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Living in the Ecosystem Frontier

**Ecosystem boundaries, ecological distribution conflicts
and discourse constructions in rural Northern Uganda**

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Abstract

Environmental degradation is often understood as linked to poverty and ignorance of ecosystem values. Taking point of departure in the theories of ecological economics and political ecology, this study seeks to offer an alternative explanation of the concurrence of environmental degradation and economic challenges. Through participatory observation, semi-structured interviews and group interviews, the study investigates the production-consumption patterns of farming, brickmaking, charcoal burning and fishing in Apac district, Northern Uganda. While brickmaking is aimed at local consumption, farming, charcoal burning and fishing are partly for external consumption indicating a net outflow of labour, materials and energy, eventually leading to social and environmental impoverishment. The study further shows that the environmental impacts, in the form of soil degradation, loss of ecosystem services, deforestation and depleted fish stocks, are only affecting producers and the rest of the community, and are thus unequally distributed among producers, consumer and other actors. The environmental impacts are, however, mostly discursively constructed as local challenges of poverty, ignorance and poor attitudes. The subsequent responses are predominantly aimed at producers focussing on sensitisation, regulation and promotion of 'modern' technologies to increase production. The study concludes that current responses cannot fully address the production-consumption patterns, and hence have limited impact on the net outflows of labour, materials and energy.

Key words: Ecosystem boundaries, ecological distribution conflicts, environmental degradation, ecological economics, political ecology, rural communities, northern Uganda.

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Abbreviations

BMU	Beach Management Unit
CSO	Civil Society Organisation
DPU	District Planning Unit
EDC	Ecological Distribution Conflicts
ELD	Environmental Load Displacement
GoU	Government of Uganda
LC	Local Council
LRA	Lord's Resistance Army
NAADS	National Agriculture Advisory Service
NFA	National Forest Authority
NRM	National Resistance Movement
NUSAF	Northern Uganda Social Action Fund
TSEA	Time-Space-Emergency Appropriation
UNEP	United Nations Environment Programme
UPC	Uganda People's Congress
WCED	World Commission on Environment and Development

1. Introduction

1.1 Research area

Environmental degradation and natural resource depletion are topics that have increasingly come to the global agenda. This is for instance seen in a growing awareness of widespread deforestation, soil degradation, contamination of water sources, desertification and loss of biodiversity. Environmental degradation is for instance seen in Apac district in Northern Uganda¹. Favoured with various natural resources such as fertile soils, wetlands, lakes, rivers and forests, the main economic activities are farming and fishing supplemented by charcoal burning and brickmaking. However, while people are struggling to get food on the table, proper clothing, education and maintain a good health, the soils, wetlands, forests and fish stocks are depleting around them leading to low crop yields, small fish catch, loss of ecosystem services and seasonal disasters such as flooding and droughts. With the abundance of natural resources, it is essential to ask why people in Apac district are experiencing environmental degradation and economic challenges².

Environmental degradation has often been linked to poverty; the two reinforcing each other in a vicious cycle, where poverty is both the cause and consequence of environmental degradation. Headed by the World Commission on Environment and Development (WCED) (1987) with the publication '*Our Common Future*', this link has been asserted by a number of scholars and institutions (see e.g. Leonard *et al.* 1989; Munasinghe 1999; UNEP 1999, 2002; World Bank 1992). It seems to be a general assumption that people who are poor '*cannot afford to take proper care of the environment*' (SADC 1994 in Byarugaba 2003:3), they have a short-term perspective, and their limited ability to plan ahead makes them degrade resources (Byarugaba 2003:3-4; Nkonya *et al.* 2004:9-10). In addition to poverty, environmental degradation is often linked to ignorance and the limited awareness of the value of ecosystem services (see e.g. Boelee *et al.* 2011:25; Friend 2007:48; Jogo & Hassan 2010:1570; Ravindran 2012:77).

As noted by several scholars, the above problem analysis often leads to a response based on awareness creation, technological solutions and economic growth (Bassett & Zuéli 2003:116-117; Clark & York 2012:26; Daly 2007:12; Røpke 2013; Zimmerer 1996:115). However, by focusing on

¹ Apac is pronounced 'Apach'.

² In this study the term 'economic challenges' refers to '*a situation in which households are unable to satisfy their basic needs for food, clothing, shelter, health care, and functional literacy*' (Yapa 1996:70).

technological solutions, we risk only providing superficial change, not addressing underlying causes or questioning the underlying development pathways (Eriksen *et al.* 2011:9-10).

Instead we need to step back and look at the big picture (Odum 2007:2-3). We live in one global ecosystem, the biosphere, with society and the economy being a subsystem thereof (Daly 2007:2; Meadows *et al.* 2004:4; Shmelev 2012:6). As the economy expands, it starts encroaching on natural resources, eventually reaching the ecosystem boundaries³ (Daly 2007:12). Navigating within these ecosystem boundaries implies a distributional aspect in terms of access to resources and the burden of environmental impact (Martinez-Alier 2010:6). This is the object of study of ecological economics and political ecology. While the theory of ecological economics studies the clash between the ecosystem boundaries and the economy (Martinez-Alier 2002:vii), political ecology investigates how environmental impacts are distributed among different groups and how they are discursively constructed (Martinez-Alier 2002:256). By placing the issue of environmental degradation into a larger political and economic context (Robbins 2004:14), these theories may offer valuable insight to local environmental degradation and economic challenges experienced in Apac district.

1.2 Research questions

Based on the above, the purpose of this study is to investigate *how ecosystem boundaries and ecological distribution conflicts can explain local environmental degradation and economic challenges in Apac district*. Further, the study investigates *to what extent the current responses from local government, civil society organisations (CSOs) and communities address the drivers of environmental impact from this perspective*.

With point of departure in land, wetlands, forests and lakes, I will analyse the four main economic activities – farming, brickmaking, charcoal burning and fishing – through qualitative data derived from observations and interviews. The specific research questions are as follows:

1. What are the production-consumption patterns⁴ and subsequent flows of labour, materials and energy of farming, brickmaking, charcoal burning and fishing, respectively?

³ Ecosystem boundaries are in this study understood as the outer limit of the ecosystem, which are dynamic and flexible, but which are increasingly under pressure from society and the economy. As seen in figure 3: *Model of analysis*, p.26, there are both global ecosystem boundaries (the global biosphere) and local ecosystem boundaries, for instance demarcated by a catchment area.

⁴ Production-consumption pattern is in this study understood as an indicator of whether a product is produced for local or external consumption.

2. What are the socioeconomic and environmental impacts of these patterns and flows?
3. How are the environmental impacts distributed among producers, consumers and other actors?
4. How are the environmental impact distribution discursively constructed, and what are the following responses?
5. To what extent do the discursive construction and following responses address the drivers of environmental impact and the underlying production-consumption patterns?

1.3 Contribution to academic debates

With this study I wish, first of all, to understand the environmental degradation and economic challenges I experienced when conducting field research in Apac district. Using the theories of ecological economic and political ecology this will add to the literature of ecosystem boundaries and ecological distribution conflicts. As outlined in section 4, much of the current literature of ecological economics is focussing on a sustainable transition of the economy in affluent countries, with little attention to the challenges in less affluent countries, where the ecosystem boundaries are more acutely felt. Furthermore, the literature in political ecology is mostly focussing on global environmental injustices between multinational corporations and local populations in less affluent countries. My intention is thus to investigate to what extent the theory of ecological economics can be used to understand local ecosystem boundaries in a less affluent country, and the extent to which political ecology can be used to explain unequal exchange in a convention market situation. While I do not provide quantitative evidence, I wish to illustrate that there are clear indications that ecosystem boundaries are being surpassed and the effects are unequally distributed between actors. This will hopefully inspire others to conduct further research.

1.4 Outline of thesis

After this introduction, Chapter 2 will present the background of Apac district, outlining the natural resources and the economic activities subject of this study, while Chapter 3 will present the methodological considerations. Following this, Chapter 4 will form the theoretical framework based on ecological economics and political ecology, highlighting the key analytical concepts employed in the analysis. In Chapter 5 the empirical data for the four economic activities – farming, brickmaking, charcoal burning and fishing – is analysed through the perspective of ecosystem boundaries and environmental distribution conflicts. Finally, Chapter 6 presents the main conclusions, the contribution to the academic debate and suggestions for further research.

2. Setting the stage: Apac district

Apac district is located in Northern Uganda approximately 250 km north of the capital Kampala (see figure 1). The total area of the district is 2,847 km², and the total population is 339,647 (2011), giving a population density of 119 persons/km². The population is mainly rural with only 4% residing in urban areas. Due to high influx of internally displaced people, Apac district was indirectly affected by the insurgencies brought about by the clashes between government and Lord's Resistance Army (LRA) from mid 1990s to early 2000s (interviews⁵ SCb; CSd). While the migration has declined since the insurgencies ended, the population is still increasing due to high fertility, reduced child mortality and a prolonged life expectancy (DGa; DGb; DPU 2012:1-2).

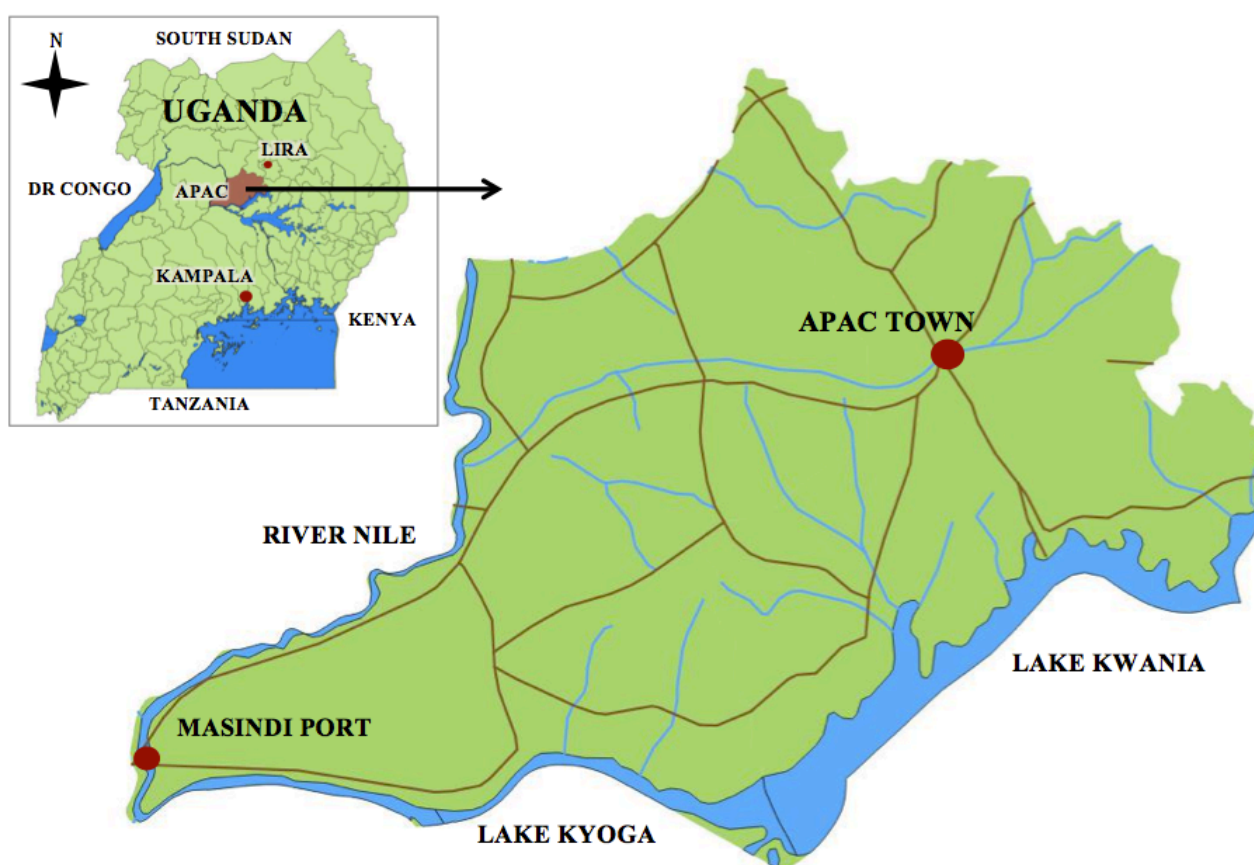


Figure 1: Map of Apac district.

