. (2011). Social-ecological indicators of resilience in agrarian and natural landscapes. *Management of Environmental Quality, 22*(2), 154-73.

Visvanathan, S. (2006). Alternative science. *Theory, Culture and Society, 23*, 164-169.

Vygotsky, L.S. (1978). *Mind in society: The development of higher psychological processes.* Cambridge: Harvard University Press.

Walker, B. H., & Lawson, R. L. (2006). *Case studies in resilience: Fifteen social-ecological systems across continents and societies.The Resilience Alliance*. Retrieved August 28, 2011 from http://www.resalliance.org/1613.php

Walker, B.H., Holling, C.S., Carpenter, S.R., & Kinzig, A. (2004). Resilience, adaptability and transformability in social-ecological systems. *Ecology and Society, 9*(2), 5.

Walker, M. (1999). Basketry and biodiversity in the Pacific Northwest. In Posey, D. (Ed.), *Cultural and spiritual values of biodiversity* (pp. 86-87). London: UNEP/Intermediate Technology Publications.

Wals, E.J. (2007). Learning in a changing world and changing in a learning world: Reflexively fumbling towards sustainability. *Southern African Journal of Environmental Education, 24,* 34-62.

Wals, A.E.J., Van der Hoeven, N., & Blanken, H. (2009). *The acoustics of social learning: designing learning processes that contribute to a more sustainable world.* Wageningen: Wageningen Academic Publishers.

Wang (2003).Vygotsky and his theory. Retrieved August 20, 2011 from http://coe.ksu.edu/jecdol/Vol_3/articles/Wang.htm

Waters-Bayer, A. (1994). *Planning with pastoralists: PRA and more. A review of methods focused on Africa Deutsche GesellschaftfürTechnischeZusammenarbeit (GTZ) German Agency for Technical Cooperation*. Eschborn: GTZ.

Welmera Adminstration Bureau (2011). Basic Data: Wolmera Wereda and Telecho. Welmera Wereda, Ethiopia.

Wenger, E. *(*1998*). Communities of practice: Learning, meaning and identity*. Cambridge: Cambridge University Press.

Wenger, E., McDermott, R., & Snyder, W.M. (2002). *Cultivating communities of practice: A guide to managing knowledge.* Boston: Harvard Business School Press.

Wiggins, S. (2009). *CEDRA: Climate change and environmental degradation risk and adaptation assessment (Toolkit).* Teddington: Tearfund.

Wongbusarakum, S. (2009). Loss of traditional practices, loss of knowledge, and the sustainability of cultural and natural resources: a case of UrkLawoi people in the Adong Archipelago, Southwest Thailand. In P. Bates, M. Chiba, S. Kube & D. Nakashima (Eds.), *Learning & Knowing in Indigenous Societies Today* (pp. 73–85). Paris: UNESCO.

Wood, D. (2010). *Rethinking the power of maps.* New York: Guilford Press.

Wood, D. & Fels, J. (2008) *The natures of maps: Cartographic constructions of the natural world*, Chicago: University of Chicago Press.

Woodley, E. (2010). Cross-cutting analysis of the projects. In L. Maffi & E. Woodley (Eds.), *2010 biocultural diversity conservation: A global sourcebook.* London: Earthscan.

Woodward, D. & Lewis, G.M. (1998). *The History of Cartography. Volume 2. Book 3. Cartography in the Traditional African, American, Arctic, Australian, and Pacific Societies*. Chicago, University of Chicago Press.

Yeraswork, A. (2001). Overview of natural resource management in Ethiopia and policy implications. In A. Pankhurst (Ed.), *Natural resource management in Ethiopia: Proceedings of the workshop organized by the Forum for Social Studies in collaboration with the University of Sussex (*pp. 3-9). Addis Ababa.

Yin, R.K. (2003). *Case Study Research Design and Methods* (3rd ed.). London: Sage.

Yin, R.K. (2009).*Case study research: Design and research* (4th ed.). London: Sage.

Yirga, C. (2007). *Land tenure security and adoption of natural resource management technologies in Ethiopia.* Addis Ababa: Holetta Agricultural Research Center, EIAR.

Zent, S. (1999). The Quandary of Conserving Ethnobotanical Knowledge: A Piaroa Ex- ample. In T. Gragson & B. Blount (Eds.), *Ethnoecology: Knowledge, Resources, Rights* (pp. 90-124). Georgia: University of Georgia Press.