Composed by the author (data source: DIVA-GIS 2013)

⁵ See coding principles in Appendix I.

Uganda operates with four levels of local government: district, sub-county, parish and village headed by the Chief Administrative Officer, Sub-county Chief, Local Council (LC) 2 and LC1, respectively (DGd). The local government in Apac is occasionally implementing projects in cooperation with the CSOs working in the district (e.g. DGA; DGc; SCa; CSd). A few CSOs have implemented projects in the sub-county where this study was conducted, but only one is currently active there (SCc; CRb; CRc; CRd).

The sub-county of study has a population of 36,414 people sharing an area of 678 km² (DPU 2012:4). The sub-county is sparsely connected by a few murram (laterite) roads, which often get flooded during the rainy season, making transportation very difficult (e.g. DGc; CRE; GLe; GIf). There is no electricity in the sub-county, but solar panels are sporadically installed and used for charging mobile phones and running TVs at the trading centres (CRh; CSe). Radios are relatively common, while cell phones have limited connectivity and are more unusual.



Photo 1: Murram road, Apac district.

Photo by the author

Based on this, Apac district can in world-system terminology be considered a triple periphery⁶. First, as part of a less affluent country it belongs to the *global* periphery. Second, located in the Northern Uganda it can be characterised as the *national* periphery, due to the historical and political

⁶ See explanation of world-system theory in section 4. Ecological economics and political ecology.

marginalisation⁷. Finally, with limited connectivity, electricity and industry it may be considered as a *regional* periphery.

2.1 Natural resources and economic activities

Apac district is enriched with a variety of natural resources including fertile soils, wetlands, woodland, bush and grassland, which together with the Lake Kyoga, Lake Kwanja and the River Nile, provide vital sources of livelihoods for the majority of the population (e.g. DGb; SCc; CRg; CSd; GIa).



Photo 2: Cassava, Apac district.

Photo by the author

Around 63% of the total area in Apac district is arable land and the majority of the population (91%) are engaged in agriculture (DPU 2012:1-2). The main crops are cassava, beans, sunflower, soybeans, groundnuts, simsim (sesame), maize, sorghum, millet and potato (e.g. DGe; SCb; CRc; CRf). Cotton and bananas used to be very important crops to, but due to price fall and diseases, respectively, production has halted and farmers have turned to other crops (SCb; CSe; GIa). Livestock rearing of goats, sheep, cattle pigs and poultry is widespread (GIb). The land tenure

⁷ This is for instance seen in the current political constellations with the national ruling party being the National Resistance Movement (NRM) and the local ruling party being Uganda Peoples Congress (UPC) and in the insurgencies in Northern Uganda from mid 1990s to early 2000s (CSb; CSe).

system is mainly customary⁸, and the average land plot size is estimated to be around 3-5 acres per household. Due to population increase and the custom of each male child inheriting a part of the family plot, the average land plot size is decreasing for every generation (e.g. CSa; GIa; GIF).

Covering around 30% of the district (DPU 2012:1), wetlands constitute another vital resource in the district. According to national regulations, all wetlands are public lands held in trust by the government on behalf of the people. They are open for public use like grazing, harvesting papyrus and cultivation, as long as the use does not exceed 25% of total wetland area (DGB; GoU 1995; GoU 2000:3(2)). However, one respondent refer to a local bylaw indicating that wetlands cultivation is completely illegal in Apac district though this is unclear (DGC). As many wetlands are seasonal and/or situated within individual or communal land holdings and poorly demarcated, the regulations are often transgressed (DGB; DGD). Wetlands are considered among the world's most valuable ecosystems and provide essential materials and services (Boelee *et al.* 2011:31; Friend 2007:10). In Apac they support the communities by supplying fresh water resources, construction material, grazing areas as well as ecosystem services as flood regulation and drought control, hence providing a buffer against seasonal disasters and extreme weather events (e.g. DGB; DGD; CRC; CRF).

Other important resources are the forest areas, which cover around 15% of the district (DPU 2012:1). Some of the forests are protected in the eight local and twelve central forest reserves⁹ (DGB). Forests are supporting the communities by providing firewood, wood for charcoal, timber for construction, medical plants as well as wildlife habitat (DGD; CRC). Moreover, trees are important for regulating the microclimate, providing shade and windbreaks, limiting soil erosion, regulating floods and controlling droughts (DGD; SCC).

⁸ Uganda employs four types of tenure: customary, leasehold, freehold and mailo. *Customary land* is owned in perpetuity, typically guided by local customary regulation and management, and can be held by communities, households or individuals. *Freehold land* may be held in perpetuity or for a period of time, and may be subject to conditions, restrictions and limitations. *Leasehold tenure* is created by contract or by law, and may be subject to terms and conditions. Finally, *mailo* is held in perpetuity and was granted by the British colonisers to the Buganda royal family. (GoU 1998:§§2-3; Nkonya *et al.* 2004:8-19)

⁹ There are four types of forest reserves in Uganda: central forest reserves, local forest reserves, community forest reserves and private forest reserves. Central forest reserves are managed by the National Forest Authority (NFA), while local forest reserves are managed by the local district government. (DGB; GoU 2003:§33)

Finally, around 11% of the district area is open water¹⁰ (DPU 2012:1), supplying fresh water resources for the communities for drinking, cooking, cleaning as well as for watering cattle (DGB; GIf). Moreover, the lakes and river are supplying fish to the communities and are according to many of the respondents the most important natural resources in the district (e.g. DGc; SCb; CRh; GIa).

While some people rely only on farming or fishing, many diversify their livelihoods through charcoal burning, brickmaking, hunting, bee-keeping and sand-quarrying. Others are selling wood logs for smoking fish at the landing sites, producing local brews, or running small shops at the trading centres selling soaps, biscuits, sugar, cooking oil and soda. (e.g. DGe; SCc; CRh; GIb; GIe). There is very little or no industries in the district partly due to the instability in the electricity provision (CSe; DGA). However, there are a number of traders facilitating the market exchange of agricultural products and charcoal to industrial centres (DGB; SCc; CSe; GIc). This will be elaborated upon in the analysis.



Photo 3: Trading centre, Apac district.

Photo by the author

¹⁰ The reason for the sum of the percentages of the four resources (land, wetlands, forests and open water) exceeding 100% may be the seasonality of wetlands.

3. Methodology

In the following, the methodology guiding this study is outlined. This includes research design, data collection methods, challenges of data collection and analysis, as well as a discussion of the validity and reliability of the study.

3.1 Research design

This study has been guided by an explorative research design, where I have tried to understand the environmental degradation and economic challenges that I encountered in Apac district in Northern Uganda. Taking point of departure in the situation on the ground, I tried to understand 'reality' as expressed by my respondents and as it unfolded for me. While this process has generated a lot of data, it has also allowed me to get a more comprehensive understanding of the research area.

In my quest to understand the environmental degradation and economic challenges, I found the theories of ecological economics and political ecology to complement each other very well. While the theories integrate the social and ecological dimensions, and thus allow for both quantitative and qualitative methods to capture the biophysical as well as the social constructivist aspects of the human ecosystem, I have in this study only employed qualitative research methods. In this way, my study can be understood as a theoretical reflection of my observations, experiences and encounters in Apac district, where I point to indications of theoretical concepts that can be investigated further in quantitative terms. While each of the four economic activities – farming, brickmaking, charcoal burning and fishing – could have been a study in itself, I chose to look at them in combination to give a comprehensive understanding of local environmental degradation and economic challenges. In this way this can be considered a 'pre-study' opening the field for further research.

3.2 Data collection

The data collection has mainly taken place during a two-months stay in Apac district, Northern Uganda, from December 2012 to January 2013, where I was based with a local branch of a national CSO working in the field of disaster risk reduction. Given the restricted timeframe, I am aware that I may not have gained a full understanding of all the social and environmental processes taking place, but I believe that my explorative research design and my daily interactions with some of the respondents have given me a good understanding of the research area. Since there is not much

written about Apac district, a major part of the information provided in the background section is based on statements from my respondents.

The data collection methods employed were participatory observation, semi-structured interviews and group interviews. My main observations were made from the district capital, Apac town, where I was based, and where the district government and most CSOs are located. During my stay I visited the sub-county and the two parishes of study eight times, and I can therefore draw some general observations from these visits as well.

In addition to this, I conducted interviews with six district government officials (DG), four sub-county government officials (SC), eight community representatives (CR) and five staff from local CSOs (CS) (see list of respondents and coding principles in Appendix I). Further, I conducted six group interviews (GI) at parish level; three in each parish with 8-12 people in each group, the groups being divided into men, women and youth, respectively. Basic information such as age, village and educational level was registered to get an overview of the composition of the groups (see group composition in Appendix II). The grouping ensured that the views of these three groups were all represented and allowed for possible difference in opinions between the groups to emerge. While I do not consider neither these three groups nor the communities as unified entities, I use statements from individuals in the analysis to indicate common opinions in the communities.

The interviews were conducted in a semi-structured manner with a range of questions and topics prepared on beforehand, but allowing the conversation to take different routes along the way (see the interview guides in Appendix III). The wide selection of respondents was a method to investigate differences in the understanding of environmental degradation and economic challenges among various actors, as well as to triangulate data and account for possible bias from respondents and from translation.

The sampling methods range from convenience and semi-purposeful to purposeful sampling. First of all, the sub-county and the parishes were selected through convenience sampling, as this was where my host CSO was implementing a project. The selection of project sites was from the CSO's part in cooperation with the local government officials based on an investigation of the most vulnerable sub-county and parishes in terms of seasonal disasters such as drought and flooding. Second, the government officials and CSO staff were selected through purposeful sampling, while

the community representatives were selected by semi-purposeful/convenience sampling. I asked my gatekeeper to invite the LC2 from the two parishes, two of the ten LC1s from each parish, as well as the two chairpersons from the community groups established by my host CSO in connection to their current project in the parishes. Likewise, the respondents for the group interviews were selected through semi-purposeful sampling as the two chairpersons from the community groups assisted the sampling of respondents. While this may have brought bias, people from each of the four economic activities subject of this study were represented in the groups. Since a wide range of opinions was expressed, I consider the groups fairly representative.



Photo 4: One of the interview settings, Apac district.

Photo by the author

3.3 Challenges of data collection and analysis

During group interviews and interviews with community representatives the gatekeeper from my host CSO worked as translator. Given that most respondents know basic English, I believe they would have objected in case he made incorrect translations. Being affiliated with the CSO, I easily gained access to respondents and study sites, and my study was legitimised through the current project of the CSO. On the other hand, being associated with the CSO may have brought some bias

in the responses, as the respondents may have had expectations of funding for project activities, and thus exaggerated their challenges, needs and wishes. Since I am not able to fulfil these expectations, I tried to apply appreciative inquiry (Mikkelsen 2005:244-245) by asking into both challenges and strengths of the communities, and by encouraging the communities to organise themselves to work with relevant livelihood improvements. Moreover, I sought to overcome potential bias by consulting a wide range of sources to triangulate my data. However, being dependent on a translator during group interviews and interviews with community representatives gave me less control over the interview situation. On the other hand it allowed me to get an elaborate explanation of certain phenomena (e.g. customs, family relations) from the translator after the interviews.

As I started analysing the data, I faced a common challenge for fieldwork research: the distance in time and space between data collection and data analysis. I would have liked to interview more people and to explore some issues more in depth. On the other hand, the width of my research allowed me to uncover a wide range of aspects, which a very focused research process might have left out. This is the charm of an explorative research design; letting the field unfold, the data emerge and the puzzle fall into pieces along the way.

3.4 Validity and reliability

Validity is here understood as relevance and representativeness of the data collected. As mentioned above, my theoretical framework allows for both quantitative and qualitative methods to capture both the biophysical and social constructivist aspects of the human ecosystem. However, as a consequence of the explorative research design and the general limited data on Apac district, I have left out the quantitative part. Instead I constructed the theoretical framework with different concepts from ecological economics and political ecology making the qualitative data collection relevant for the analysis.

Since the sub-county and the two parishes were selected as project sites due to the vulnerability to floods and drought, they may not be representative for Apac district as a whole. Instead they can be considered representative for peripheral rural communities in the ecosystem frontier¹¹. As mentioned above, the respondents represent different groups in society with representatives from local government, CSOs, community representatives, different economic activities as well as men, women and youth, illustrating the representativeness of the sample.

¹¹ Ecosystem frontier is in this study understood as the periphery that is experiencing environmental degradation first as a consequence of the unequal flows of labour, materials and energy.

Reliability is here understood as the degree to which the study can be replicated with same findings. Given that qualitative studies are about social interactions within a certain context, it is not given that another researcher would obtain the same data and arrive at the same findings as I did. This is illustrated by the fact that I found inconsistencies and contradictions in the statements of my respondents, even within the same interviews¹². This can for instance be caused by the fact that the respondent changing his/her opinion during the interview, that he/she may have gained more trust in the interview situation and felt more comfortable to disclose information as the interview progressed, or it could be a misunderstanding or misinterpretation by the translator. Hence, as we as researcher are shaped by our socio-cultural and academic backgrounds, there is no guarantee that the same data will emerge in another context with another researcher. However, given the macro-perspective of current analysis, other researcher may recognise the same processes and relations in similar settings. Nevertheless, the generalisability of this study requires further research.

4. Ecological economics and political ecology

To guide the analysis of environmental degradation and economic challenges in Apac, I will in the following present the theories of ecological economics and political ecology. I will first of all outline the worldview that lies behind the theories, the same that will guide this study. Secondly, I will trace the origins and present the renewed focus on the two theories, before venturing into the key analytical concepts and finally presenting the model of analysis.

4.1 Embracing ambiguities

Ecological economists consider the world, on the one hand, as a delimited physical phenomenon – a global ecosystem – and, on the other hand, they recognise society as a self-conscious and reflective entity (Ingebrigtsen & Jakobsen 2012:85-86). Political ecology, for its part, can be interpreted from a position of critical realism or social constructivism (Forsyth 2001:1-2). Ideally both positions are included as environmental challenges are biophysically rooted, but unfold to society because they are socially and politically constructed – a construction that can be more or less true to the biophysical realities (Martinez-Alier 2002:68-70).

¹² For instance whether crop yields and prices have increased or decreased in recent years, and whether the soils are fertile or degraded (CRa; CSc).

For the purpose of this study I have adopted these two dualisms. I understand the world as one global ecosystem, within which society unfolds as different actors interact and construct meanings and understandings of the world. However, since my worldview – like that of other researchers – in itself is a social construction, I acknowledge that other worldviews may be constructed as well, for instance seeing economic growth as the answer to environmental degradation. My role as a researcher is then to point to indicators of ecosystem boundaries in order to enhance the debate about environmental degradation and economic challenges.

4.2 The origins

The observation that we live in a world with limited resources has a long history. It was clear already in Ancient Rome that the economy is ultimately constrained by ecological conditions, yet it was not until the 19th century that natural science scholars laid the foundation for ecological economics with the formulation of the Second Law of Thermodynamics: the dissipation of energy in production (Hornborg 2012:46). Martinez-Alier (1987) outlines a number of scholars, who contributed to the construction of the field: Podolinsky studied the energy input/output ratio in agriculture, Geddes advocated for an inclusion of material aspects in economic models, and Pflaunder calculated the carrying capacity of the ecosystem. According to Hornborg (2011:18), Marx used the concept *social metabolism*¹³ to illustrate how the asymmetric exchange of nutrients and other materials between rural and urban areas resulted in deprived soils in rural areas and accumulation of waste in urban areas. However, the theories did not offer any solutions to urgent problems at the time, and due to the strict disciplinary boundaries between natural and social sciences, these ideas submerged in the dominance of mainstream economic ideas of technological progress and human ingenuity (Röpke 2013).

Nevertheless, the ideas continued to evolve and reappeared in the 1960-70s in response to the oil crises and an emerging environmental conscience and concern (Röpke 2013). Hornborg (2011:16-18) attributes the revival to scholars like Boulding and Daly, who articulated the boundaries of the global ecosystem, Georgescu-Roegen, who stated that that total energy quality decreases in a production process, and Odum, who argued that total amount of energy used in the production of a good, what he termed *emergy*¹⁴, is an adequate measure of value.

¹³ *Social metabolism* is defined as 'the exchange of materials and energy between society and the natural environment,' (Eisenmenger & Giljum 2007:290).

¹⁴ Originally understood as 'energy memory', *emergy* is now defined as 'the available energy of one kind previously used up directly and indirectly to make a product or service,' (Odum 2007:69).

Along with the developments of ecological economics, the theory of political ecology emerged in the 1970s. Evolving from a mix of anthropology, biology, geography and political science, scholars like Wolf, Cockburn and Beakhurst spearheaded the field (Paulson *et al.* 2005:17; Peet & Watts 1996:4; Robbins 2004:67). Political ecology partly builds on world-system theory, which was developed by Latin American economists in the 1960s. World-system theory states that surplus economic production in peripheral countries as a legacy to the colonial period is transferred to core countries, leading to asymmetries in international exchange and structural dependency relations between the periphery and the core (Hornborg 2011:16-18; Robbins 2004:50). According to Hornborg (2011:16-18), Bunker was the first to unite ecological economics and political ecology by combining world-systems theory and the theory on dissipation of energy into the concept *ecological unequal exchange*. However, as the oil crisis in the 1970s diverted attention to energy studies, the ideas of environmental challenges and unequal exchange faded in the dominance of the mainstream economic beliefs in technological optimism and the free forces of the market (Röpke 2013).

4.3 Thirty years later

With the simultaneous occurrence of the four global crises – energy, food, climate and finance – ecological economics has in the recent decade gained renewed attention. This is seen in a number of publications, debates and movements such as the updated version of Meadows et al.'s 1972 landmark *Limits to Growth* (2004), Rockström et al.'s *Planetary Boundaries* (2009), Jackson's *Prosperity without growth?* (2009), O'Neill et al.'s *Enough is Enough* (2010) as well as a number of publications of the Research and DeGrowth association (2013).

Much of the literature has been focussing on affluent countries, with a vision of a *steady state economy*, with many interesting and visionary ideas. However, very few address the challenges of ecosystem boundaries in a less affluent country, or in the 'peripheries' to use world-system theory terminology. Instead, the general response seems to be that 'they still need to develop' (Daly 2007; Jackson 2009; McKibben 2009:xiii; Nielsen 2012:35; Robinson 2009:xvi). While this may be an expression of ethnocentric lack of imagination to find other ways of life (or 'development paths'), it is also contradictory to the premises of ecological economics. If the ecosystem boundaries are already met and we are consuming beyond nature's capacity to replenish, as claimed by Meadows et al. (2004), it is not even an option for less affluent countries to follow the same path as affluent countries have done (Amin 1976:200; Escobar 1996; Sutcliffe 1995).

What seems to be missing from the debate, is the insight from political ecology that today's overconsumption of the few is happening at the expense of the many (Robbins 2004:8). However, some scholars have been attentive to the global unequal distribution of economic prosperity and environmental degradation. This is for instance seen in the works of Martinez-Alier (2002). He claims that while some affluent countries apparently have managed to decrease environmental impact nationally, this is only so because they have moved production – and with that resource extraction, energy consumption and pollution – to other countries (Martinez-Alier 2002:252). Moreover, Jorgenson & Rice (2007:284-285) argue that the asymmetrical flows between the core and the periphery limit the opportunities of less affluent countries to achieve socio-economic stability and to protect the environment. Rydberg (2010) builds on the work of Odum and emphasises the unequal flows of emergy to be a major determinant of global inequality. Further, Hornborg (2001:11) claims that the exchange between industrial and non-industrial sectors is unequal in terms of time and space required for production, a concept he calls *time-space appropriation* – in this study elaborated to be *time-space-emergy appropriation (TSEA)*. Finally, building on the concept *ecological unequal exchange*, Martinez-Alier (2002:252) was the first to coin the term *environmental load displacement (ELD)* and pointed to the *ecological distribution conflicts (EDC)* that arise when local actors claim redistribution as a response to the unequal flows (Martinez-Alier et al. 2010:154). The concepts TSEA, ELD and EDC will be elaborated upon in the following.

4.4 Key analytical concepts

In figure 2 below the three analytical concepts – time-space-emergy appropriation (TSEA), environmental load displacement (ELD) and ecological distribution conflicts (EDC) – are sketched according to their relation to the overall theories of ecological economics and political ecology. These concepts will be used to analyse the four economic activities farming, brickmaking, charcoal burning and fishing.