Zent, S. (2009). Traditional Ecological Knowledge (TEK) and Biocultural Diversity: A close-up look at linkages, declaring trends, and changing patterns of transformation. In P. Bates, M. Chiba, S. Kube & D. Nakashima (Eds.), *Learning and knowing in Indigenous Societies Today*. Paris: UNESCO.

Appendices

Appendix 1: Case study record – 1st round

Appendix 2: Case study record – 2nd round

Appendix 3: Maps

- Appendix 3.1: GIS Map of the Foata Mountains
- Appendix 3.2: GIS Map of the Bale Mountains
- Appendix 3.3: Ecological calendar of the Horo Soba *kebele*, Bale Mountains
    - Appendix 3.3.1: Calendar of the past
    - Appendix 3.3.2: Calendar of the present
    - Appendix 3.3.3: Calendar of the future if things go on as usual
    - Appendix 3.3.4: Calendar of the future if things change for the better
- Appendix 3.4: Ecological calendars of the Telecho *kebele*, Welmera *wereda*, Foata Mountains
    - Appendix 3.4.1: Calendar of the past
    - Appendix 3.4.2: Calendar of the present
    - Appendix 3.4.3: Calendar of the future if things go on as usual
    - Appendix 3.4.4: Calendar of the future if things change for the better

Appendix 4: Summary of interview with MELCA staff

Appendix 5: TOR for the digitizing the participatory maps

Appendix 6: CD Rom

Appendix 1: Case study protocol to be used for Horo Soba kebele (Dinsho wereda, Bale) and Telecho kebele (Welmera wereda)

Case study questions

a. What are the biocultural knowledge and practices of the Telecho and the Bale community related to their landscape
    i. How did their landscape change over time?
    ii. Why did the change happen?
b. What did they learn and how during the participatory mapping process?

Data collection procedure

c. Names and sites for the study – Horo Soba community, Dinsho *wereda* Bale and Telecho community, Welmera *wereda*.
d. Data collection plan
    i. Defining the area to be mapped with stakeholders
    ii. Meeting with stakeholders, mainly local communities and relevant government offices at the *wereda* and k*ebele* level, and explaining the purpose and the techniques of mapping.
    iii. Choosing the scale for P3DM and 2D scale mapping and preparing the base map
    iv. Preparing logistics
    v. Selecting, convening and orienting community representatives and students
    vi. Manufacturing the blank model by the students and depicting mental maps
    vii. Documenting the process through audio, video and writing
    viii. Taking photo of the models and cartographic processing
    ix. Cross checking and validation

Expected preparation

    x. Informing the MELCA office of the purpose of the meeting
    xi. Identification of participants both from the schools and the community
    xii. Check with Giacomo whether or not we can use the money for the film showing and reflection on the model
    xiii. Looking for a good person to do the digitization process
    xiv. Preparing materials including: source of electricity (generators), good recorder, video (?), comfortable chairs for elders, etc.

Case study interview guides

    xv. To the community
        1. What was your experience in the mapping process?

2. Pointing at the map, what are the relationships among the rivers, the mountains, the grazing land, you, the cattle, etc?
3. How did this relationship change?
4. When did it start to change and why?
5. What will be the difference if they did the mapping as an individual? How did working as a group help?
6. What surprised you about yourself in the mapping process? Was there a moment when you said to yourself 'oh I did not know that I know this?' If then, at what moment?
7. What do each of these elements on the legend indicate?
8. Is there any other element that is not on the legend?
9. What have you felt after the modeling process ended?
10. What do you think can be done in the future to reverse the situation?
11. How are you going to use the model?
12. What have you learnt that you did not know before
    a. Cultural
    b. Environmental
    c. Economic
    d. Social
    e. Intergenerational
    f. Any other?
13. Did you learn anything because of the interaction that you had today (on the day of the discussion)

xvi. To the students
1. How did you see your role in the mapping process?
2. How did your view of the following change after the mapping?
    a. environment
    b. culture
    c. relationship with the elders
3. What have you learnt during the mapping process?
4. Did you have a moment when you said 'Aha' because of something that you know but thought did not know?

xvii. To government staff
1. What was your involvement during the mapping process?
2. How did you know about it?
3. What has changed in your mind because of the mapping process?
4. How are you planning to use the model and the maps?

xviii. To MELCA staff who participated in the mapping processes (Shimeles, Samrawit Tesfaye (both), Abebayehu, Kirubel, Mersha)
1. What was your role in the mapping process?
2. What is your feeling about the process
3. Did you learn anything in the process? If so, what in detail?
4. Do you honestly think that the model/ maps will be useful? If so, how?
5. Who should be involved in using them? Why?