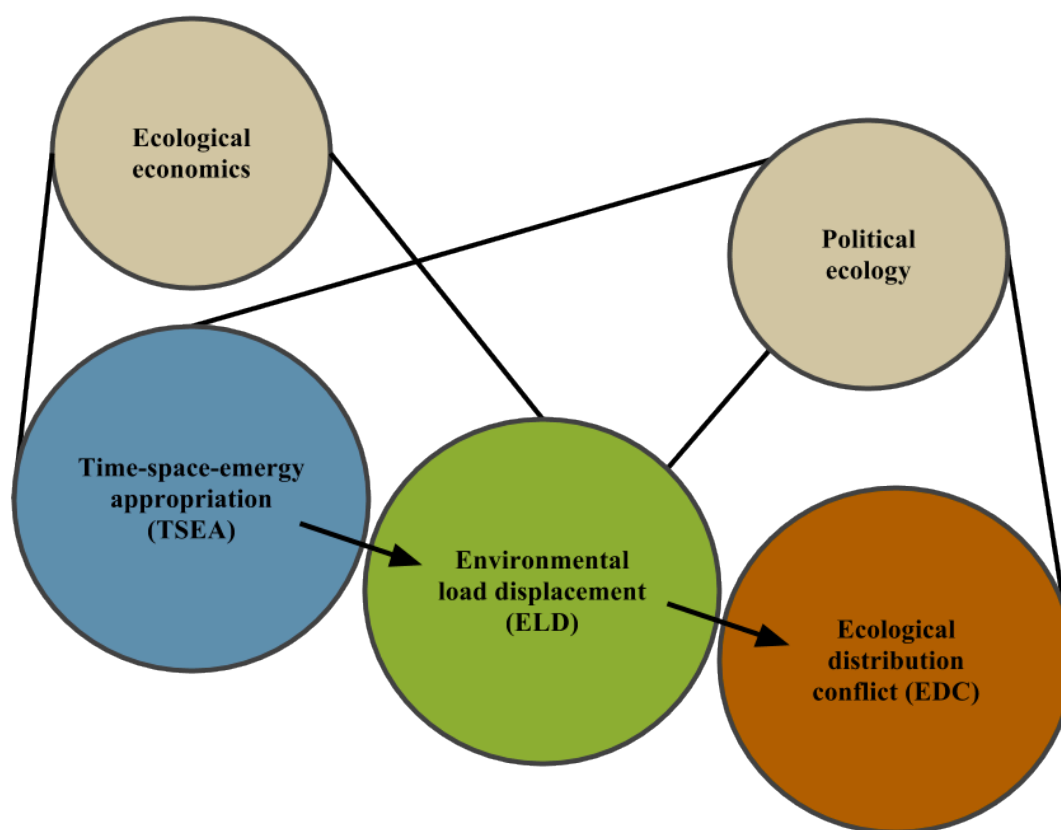


Figure 2: Model of analytical concepts.

Compiled by the author

4.4.1 Time-space-emergy appropriation (TSEA)

Time-space-emergy appropriation (TSEA) can be defined as the *exchange of goods and services requiring different amounts of labour time, production space and emergy*. In response to the notion of *time-space compression*, Hornborg (2011:38) coined the term *time-space appropriation*, arguing that when we save time and space locally through technologies such as a computer or a car, it occurs at the expense of someone else's time and space, namely the producer and the extractor of material resources. In this study I have added the dimension of *emergy* to capture that extra dimension of unequal exchange, to be able to identify unequal flows in '*real resources such as energy, labour time, and hectares of productive land*' (Hornborg 2001:33).

The concept of emergy can be understood as an 'environmental accounting tool' measuring the work required for the production of a certain product or service – both in terms of human labour and the 'free work' of nature (Odum 2007:41; Rydberg 2010:49). Since market exchanges are normally done in monetary terms, the work of nature is not counted in; no one pays the cow for its milk or the soil for producing crops. Therefore, raw materials and primary products are not only

undervalued in the current economic system, they are sold in metrics that cannot account for their environmental value. (Rydberg 2010:49-53). Emergy has been used to document the unequal exchange between affluent countries trading industrial goods and less affluent countries trading primary goods with 'free emergy' (Odum 2007:273-274). This exchange leads to accumulation of wealth in affluent countries, and puts pressure on natural resources and biodiversity in less affluent countries as this imbalance in trade is compensated by intensification and expansion of primary goods production (Rydberg 2010:60).

Another way to illustrate unequal exchange is through the concept *entropy*¹⁵ or 'material disorder'. As industrial products represent more entropy/disorder than raw materials, an exchange of goods is in effect a transfer of material disorder from the industrial to the non-industrial area. In other words, the products transferred to resource extraction areas represent less potential for value addition and economic growth than those transferred to industrial centres. Hence, economic impoverishment and environmental degradation are two sides of the same coin (Hornborg 2001:11).

Studies of time-space appropriation (without emergy) are conducted by calculating the labour hours and hectares of land needed in production for a certain good, and comparing this with the time and space needed for goods traded in exchange. This is for instance exemplified in Bogadóttir's (2012) study of clothes exchange in pre-Columbian Andes and Hornborg's (2011:83-101) study of trade flows between England and its colonies around 1850s. Accurate quantitative studies of resource flows are, however, difficult to perform since mainstream economics has not been concerned with measuring biophysical flows and translating market values into hectares and human labour hours (Hornborg 2012:21).

While I will not attempt to make a quantitative study with a full account of land, labour and emergy flowing in and out of Apac district, I will use the explanatory power of TSEA to draw attention to potential spaces for unequal exchange. Instead of looking at the *exchange*, I will look at the *flows* of labour, materials and energy for the four economic activities – farming, brickmaking, charcoal burning and fishing.

¹⁵ Entropy can be defined as the '*quantity of energy which would no longer be transformed into other forms of energy.*' (Podolinsky in Martinez-Alier 1987:47).

4.4.2 Environmental Load Displacement (ELD)

As seen in figure 2, the concept environmental load displacement (ELD) builds on TSEA, investigating how environmental impacts deriving from the unequal flows of land, labour and energy are distributed among producers, consumers and other actors. ELD can be defined as *a spatial or temporal displacement of the environmental impact of production/consumption*. As industrial production has become faster than natural production, natural resources are extracted faster than they can renew (Daly 2007:9; Odum 2007:9; Robbins 2004:51). As Robbins (2012:159-160) note, *'otherwise environmentally innocuous production systems undergo transition to overexploitation of natural resources on which they depend, as a response to /.../ increasing integration in regional and global markets.'* ELDs occur when the site of consumption is distanced from the site of production or extraction (Ferrari 2012:218); as resources are degraded at location of extraction, the consumer/industrial producer is not directly affected by the environmental impact and can move extraction to another location. Hence, the impact of environmental degradation is displaced to the people in location of extraction as well as to future generations. (Bunker 2007:239-240)

Early examples of ELD can be found in Ancient Rome, where the local accumulation in the Roman Empire lead to social and ecological impoverishment in parts of North Africa, Middle East and Europe (Hornborg 2011:17). More recent examples include the extraction of resources from European colonies, where value was derived far away from the point of extraction, and natural resources in the location of production were degraded (Hornborg 2011:53; Robbins 2012:161-162). Contemporary examples of ELDs include the process of outsourcing polluting industries from affluent countries with disproportionate consequences for less affluent countries and future generations (Frank 2007:306; Hornborg 2012:16; Nixon 2011:2-3).

As a qualitative concept, ELD will in this study be used to point to unequal distribution of environmental impacts of farming, brickmaking, charcoal burning and fishing.

4.4.3 Ecological Distribution Conflicts (EDC)

Finally, as seen in figure 2, the concept ecological distribution conflict (EDC) builds on the biophysical environmental conflict identified by ELD. Arising from inequalities of income and power (Martinez-Alier *et al.* 2010:154), EDCs can be defined as a *conflict over the distribution of environmental impacts from production and/or consumption, whose discursive construction is not*

necessarily true to the material conflict. Thus, while TSEA and ELD explain why environmental conflicts arise, EDC investigates how the material conflict and the subsequent response are discursively constructed and to what extent the discourse corresponds with the material EDC (Martinez-Alier *et al.* 2010:157).

EDCs often involve various cultural, political, economic and ecological perspectives, and different actors may employ diverse languages and discourses in the discursive construction of the conflict (Hornborg 2011:46; Martinez-Alier 2002:256). The ones who manage to control the discourse often define the solution to the conflict (Martinez-Alier *et al.* 2010:157). However, a conflict resolution is not the same as solving the problem of environmental degradation; instead it can aggravate the problem, e.g. by making a compromise of too high fishing quotas or too high pollution allowances. Here social constructivism and critical realism collide: a socially constructed agreement cannot solve the clash between the environment and the economy. It can only displace or postpone the problem. (Martinez-Alier 2002:68-70)

The concept of EDCs has been used to study phenomena of land degradation, ecological debt, bio-piracy, mining conflicts and fishing rights (Martinez-Alier 2002:258-260). Apart from Östberg's (2012) study of contract farming in vegetable oil production in Tanzania, EDC studies in less affluent countries often look at conflicts of people rising against polluting or exploiting multinational corporations – also called the 'environmentalism of the poor' (Hornborg 2007:3; Martinez-Alier 2002:263-266).

In this study EDC will be used to investigate how the environmental impact distribution for the four economic activities is discursively constructed, how the subsequent responses are shaped, and to what extent the discourse and responses address the biophysical EDC. This will then lead to a discussion of the appropriateness of the responses.

4.5 Model of analysis

The strategy of analysis is graphically illustrated in figure 3 below. Taking point of departure in each of the four natural resources land, wetlands, forests and lakes, the economic activities of farming, brickmaking, charcoal burning and fishing will be analysed using the three analytical concepts TSEA, ELD and EDC. First, TSEA concerns unequal exchange in social and environmental terms leading to social and environmental impoverishment. Building on this, ELD

investigates the distribution of environmental impact and points towards ecological distribution conflicts in material terms. Finally, EDC investigates how the material conflict is discursively constructed, what responses are shaped, and to what extent the discourse corresponds with the material EDC.

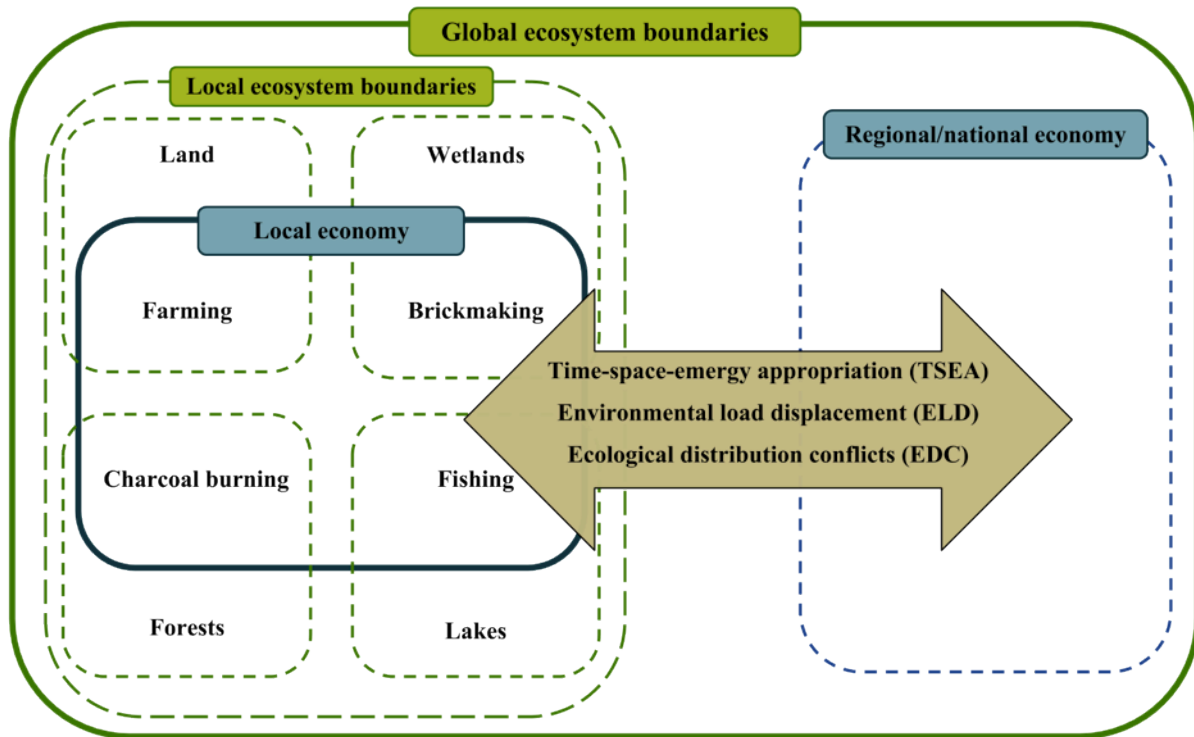


Figure 3: Model of analysis.

Compiled by the author

To be able to investigate the flows of labour, materials and energy I have divided the model into *local economy* and *regional/national economy*. The model illustrates that the economies are limited by the global ecosystem boundaries, and that the local economy further is limited by local ecosystem boundaries. As the dotted line indicates, I have not investigated the regional/national economy, but focussed on the local setting.

5. Economic activities from an ecosystem boundaries perspective

In the following section, I will investigate how local environmental degradation and economic challenges in Apac district can be explained through the perspective of ecosystem boundaries and ecological distribution conflicts.

The analysis is organised with a section for each of the four economic activities, each section seeking to answer the five research questions. This means 1) outlining the production-consumption patterns and the subsequent flows of land, labour and energy; 2) investigating the socioeconomic and environmental impact of these patterns and flows; 3) examining how the environmental impact is distributed among producers, consumers and other actors and how this may lead to conflicts; 4) investigating how the environmental impact is discursively constructed, how this results in subsequent responses; and finally 5) examining the extent to which the discourse and responses address the environmental impact and the underlying production-consumption patterns.

5.1 Agricultural production and soil degradation

As mentioned earlier, the principal economic activity in Apac district is agriculture occupying about 91% of the population (DPU 2012:2). According to one district official, the production is mainly for internal consumption, with around 85% subsistence farmers producing for home consumption and selling the surplus in local markets. Further, he estimates that 10% produce mainly for sale at local markets, while around 5% are engaged in commercial farming with livestock and crop cultivation as well as value addition/processing (DGe). However, statements from other respondents indicate that subsistence farmers are relatively market-oriented. Since very few have capacity to store beyond household consumption, several respondents say that the farmers are forced to sell their products immediately after harvesting (DGe; CSc; CRh; GI f). This indicates a partly local, partly export-oriented production-consumption pattern.

According to several respondents the laterite roads in the sub-county are in poor conditions and often get flooded during rainy seasons. As the only means of transportation farmers have are bicycles, their mobility is limited and most farmers depend on middlemen to facilitate the market exchange (e.g. DGb; CSc; GIa; GIc). While there have earlier been cooperatives in the district securing farmers good prices for their products, farmers are now marketing their products individually¹⁶ (SCb; CRg; CSe; GI d). As the bargaining power of the farmers is low, the middlemen approaching them at their homesteads can singlehandedly set the exchange price (e.g. DGb; SCc; CRc; GIa). Farmers are often in immediate need for cash to pay medical bills or school fees (SCb; SCc; GIe), and are therefore inclined to sell, even though they are not satisfied with the price: *'Even if they come with their low price, you have to sell to them,'* (CRc). Further a community representative tells that middlemen sometimes claim that prices in South Sudan have

¹⁶ The significance of the cooperatives diminished since the current government came to power in 1986 promoting privatisation and free-market policies (GI d; SCb; SCc).

fallen, and as farmers have little chance to check the market information, they have to accept the price (CRh). This is what Tainter (2007:361) refers to as a disjunction between the flow of materials and the flow of information: agricultural products flowing out, and no market information flowing in. Hence, farmers are locked in a situation where low mobility and limited storage facilities make them dependent of middlemen, and where their poor organisation, limited market information and urgency for cash flows give them low bargaining power in the exchange relation.



Photo 5: Going to the market, Apac district.

Photo by the author

Some of the middlemen are storing the food crops locally, and reselling when the rains are delayed and household stocks are running empty. Some farmers may end up buying the same food crops they sold to the middlemen a few months earlier (SCc). Both local government officials and community members point to the high price fluctuations farmers experience pre- and post-harvest (DGe; SCc; CSc; GIb):

Immediately after harvest /.../ they [the middlemen] can buy beans a kilogram around 800 [UGX¹⁷]. But after some few months it depends, things go back again at 2,500 [UGX], so that is too much. So they [the farmers] are being cheated.

SCc

¹⁷ 1,000 UGX \approx 0.39 USD

In addition to storing, some middlemen are processing for instance maize flour and reselling it to the farmers¹⁸. According to some respondents, the middlemen charge significantly for the value addition:

...these middlemen are in their own prices, which are too low. For example when I take that on maize. A kilogram of maize they can buy at 200 or 300 [UGX]. And then when they process it, they just take some few kilometres. When then process it they bring it back as flour at 2000 at 2500 [UGX], then it is too much.

SCc



Photo 6: Sunflower, Apac district.

Photo by the author

Other crops like sorghum and sunflower seeds are taken to industrial areas for processing (DGe; CSe; GIb). Sunflower seeds have recently been introduced to Apac district, and a few farmers have

¹⁸ According to some CSO staff there are currently no processing industry in Apac district due to unstable electricity supply (CSe; CSe). However, some government officials point to processing facilities at commercial farms (DGa; DGe; SCc). The difference may originate in different interpretations of the term 'processing industry'; i.e. whether it applies to e.g. maize mills and dairy producers or only large-scale processing plants such as sunflower oil factories and breweries.

taken up the practice supplying the sunflower oil factory, owned by Mukwano¹⁹, in the nearest larger town, Lira (see figure 1: *Map of Apac district*, p.9). As the sunflower seeds are so-called 'improved seeds', they '*will not give the next season,*' (woman, age 23), and farmers have to buy new seeds every season (CSc). One respondent tells that the seeds are more expensive than normal seeds: '*Mukwano, they use their agents to bring these seeds back to the community, but they charge,*' (woman, age 28). Thus, farmers are depending on the company's agents for production input, as well as for postharvest sales, but the exchange may not be favourable to the farmer: '*People are buying the seeds for sunflower very expensively, but when it comes to time of selling, you sell at a very low price,*' (woman, age 23).

To answer research question 1, the partly export-oriented production-consumption pattern for farming indicates an outflow of labour, materials and energy. While local consumption allows for the nutrients to be recycled in the ecosystem, the movement to food crops to urban areas deprive the rural areas of nutrients (Clarke & York 2012: 25-26). Moreover, as raw materials contain 'free work' of nature that is not accounted for, they contain a higher degree of emergy than the processed goods returned, leading to a net outflow of emergy. In addition, there is more potential for value addition and capital accumulation in the raw materials exported than the processed goods exchanged, leading to a net inflow of entropy/disorder. Further, Hornborg (2001:46) notes that, in general, the industrial goods returned to the periphery are only a fraction of the goods produced from the raw materials provided.

However, to be able to properly determine the level of TSEA – i.e. *the exchange of goods and services requiring different amounts of labour time, production space and emergy* – would require a full account of the land, labour and emergy flows in and out of the district. The question is whether the processed agricultural goods, production inputs and consumer goods that the farmers can buy for the money they gain from selling their products to the middlemen require an equal amount of labour hours, production space and emergy as the agricultural products that are exported. The above examples for maize and beans as well as the statements by the respondents indicate an unequal exchange, however, this would require a further quantitative study.

¹⁹ The Mukwano Group of Companies figures among the top ten companies in Uganda. The company produces a range of consumer goods such as cooking oil, maize flour, household plastics, cosmetics, detergents, etc., and has recently engaged in agriculture, real estate development, logistics and financial services. (Mukwano Industries 2012)

5.1.1 Pressure from processing

As noted by Rydberg (2010:60), to compensate for the imbalance in trade, agricultural production is intensified and expanded, putting further pressure on natural resources. This process is also explained by Bunker (2007:239-240), who argue that industrial production is faster than the production of nature, and driven by the logic of profit-maximisation, industrial production will demand raw materials to be extracted at a faster rate than nature can regenerate. This is recognised by several respondents, who note that farmers have started to cultivate the land more intensively and abandon traditional soil conservation practices, such as fallowing and crop rotation, eventually leading to soil degradation and nutrient loss (e.g. DGe; CRd; CSb; GIc). Moreover, to expand cultivation areas, farmers have started encroaching wetlands, and thereby affecting the ecosystem services and increasing the risk of seasonal disasters such as floods and drought (DGb; DGc; CSb). Apart from pressure from industrial production this is also driven by the changes in seasonal pattern (e.g. CRh; CSb; GIb; GIc). While the two rainy seasons are normally March-May and July-October, they have recently become more unpredictable, making it very difficult for the farmers to time their planting, sowing and harvesting²⁰ (CSb; GIc). When rains are delayed, farmers are inclined to cultivate wetlands, a point that will be elaborated upon in section 5.2.2. In addition to these mainly environmental impacts, the pressure from industrial production and external consumption in combination with population increase also leads to land conflicts. Though a few respondents noted that there is abundant land in the sub-county (SCb; CRa; GIc), the overall opinion is that the average land plot size per household is decreasing for every generation, and there is an increasing pressure on land (e.g. DGd; CRf; CSa; GIc; GIc). Hence, to summarise research question 2, the socioeconomic and environmental impacts are seen in soil degradation, nutrient depletion, loss of ecosystem services and land scarcity. Based on this, there are clear indications that the local ecosystem boundaries have been met.