<u>Appendix 2</u>: Case study protocol to be used for Horo Soba kebele (Dinsho wereda, Bale) and Telecho kebele (Welmera wereda) for further discussion

Case study questions

a. What are the biocultural knowledge and practices of the Telecho and the Bale community related to their landscape?
    xix. How did their landscape change over time?
    xx. Why did the change happen?
b. What did they learn and how during the participatory mapping process?
c. Has the learning led to any other kinds of action? If so, what?

Data collection procedure

d. Names and sites to be visited – Bale and Telecho community
e. Data collection plan
    xxi. There will be a meeting for the Telecho *kebele* representative communities
    xxii. An ecological calendar will be done with the representatives of the community. The calendar will be presented to the bigger group and we check whether or not it represents what actually happens throughout the year.
    xxiii. At Telecho, the film done by Jess will be shown and they will be asked about their reflection
    xxiv. There will also be a separate meeting with students who participated in the mapping process
    xxv. The data collected on the Telechoand Horo Soba Kebeles and the WelmeraWeredaand the DinshoWeredawill be further strengthened.
    xxvi. Discussion with office staff who participated in the process. I will also present to them the draft analysis data that I have and ask them to confirm.
    xxvii. Discussion with government officials who participated in the process.
    xxviii. Visiting the Ethiopian Cartographic Agency, Addis Ababa University Geography Department and the Addis Ababa University Science faculty, the AAU geology department and also some NGOs who have a history of doing participatory mapping.

Expected preparation

    xxix. Informing the MELCA office the purpose of the meeting
    xxx. Identification of participants both from the schools and the community
    xxxi. Check with Giacomo whether or not we can use the money for the film showing and reflection on the model
    xxxii. Looking for a good person to do the digitization process

xxxiii. Preparing materials including: source of electricity (generators), good recorder, video (?), comfortable chairs for elders, etc.

Case study interview guides

xxxiv. To the community

1. What was your experience in the mapping process?
2. Pointing at the map, what are the relationships among the rivers, the mountains, the grazing land, you, the cattle, etc?
3. How did this relationship change?
4. When did it start to change and why?
5. What will be the difference if they did the mapping as an individual? How did working as a group help?
6. What surprised you about yourself in the mapping process? Was there a moment when you said to yourself 'oh I did not know that I know this?' If then, at what moment?
7. What do each of these elements on the legend indicate?
8. Is there any other element that is not on the legend?
9. How do features in the legend relate with each other? For example, is there a relationship between agricultural land and the forest?
10. What did you feel after the modeling process ended?
11. What do you think can be done in the future to reverse the situation?
12. How are you going to use the model?
13. Who should be involved?
14. What have you learnt that you did not know before
    a. Cultural
    b. Environmental
    c. Economic
    d. Social
    e. Intergenerational
    f. Any other?
15. Did you learn anything because of the interaction that you had today (on the day of the discussion)

xxxv. To the students

1. How did they see their role in the mapping process?
2. How was their experience with their landscape before the mapping?
    a. With their environment
    b. With their culture
    c. With their action in school
    d. With their relationship with the elders
3. How did this change after the mapping?
    a. With their environment

b. With their culture
c. With their action in school
d. With their relationship with the elders

4. What have they learnt during the mapping process?
5. Did they have a moment when they said 'Aha' because of something that they know but thought did not know?
6. Have they done anything as the result of the mapping process?
7. What did they learn today because of this group discussion?

xxxvi. To government staff

1. What was their involvement during the mapping process?
2. How did they know about it?
3. What has changed in their mind because of the mapping process?
4. Have they done anything new because of the mapping process? What and why?
5. Did their view of the community changed because of the mapping process? If so, how?
6. How are they planning to use the model and the maps?

xxxvii. To MELCA staff who participated in the mapping processes (Shimeles, Samrawit Tesfaye (both), Abebayehu, Kirubel, Mersha)

1. What was your role in the mapping process?
2. Shimeles and Tesfaye (How did they go about organizing the local government and the local community? Who helped them in the process?)
3. What is your feeling about the process
4. Did you learn anything in the process? If so, what in detail?
5. Do you honestly think that the model/ maps will be useful? If so, how?
6. Were the Participatory maps produced by the local communities of Horo Soba and Telecho useful? How?
7. What shall we do to use the models effectively?
8. Who should be involved in using them? Why?
9. Did you learn anything from the discussion that we had today? If so, what?