To answer research question 3, the environmental impacts are unequally distributed among producers, consumer and other actors. Since the soil degradation, nutrient loss, loss of ecosystem services and land scarcity are only affecting the production areas, there is an environmental load displacement (ELD) – defined as *a spatial or temporal displacement of the environmental impact of production and/or consumption* – from the external consumers, the processing industry and the middlemen to the farmers. Moreover, the farmers are sharing the environmental impact with the

²⁰ Some respondents also pointed to advantages of the seasonal changes, e.g. general increased rainfall and the opportunity for an extra harvest in October (SCa; CRb; CRf; CRg)

small part of the community who are not farmers; i.e. the environmental impact is even affecting people, who are not taking part of the production-consumption relation.

5.1.2 Technology to thrive

While the environmental impacts of soil degradation, nutrient loss, loss of ecosystem services and land scarcity are relatively recognised by the respondents, they are not seen in the context of the ELD from consumers, processing industry and middlemen identified above. To address research question 4, land scarcity is largely constructed as a local challenge of population growth (CRc; DGb; Glc; GId), and insufficient demarcation of land plots (CSa), while soil degradation and nutrient loss are largely attributed the deficiencies of current agricultural practices. The labour intensive methods of hand hoes are presented as 'rudimentary' and 'primitive' (e.g. CRg; CRh; CSb; GIb). This is for instance expressed in the following:

We are not yet farmers. We are peasant farmers. /---/ Because real farmers have an ox-plough or a tractor, and they have many acres. We only have 2-3 acres. And even we use our hand, the hand hoes. /.../ That is why I say we are peasant farmers.

Woman, age 49

Along the same line as this statement, some government officials and CSOs claim that farmers have '*poor agricultural practices*' (SCb; SCc; CSb), and they are slow at adopting new methods (DGe; SCE; CSb). In this way, soil degradation and nutrient loss are understood as connected to ignorance, poverty and poor attitudes among farmers; linkages that have earlier been criticised by scholars such as Yapa (1996:79), Escobar (1996:51) and Zimmerer (1996:114). Hence, the material EDC involving both farmers, consumer, middlemen and industry is largely constructed as a local conflict.

Based on the above, one could assume that agricultural yields have decreased in recent years. However, the respondents disagree about this point; some think it has decreased while others think it has increased²¹. Nevertheless, they are considered too low. As a response, local government officials, CSOs and communities all point to the need for improved agricultural methods and technology (e.g. DGa; SCc; CRc; CSd; GIb), and many farmers are interested in acquiring an ox-plough, employing improved seeds, applying chemical fertilisers and getting access to irrigation schemes (DGe; CRf; GIa; GIe).

²¹ This divergence in response may be caused by a number of factors, such as population increase, change in individual families, change in land plot size, changes in market prices, as well as a lack of clarification of the term 'recent years' from the interviewer's side.

However, the use of production inputs such as fertilisers, pesticides, tool and machinery, is according to Hornborg (2011:38) only *displacing* the burden of problem-solving to other areas. While acquiring production inputs for agriculture may entail an unfavourable exchange for the farmer in terms of labour, materials and energy as explained above (agricultural products traded for industrial goods), the farmer is also engaging in TSEA and ELD causing resource depletion at the location of extraction of raw materials for these agricultural inputs materials. Thus, from a local as well as global ecosystem perspective, importing production inputs is neither socially nor environmentally sustainable.

Further, Hornborg (2011:67) notes that technological solutions often result in new problems. This can for instance be seen in the use of chemical fertilisers, which delays soil degradation (Meadows *et al.* 2004:62) and fosters an endless need for input – the so-called ‘fertiliser treadmill’ (Clark & York 2012). The application of fertilisers and pesticides may further cause pollution of water resources. This is especially the case since very few farmers are trained in applying fertilisers and risk applying inappropriate amounts (SCa). Moreover, some respondent noted that so-called ‘improved seeds’ often bring pests and diseases (SCc; GIb).

In addition, as noted by Yapa (1996:74) and Odum (2007:190), the increased demand for ‘modern’ technologies may lead to the de-development of traditional practices and methods. Traditional soil conservation practices, such as crop rotation and fallowing, are not considered agricultural *techniques*, but just ‘*something you know*’ (CSe). It is thus not valued as methods for sustaining agricultural yields. Likewise organic fertilisers are considered ‘*tiresome*’ and ‘*difficult*’ to utilise (GIe; GI f), and very few apply it (DGe; SCb; CRf; GI d).

Nevertheless, there are initiatives that address the production-consumption pattern and outflow of labour, materials and energy. This includes for instance the sub-county government promoting food crops instead of cash crops to ensure farmer self-sufficiency in food products. Further they encourage the use of organic fertilisers, as they have no side effects. (SCb; SCc; GIb). Moreover, the socioeconomic impoverishment caused by the unequal exchange with middlemen is discursively recognised both by local government, CSOs and communities: ‘*There are these middlemen who just come and it is just like grabbing our things away from us,*’ (man, age 59). To address the challenge of farmers ‘being cheated’ by middlemen, the local government is promoting farmers’ groups, bulk marketing and local value addition (DGb; SCc; CSb; CSc). Processing products locally would

reduce the unequal exchange of raw materials and processed goods, and diminish the entropy import that according to Hornborg (2001:11) leads to environmental and socioeconomic impoverishment.

Hence, to answer the last research question, the environmental impacts in the form of soil degradation and nutrient depletion are locally understood as a consequence of poor farming methods and slow adaptation of new technology, i.e. poverty, ignorance and poor attitudes. As a consequence, farmers are questioning their traditional practices and turn towards 'modern' techniques requiring production input from outside, thus, increasing dependency. Following this, the discourse and the following response are not addressing the production-consumption patterns causing an outflow of labour, materials and energy. On the other hand, the socioeconomic impoverishment caused by the middlemen is recognised and addressed in ways that point towards more favourable production-consumption patterns and less outflow of labour, materials and energy.

To sum up, the production-consumption patterns for farming are partly local and partly export-oriented, indicating a net outflow of land, labour and energy. While industrial processing encourages an agricultural production at a faster rate than nature can reproduce, this may have environmental impacts in the form of soil degradation, nutrient depletion and encroachment of wetland leading to reduced ecosystem services. The export of raw material agricultural products in exchange for industrial inputs will further lead to social and environmental impoverishment due to the inflow of entropy. The environmental impact is unevenly distributed as it only affects farmers and the rest of the community at the production site, not the middlemen, consumers or the processing industry. The environmental impacts of soil degradation and nutrient depletion are discursively constructed as caused by inadequate agricultural methods and the following response is thus to adopt 'modern' technologies. While a few initiatives addressing the production-consumption pattern are emerging, the overall impression is that current responses do not adequately address the outflows of labour, materials and energy.

5.2 Brickmaking and wetland degradation

As mentioned in the background section, wetlands cover around 30% of the total area in Apac (DPU 2012:1). The main economic activity in wetlands is brickmaking, while farmers, as mentioned in previous section, are increasingly cultivating in wetlands due to pressure from production and changes in rainy seasons. As the production-consumption pattern for farming has

been presented in previous section, the following will focus on the activity of brickmaking. However, moving into research questions 3-5, the ELD and EDC for wetlands cultivation differs from those presented in previous section, and will thus be discussed.



Photo 7: Wetlands, Apac district.

Photo by the author

Brickmaking is taken place at the edges of the wetlands. Often groups of 3-5 men can be seen along the roadside forming bricks with wooden frames. The bricks are then left to dry for a few months, before they are burned to increase their durability (CRb). Piles of dry bricks along the roadside are not a seldom sight. Bricks are mostly produced for constructing huts to the immediate family, while a few are produced for sales on very small scale within the local community (CRb; CRc; CRd; CSe). Brickmaking can, thus, be considered an economic activity as well as a socio-cultural practice. Hence, to answer research question 1, the brick production is mainly for local consumption. Without a market exchange relation there is no outflow of labour, materials and energy, and the concept of TSEA is not applicable.

5.2.1 Recycling resources

As a consequence of this local production-consumption pattern, the materials and nutrients in the soil are recycled (Clark & York 2012:25-26). Since production only has to respond to local demand, it is not pressured by the same profit-generating motives as industrial production is as indicated by Bunker (2007:239-240). Using local renewable construction materials can actually be considered more sustainable than the alternative of importing construction materials, implying a process of

TSEA from another location of raw material extraction. Moreover, by relying on local materials, construction workers can also construct huts independently from the provision of material input from the outside. In this way, they avoid the import of entropy and unequal ecological exchange. This locally-oriented production is well in line with the promotion of local circular networks with localised flows of labour, materials and energy promoted by ecological economics (Hornborg 2011:155; Ingebrigtsen & Jakobsen 2012:87-88; Norberg-Hodge 2006:108).



Photo 8: Drying bricks, Apac district.

Photo by the author

Nevertheless, as the population increases, the local demand for bricks is likely to increase as well. As the moist clay is removed, the increased brickmaking may result in drying up of wetlands, and brickmaking may in this way have a detrimental environmental impact on the sustainability of the wetlands (Arrighi 2009:25). This is illustrated by the deserted excavations, where people used to make bricks, that from time to time can be seen along the roadside. Degradation of wetlands areas may result in reduced ecosystem services such as water purification, flood regulation and drought control, thereby increasing the risk of disasters. This means that brickmaking can have an environmental impact, which is not captured by the concept of TSEA. However, since the production-consumption pattern is local, Jorgenson (2010:123) points out that environmental effects

are felt immediately, and the demand for bricks can quickly be adjusted to a more sustainable level if resources are overexploited.



Photo 9: Brick-hut under construction, Apac district.

Photo by the author

Hence, to answer research question 2, brickmaking stands out as a good example of an economic activity with a production-consumption pattern that from a local and global environmental perspective is sustainable and does not imply outflows of labour, materials and energy. However, the brickmaking activity may have environmental impacts that are not caused by these flows, such as population increase driving up local demand. To answer research question 3, this environmental impact is affecting the brick producers as well as the rest of the community. However, since most families engage in the activity, the producers, consumers and the affected population are largely the same people, and the environmental load is as such not *displaced*. On the other hand, if the wetland degradation will affect future generations, there may be an ELD to the future.

Moving into research question 4 and 5, since brickmaking is an essential part of local livelihoods, the environmental impacts it brings are not discursively recognised and therefore not addressed. As pointed out by Martinez-Alier (2002:68-70) this does not imply that there is no EDC in material terms. The fact that the environmental load is displaced to future generations may be the reason that

the material EDC is not discursively constructed as future generations are not able to claim redistribution.

5.2.2 Cultivation creating conflict

In contrast to brickmaking, the environmental impacts of wetlands cultivation are widely acknowledged, making the EDC of wetlands cultivation relevant to include here. Recalling the production-consumption pattern for farming presented in previous section, production is partly for external consumption, thus implying an outgoing flow of labour, materials and energy. The encroachment of wetlands may lead to reduced ecosystem services and an increased risk of disasters such as floods and drought. This is recognised in the following statement: *'the wetland if they fail to perform their ecological function of holding water for some time and releasing it afterwards /.../ we expect a lot of floods to come,'* (DGb). The environmental impacts are shared among those who cultivate the wetland and the rest of the community; however, the consumers, middlemen and industry are not affected, thus an ELD can be identified.