Appendix 3: Maps

- **Appendix 3.1:** GIS Map of the Foata Mountains
- **Appendix 3.2:** GIS Map of the Bale Mountains
- **Appendix 3.3:** Ecological calendars of the Horo Soba *kebele*, Bale Mountains
    - Appendix 3.3.1: Calendar of the past
    - Appendix 3.3.2: Calendar of the present
    - Appendix 3.3.3: Calendar of the future if things go on as usual
    - Appendix 3.3.4: Calendar of the future if things change for the better
- **Appendix 3.4:** Ecological calendars of the Telecho *kebele*, Welmera *wereda*, Foata Mountains
    - Appendix 3.4.1: Calendar of the past
    - Appendix 3.4.2: Calendar of the present
    - Appendix 3.4.3: Calendar of the future if things go on as usual
    - Appendix 3.4.4: Calendar of the future if things change for the better

Appendix 4: Summary of reflections by MELCA staff

	Engagement	Experience	Self change	Criticisms	Future usage	Change in communities
Mersha	Model building in Masha and Telecho and facilitating interviews and mapping	Appreciating - the knowledge of people, value of tool in participating, empowerment, critical awareness and agency of people	Mapping should expand. Seeing maps as community heritage.	Limited to specific area, not widely implemented, maps not used by stakeholders; model may not last long.	Critical for conservation of biocultural diversity, should be used widely, use of other materials for durability	They could see change in their environment and decided to act
Shimeles	Coordinating, facilitation and research	Found it to be the best tool, better than other methodologies. Prior organization critical.	Felt like a dream that people can do it. Mobilizes people and government. Mobilizes working spirit. Changed the view of decision makers.		Models can help in mobilizing people and for education.	There is change in community in SWC and in seed saving.
Endale	Coordinating, facilitation and research	Was not sure in the beginning but found it educative and interesting.	Impressed by youth's motivation, and knowledge of people.		Schools use it for educating and Agri-bureau for planning. Should be introduced to universities.	
Kirubel	Participation and coordination	Appreciated team work of youth and got true meaning of TEK. Asked 'what is knowledge and who produces it and for what?'	Was eye opening to people's knowledge of their territory.	Only few members of community participating. May be cause of conflict in community because of participation and representation.	Not sure! May be good for intergenerational learning and planning but not sure. Good for documentation of TEK. Not sure if mapping can be used for change.	Uplifting and motivational while doing but did not see it translated in to action.
Tesfaye A	Coordination, participation and facilitation	Appreciated knowledge of elders and work coordination among elders and youth. Shows where we are and where we want to go.	Appreciation of people's spirituality, spatial knowledge. Aware of people and nature linkage, cause of change & conflict of interest.	Time given to community was short. Not enough decision makers' participation. Field visit not included. No distribution of reference materials.	It must be done. Already donor funded. SEGNI and mapping are the identity of MELCA so we do it more.	They were sad during mapping and determined but no idea whether this is translated in to action.

	Engagement	**Experience**	**Self change**	**Criticisms**	**Future usage**	**Change in communities**
Tesfaye B	Coordination, facilitation and research.	Was amazed at elders' knowledge.	Appreciated community knowledge and power of mapping.	Service not equal with cost of production. Difficult to persuade govt and community to use. Usage and integration in to work not thought of.	Integrate in to work and think of usage	Change of attitude seen
Abebayehu	Coordinating and logistics, facilitation and research	Impressed with: knowledge of elders, participation, affirm MELCA's philosophy, can motivate stakeholders	Appreciating elders, convinced of power of mapping, value for SEGNI, involves community. For conservation	Creating awareness is not enough; Not clear how to implement decision of participants. Need to be supported with proposal .	Linkage with advocacy. Need to revisit our strategy.	They said they will change but little change on ground
Befkekadu	Coordinating logistics, participating in eco-mapping	Process active and real. Genuine participation. Result unique and informative. Using GPS and satellite data marvellous.	Felt power of maps for: participation visualizing biocultural diversity, planning, motivation, motivates donors.	Goal not mapping. Think of usage from start. We did not popularize it.	Think of spreading usage. Think of properly utilizing maps made.	Motivation for SWC improved. Motivation for revitalizing farmers' varieties.
Keria	Coordinating logistics and facilitation.	Was worried that it won't work but impressed with participation of students and community.	Got a skill on mapping. Appreciated knowledge of elders.	Very costly. Identifying sacred sites could be risky.	Learning tool for youth; resource for visitors and researchers; advocacy. Continued training for govt officials;	Started conversation between community. and govt officials on change and protection;
Samrawit	Participating	Appreciate Participating power. Convenient for work with communities.	Felt it can bring change because of participating ability	Expensive and needs professional guidance	Should continue. Not being utilized for change. Use it for SWS.	Saw changes during mapping- they were able to explain and educate.