Addressing research question 4, the EDC is constructed as a conflict between the farmers encroaching wetlands and the rest of the community backed by local government officials and CSOs. As seen in the following statement, wetlands encroachment is constructed as a challenge of poor attitudes and poverty: *'Of course there are those who are aware, but still they are stubborn /.../ due to lack of other options, other livelihood options, people are forced to do this,'* (DGb).

As a consequence, the response of the local government and CSOs is to sensitise the communities to increase awareness of the value of wetlands and the impact of encroaching them (DGc; CSc; CSd; GIc). This is partly done through radio announcements stating that *'you have to be like 200 metres away from the wetland,'* (CRc); *'We always hear them [district government officials] announcing on the radio that we are not supposed to dig in the wetlands,'* (woman, age 28).

The fact that wetlands cultivation is recognised as an EDC, while brickmaking is not, may be explained by the different production-consumption pattern of the two activities. While both farming and brickmaking are traditional and socio-cultural practices, farming is to a larger extent an *income-generating activity*, where production can be exported, and the incentive to expand and intensify production is higher. In this way, it seems reasonable for the government to focus the sensitisation activities on wetlands cultivation.

To answer research question 5, the discursive construction of wetlands cultivation being a local challenge of poor attitudes and poverty, resulting in responses of awareness creation of wetlands values may address the immediate environmental impact. However, it does not address the underlying production-consumption pattern of farming identified in previous section, and thus not the outflow of labour, materials and energy.

To sum up, the production of brickmaking is mainly for local consumption, and is therefore not creating any outflows of labour, materials and energy. In this way brickmaking can be considered a good example of sustainable production-consumption pattern. However, population growth can still increase the demand for bricks to an unsustainable level, leading to environmental impacts that are not captured by the concept of TSEA. These environmental impacts are largely displaced to future generations, whose absence from the debate may explain why the ELD and EDC are not being discursively constructed and thus not addressed. In contrast to brickmaking, the environmental impact of wetlands cultivation is widely recognised. As it is discursively constructed as a challenge of poor attitudes and poverty, the responses are geared towards the farmers through regulation and sensitisation of the value of wetlands. As a consequence the responses are not adequately addressing the production-consumption pattern leading to outflows of labour, materials and energy.

5.3 Charcoal burning and deforestation

As mentioned in the background section, approximately 15% of the total area in Apac district is covered by forests. While firewood is the main source of energy in the study area (DGd; CRh; CSd; GIc), there has recently been an increase in the production of charcoal (e.g. DGc; CRc; GIb; GIc).

Charcoal burning is not necessarily a fulltime occupation, but is often employed as a secondary income source to agriculture to counter for unexpected costs such as school fees and medical bills (e.g. DGe; CRg; CSd; GIa). The production is mainly geared towards export to Kampala, Mbale and other urban areas (DGe; DGd; GIc). Local charcoal burners do not transport the charcoal themselves, but sell to charcoal traders, who earn well on the transport: *'A bag from Kampala is around 80,000 [UGX], but from here they buy at 15,000 or 18,000 [UGX],'* (man, age 24). Sometimes bags of charcoal can be seen along the roadside or piled together at the trading centre, waiting for the charcoal traders to arrive. Some traders are more proactive:

They [the traders] give them [charcoal burners] money in advance and say '*now I want like 100 bags of charcoal.*' So the person will go around and cut down nearly a half forest, just to produce, because the person has already given him the money, so he doesn't want to loose.

CSd

When crossing the River Nile at Masindi Port (see figure 1: *Map of Apac district*, p.9), I always encountered a truck or two and several bicycles loaded with sacks of charcoal waiting for the ferry going south towards Kampala.



Photo 10: Charcoal transport at the Masindi Port ferry crossing.

Photo by the author

Recently, the charcoal burning activity has been taken over by 'businessmen' from Kampala, Mbale or districts in the eastern part of Uganda (DGe; DGd; GIc). With the purpose of producing charcoal, they address farmers at their homesteads and offer to buy the trees on their lands in exchange for 'gifts':

They come with some small gifts like iron sheets, maybe five or ten sheets, sometimes cement, sometimes motorcycle, sometimes bicycles, sometimes radios. /.../ they will come to somebody who has land that has trees /.../ then they will say: *'We are going to give you this iron sheets. You give this tree. I'll cut, burn charcoal, and leave your area.'* So that is what is happening. So villagers would get convinced quite easily and they would give out the trees to be cut for charcoal. /.../ Once you have given them your land with trees they clear everything and then burn the charcoal and ferry. So that land now remains without trees. They move to the next.

DGb

As seen in the quote, some farmers consider it a reasonable trade to exchange their trees for commodities, especially if they have planned to expand their agricultural production into the tree-covered areas (CSe).

Answering research question 1, the production of charcoal is aimed at external consumption, implying a high degree of labour, materials and energy outflows. Since charcoal burning does not need any industrial production input (apart from maybe an axe for cutting the wood), the outflow is only countered by the inflow of consumer commodities that the landowners get in exchange for their trees. As the trees contain more 'free work' of nature, and thus a higher degree of emergy than the commodities flowing in, the exchange implies a net outflow of emergy. Moreover, since there is more potential for value addition and capital accumulation in the trees exported than the consumer commodities imported, the exchange implies an inflow of entropy/disorder. One could say that the local charcoal burners are in a way 'adding value' to the wood by burning it, while landowners outsource the value addition to the businessmen, and are therefore subject to higher inflow of entropy. Nevertheless, both have clear indications of the process of TSEA; indications that could be supported from quantitative studies of the flows of land, labour and emergy.

5.3.1 Redistributing risks and resources

This export-oriented production-consumption pattern is subject to the same mechanisms as Bunker (2007:239-240) noticed for industrial production: as charcoal is demanded at a faster rate than nature can reproduce, the forests are depleted. This environmental impact is observed by several respondents: *'The trees are getting fewer and fewer because people are misusing, cutting for charcoal,'* (CRc); *'There has been serious reduction, degeneration in the forest,'* (DGc). As mentioned by several respondents, deforestation may lead to loss of ecosystem services such as shade, windbreaks and climate moderation, increasing the risk of extreme weather events such as hailstorms, lightening and heavy rainfall resulting in floods (DGb; CRa; CRf; CSd). Moreover, there is a wide awareness of the linkages between deforestation and changes in rainfall patterns (e.g.

DGd; CRb; GIa; GIb): *'We had a lot of trees and there was a lot of rain, but now we are experiencing little rain because we cut so many trees for charcoal burning,'* (woman, age 19). Thus, answering research question 2, the export-oriented production is leading to deforestation, loss of ecosystem services and increased risk of extreme weather event.



Photo 11: Charcoal on the Gulu-Kampala highway.

Photo by the author

Moving into research question 3, this environmental impact is only experienced at the site of production; the charcoal burner and the landowner getting the land cleared are sharing the negative environmental impact with the rest of the community. Urban consumers as well as businessmen are not affected by the loss of ecosystem services, and in case the forests are depleted in Apac district, they can move extraction to somewhere else. Moreover, urban consumers displace the health risks of burning charcoal pointed to by one respondent:

I would never engage in that business [charcoal burning], the heat that comes from burning, /.../ the air /.../ that will be a very big problem like coughing. And worse, when you are burning, you have to wait for them [the charcoal] at night. Which means you are going to sleep out. And /.../ the mosquitos /.../ you will get malaria.

Man, age 28

Thus, in addition to the environmental impacts, charcoal burning also have health-related impacts for the individual charcoal burner. In this way charcoal burning is a prime example of ELD.

5.3.2 Shared discourses

Addressing research question 4, the environmental impact of charcoal burning is, as seen above, widely recognised in the district. The discourse mainly revolves around the practice of charcoal burning being caused by poverty and ignorance (CSb; CSc; CSd):

... they are poor first of all, someone is looking for another way to survive /.../ *'Why don't we make charcoal? And we have this big tree, we can make some good money, as we wait for our harvest.'* But they also, there are those other people who also, they are ignorant. They do not know. They don't know. /.../ They just do it hopelessly.

CSb

As a result, the local government has employed a variety of management tools (DGc; CRc). First of all, they introduced a temporary ban on charcoal burning in 2011²². Moreover, they have introduced fees for trucks transporting charcoal through the district; a loading fee of 100,000 UGX²³ per sack of charcoal and a 'movement permit' of 500,000 UGX. However, one respondent argued that the fee is too low and will not have any effect on the charcoal burning activities, since the charcoal traders earn significantly more on their trade than the imposed fee (DGc).

Apart from the regulations, some CSOs and government agencies, National Agricultural Advisory Service (NAADS) and Northern Uganda Social Action Fund (NUSAF), are promoting agroforestry and tree planting as income generating opportunities (e.g. DGb; SCb; CRf; CSd; GIb). Since tree seedlings are generally not available for purchase locally, CSOs and government agencies are distributing fruit and timber tree seedlings to individual households in order to increase the tree cover in the short run, and increase income through the selling of fruits and timber in the long run (e.g. DGd; SCb; CRf; CSd; GIb). In addition to this, the local government has launched an awareness campaign in the radio: *'There was a bylaw being announced on the radio that if you are going to cut a tree, you first plant five,'* (man, age 32); *'I have just learned /.../ from the radio or what, that if you keep cutting down the trees without planting, it affects the rain, you make the rain stop,'* (man, age 20). This connection between tree cover and rain is also found as inherited knowledge in the communities: *'Our grannies used to tell us that it is the trees that bring rain, but*

²² It is not clear whether this ban is still in function (DGc; GIa); some state that that it is necessary to obtain a permit from the local government to burn charcoal (CSe), which would indicate that the practice is no longer banned.

²³ 100,000 UGX ≈ 39 USD

these days, since the trees are few, the seasons are changing,' (man, age 34). Hence, the local government and CSO responses have been very effective in increasing awareness in the communities. While the responses have had some impact on the rate of production, some people are though continuing burning charcoal illegally (CSe).

To answer research question 5, the local government and CSOs have *discursively* succeeded in addressing the production-side of charcoal burning. However, while there is wide awareness of the detrimental impact of charcoal burning, it is clear that it is still widely practiced, and the outflows of labour materials and energy have not halted. While the local government has addressed the charcoal traders through transportation fees, and discouraged local charcoal burners by requiring a permit, the local government has not addressed the businessmen buying trees in exchange of consumer goods. Moreover, the consumption-side of the exchange relation is not addressed, therefore the EDC remain unresolved. As a consequence, the demand for charcoal is still present and drives the continuous charcoal production and with that environmental degradation. However, these are actors and factors that the local government and CSOs are not in position to address alone. It requires interventions at other levels – regional, national – for example by finding alternative sources for energy in urban areas. Hence, as the local government is employing many strategies to address deforestation – regulation, awareness creation and alternative income options – they are doing what they can within their jurisdiction to address the outflows of labour, materials and energy.