Most of the staff were engaged in coordinating logistics, which means both material and organization of communities, participating in the event, facilitating both model building with youth and cognitive mapping and legend making. Some participated in research during eco-cultural calendars and some in interviewing participants.

Most found the team work among youth enlightening. Youth can achieve if they are given an interesting/motivating project and a clear way of delivering. What amazed most is the knowledge of the people of their biocultural landscape. They found their views totally challenged and changed because of this experience. All found the methodologies very powerful for mobilizing people's knowledge and for externalizing peoples internal traditional ecological knowledge. Most were also impressed by the participative power of the methodology.

View ranged from seeing maps as cultural heritage to the experience being an eye opening to most. Some said they got the skill of mapping and other appreciated the spiritual significance of the exercise. It was a revelation to others in terms of the power of the tool in visualizing linkages between nature and culture.

The biggest criticism is that the mapping was not well thought of from planning to implementation. The focus was in getting the mapping done. Others felt that is a very expensive endeavour and as such it was not used properly by stakeholders. Some said that time given was not enough and while others expressed their concern of putting sacred sites on maps. Others also questioned how much we call it participatory when a few members of community are participating and whether it is enough to do maps for mobilization

Suggestion for usage range from using it for planning for SWC to using for intergenerational learning. Others suggested promoting it to universities and other for extending the involvement of elders for and do a proper documentation of features mapped. Others also recommended usage for advocacy

On this critical issue, most said it was evident that the people were highly motivated, sad, happy and determined to change the status quo.

Appendix 5: TOR for digitizing the models

Value addition to the data displayed on the P3DM model of the Foata Mountain, Ethiopia

This is the continuation of the project 'Training on Participatory 3D Modelling at Foata Mountain Range, Ethiopia' under the "Promotion of Collaborative Spatial Information Management and Communication in East and Southern Africa" (Project N°: 2-1-21-203-0) implemented by MELCA – Ethiopia and CTA in Ethiopia.

In the first phase of the project, participants from African countries and the Telecho community have successfully built the 3D model which was then photographed at high resolution in view of data extraction and import into a GIS.

As discussed with the Programme Coordinator we envisage supporting the participation of one student from the University of Nairobi, Kenya, to implement the data capturing phase in order to produce data layers which could be used by different actors: the local community, the local government, universities and MELCA – for planning and decision making purposes.

During the December 2010 event, Dr. Shadrak Murimi, representative from the University of Nairobi took the lead in introducing participants to the extraction of data from the 3D model and their digitization using QGIS (an open source GIS). At that time Mr Rambaldi had already invited MELCA to consider further collaboration on the matter with the Nairobi University.

The proposed activities are a logical follow-up of the model making and will add value to the outcome of the December 2010 exercise.

Proposed activities

- Data geo-referencing
- On screen digitizing
- Data elaboration and manipulation
- Field verification

Outputs

The project will have the following outputs:

- A printed copy of the processed maps

- An electronic document of the whole process
- A report of the process

Actors involved

MELCA-Ethiopia, CTA and the University of Nairobi will be the main actors involved in this phase of the process.

The University of Nairobi will assign one MSc student to the task. The student will be based at MELCA's office in Addis Ababa, Ethiopia and will travel in country for the purpose of data extraction and validation. MELCA will provide a working space and a computer.

Dr. Shadrak Murimi, lecturer at the University of Nairobi will come to Ethiopia to supervise the student.

Financial aspects

Planned activities will be conducted within the framework of existing project budget lines and without exceeding the funds allocated to the project by CTA.

Appendix 6: CD Rom: Case record inventory

The CD Rom contains photographs, audio recordings of all discussions and interviews, indexed interviews, processed data (first draft narratives), reports (processed data) and film data. Details are outlined in Table 5.1 on p. 175.