To sum up, the production charcoal is oriented towards external consumption, indicating a high outflow of labour, materials and energy. The demand for charcoal is encouraging tree clearance at a faster rate than the forests can regenerate, thus contributing to deforestation with consequences for ecosystem services and climate regulation. This environmental impact is affecting the local charcoal burners, the landowners as well as the rest of the community, and is thus displaced from consumers, charcoal traders and businessmen. However, among local government, CSOs and communities the environmental impact is mainly constructed as a local challenge of charcoal burning being caused by ignorance and poverty. The subsequent responses are focussing on enforcing regulations, increasing awareness and providing alternative income opportunities. Hence, while the responses address the local production-side, they have limited impact on the demand side, which is beyond the jurisdiction of the local government and CSOs. In effect, the outflows of labour, materials and energy are insufficiently addressed.

5.4 Fishing and depleted fish stocks

Located at the shores of Lake Kwana, Lake Kyoga and the River Nile, Apac district has plenty of fresh water resources, and fishing is the second-most important economic activity in Apac after agriculture (e.g. DGc; SCb; CRh; GIa).

According to my respondents, fishing is a fulltime occupation for the people living near the landing sites (DGc; DGf; CRh). People who live further inland mostly fish to gain additional income, and are for instance working on the agricultural soils during daytime and fishing at night (CRh). Some of the fish are consumed locally as they are smoked at the landing sites using local firewood and brought to the villages further inland (DGc; DGd; GIa; GIb). Other fish are exported to other districts and even to neighbouring DR Congo and South Sudan (DGd). At one of the main landing sites there is a truck-loading site, where cooling or freezing trucks arrive daily to load the catch of the day and transport it out of the district.



Photo 12: River Nile, Apac district.

Photo by the author

The fishermen can roughly be divided into two groups: those producing for the local market, and those exporting. From my interviews and observations there seems to be a pattern that the people marketing their catch locally are employing small boats and simple fishing gear, while the people

exporting their catch are employing motorised boats and advanced fishing gear. While the small-scale fishermen often are local residents, it is not clear whether the large-scale fishermen are local residents or people from outside the district.

To answer research question 1, the production-consumption pattern is, like farming, partly local and partly for export. This indicates a net outflow of labour, materials and energy. While the fishermen require industrial inputs in the form of fishing gear and boats, they may still lose emergy and gain entropy/disorder in the exchange. However, it requires quantitative studies to determine the degree of TSEA.

5.4.1 Impoverishing industrial inputs

While industrial inputs for agriculture have the potential of sustaining yield e.g. by applying fertiliser and thus give a feedback loop of emergy, Odum (2007:196-197) pointed out that inputs for fisheries are not providing any emergy feedback. Fisheries inputs are only increasing the *effectiveness* of extraction, not ensuring sustained yields. He further claims that while technological improvements in the fishing industry may increase exports, it may also make the prices for fish too high for the local population, and the mechanisation may further result in loss of employment and loss of biodiversity (Odum 2007:198). Therefore, the mechanisation of fisheries in Apac may aggravate the socioeconomic and environmental impoverishment resulting from the outflow of labour, materials and energy. Moreover, using equipment to increase efficiency is, as Hornborg (2011:38) notes, a displacement of the burden of problem-solving to other areas. I.e. when fishermen acquire fishing gear and boats, they are engaging in TSEA and ELD to the location of extraction of raw materials for these inputs.

Hence, to answer research question 2, several local government officials indicated that the population growth and the opportunity to export have increased the fishing activities to a point where the fish stocks are depleting (DGd; DGe; SCb):

The fisheries resources have also been exhausted, because of over-harvesting (...) We export them to Zaire²⁴, to Sudan²⁵, to other places, so there has been a lot of business in that and it has cost us a lot.

DGd

²⁴ Now: DR Congo.

²⁵ I assume the respondent is referring to neighbouring South Sudan, which became independent from Sudan in July 2011.

To answer research question 3, the environment impacts of depleted fish stocks and loss of biodiversity are affecting the fishermen, who experience smaller catches, smaller fish and smaller incomes. Moreover it affects local consumers, who, unlike urban and foreign consumers, are not able to get fish from other locations. In other words, there is an ELD from urban and foreign consumers to large- and small-scale fishermen as well as local consumers.

5.4.2 Diverging discourses

Moving into research question 4, the unequal distribution of environmental impact is articulated around two main discourses: one among local government officials and one among community members. On the one hand, the local government is creating a discourse of ignorance and poor attitudes of small-scale fishermen (DGf):

...our communities here are hard, for example you tell them one thing, he insist on doing what he feels is right, he doesn't take you serious. So they are supposed to adopt all the good things we are trying to give them, but eventually you find that now, they don't. /---/ It is just a matter of attitude. /---/ Now we are telling this person: *'Now, you leave this one [the fishing gear] here, get this one'* – he is refusing. /.../ Their mind-sets are blocked, they have a poor mind-set.

DGf

As a response, the local government has introduced Beach Management Units (BMU) to strengthen the enforcement of the national regulations concerning the size of the nets (DGe; DGf). The BMU patrols around the landings sites and control the fishing gear as well as the size of the fish sold at the landing site urban and foreign consumers: *'So currently they [the BMU] are patrolling inside that lake /.../ they are moving around these big markets where fish are sold, and whenever they are getting those small fish, they go and arrest you,'* (SCb). However, this enforcement has even had fatalities: *'...some people jump from the canoes into the water, they die and... it is very difficult to enforce,'* (DGe). Further, the local government is increasing awareness through a sensitisation campaign, and promoting 'modern' technologies such as cage farming: *'The nets can come like that as a box of three square, three cubic metres, /.../ so this fish is fed for about six months, and the fish grow,'* (DGf). Hence, the local government discourse has been complemented by a variety of government interventions.

In contrast to the case of charcoal burning, the communities are not sharing the discourse of the local government concerning fishing. Instead the discourse among the community members illustrate that they feel overruled: *'Now the problem is the government has taken over, because they*

no longer allow us to fish,' (man, age 30); *'We have been chased from the lake, we are no longer fishing like we used to,'* (man, age 34); *'Even some small boats are now not allowed even in the lake,'* (SCb). As neither community representatives nor other community members mentioned the challenge of overfishing during interviews, the government sensitisation campaign for overfishing has not been as effective as the one for charcoal. From the communities' point of view, the problem lies in the in government restrictions as well as the increased insecurity at the lakes: *'these days you got to have a hire at your back to look for some, if someone is not coming from behind, because these people have big boats,'* (woman, age 18).

As a response, many small-scale fishermen have been forced to change livelihoods. Others demand the local government to provide them with legal fishing gear: *'Government should come in and give us the size of the nets they want us to use, not just stopping us and not giving us an alternative,'* (man, age 32). Finally, others continue fishing: *'There is some little bit of fishing nowadays, although people do it illegally, /---/ because you have to use some modern gears that the community cannot afford,'* (man, age 42).



Photo 13: Landing site, Apac district

Photo by the author

Thus, while the EDC is biophysically a conflict involving small-scale and large-scale fishermen as well as external and local consumers, it is by the local government discursively constructed as a local problem between the small-scale fishermen using illegal nets and the local government enforcing the regulations. Overall, it seems that the small-scale fishermen are hit harder by the regulations than the large-scale fishermen:

...so many people from the population are now eliminated from the business, they are /.../ left out. Because if you don't have the right fishing gears, which are costly, you cannot enter now into the river and go and do fishing. So it is the bigger people, the more progressive fisheries guys, who are managing.

DGe

This is interesting considering that studies show that small-scale fisheries are more environmentally friendly (Mansfield 2011:96), and the overfishing globally is largely driven by mechanisation (Robbins 2012:182-183). To answer research question 5, neither the local government nor the community responses seek to address the production-consumption pattern leading to overfishing. On the contrary, the government may indirectly be promoting export by favouring the large-sale fishermen. As a consequence, resources are currently redistributed away from the small-scale fishermen and local consumers, to large-scale fishermen and external consumers, thereby leading to social and environmental impoverishment.

To sum up, fishing is partly produced for consumption within the district and partly for export to others districts and abroad. This indicates a net outflow of labour, materials and energy leading to social impoverishment in the form of higher fish prices and unemployment and environmental impoverishment in the form of depleted fish stocks. The environmental impact is affecting large- and small-scale fishermen and the rural consumers who, unlike urban consumers, do not have an alternative source for fish. The local government discourse concerning the distribution of environmental impact is focusing on ignorance and poor attitudes of the small-scale fishermen, who employ illegal tools. The subsequent responses focus on regulation, enforcement, awareness creation and promoting 'modern' technologies. Since small-scale fishermen cannot afford the legal equipment, the local government is indirectly favouring large-scale fishermen, who are producing for the external market. In effect, this supports the outflow of labour, materials and energy. Further, it leads to a conflict between the small-scale fishermen and the local government. In response to the government restrictions, the small-scale fishermen are either transgressing the law or finding

alternative income opportunities. Hence, neither response is addressing the production-consumption pattern and the outflow of labour, materials and energy.

6. Conclusion

The purpose of this study is to explain environmental degradation and economic challenges in Apac district through the perspective of ecosystem boundaries and ecological distribution conflicts, and to evaluate current responses from local government, CSOs and communities in this perspective.

The study shows that by taking a step back and looking at the overall economic and political structures, we can find an alternative explanation to environmental degradation and economic challenges in Apac district that go beyond poverty, ignorance and poor attitudes. Drawing attention to the production-consumption patterns of the economic activities in Apac district, the study finds strong indication of unequal flows of labour, materials and energy. Whereas the consumption of bricks is kept locally, agricultural products, fish and especially charcoal are drawn out of the district for consumption elsewhere. Since the industrial products traded in return contain less potential for value addition than the raw materials exported, there is a net outflow of emergy and a net inflow of entropy, leading to social and environmental impoverishment.

Following the outflow of labour, materials and energy, there are clear indications that pressure from external consumption and industrial production demands a resource extraction at a rate that exceeds the capacity of nature to reproduce. In other words, there are indications that the local ecosystem boundaries have been met. This leads to environmental impacts in the form of soil degradation, nutrient depletion, loss of ecosystem services such as flood regulation, drought control and microclimate regulation leading to an increased risk of disasters, as well as depleted fish stocks and loss of biodiversity. The environmental impacts are unequally distributed among producers, consumers and other actors, which indicate an environmental load displacement that further points to ecological distribution conflicts in material terms.

While environmental degradation is largely recognised in Apac, it is mostly understood as local challenges of poverty, ignorance and poor attitudes. Therefore, the discursive constructions of the ecological distribution conflicts are not acknowledging the various actors along the production-

consumption line, who contribute to the environmental impact. Following the discourse, the subsequent responses are focussing on sensitisation, regulation and adopting 'modern' technologies to increase production output. Hence, with a geographically restricted area of influence, the current response of the local government, CSOs and communities cannot fully address the production-consumption patterns, and will hence have limited impact on the net outflows of labour, materials and energy.

Nevertheless, there are potential venues for addressing the local environmental degradation and economic challenges in Apac. First of all, there is a wide awareness among government officials, CSOs and communities about the environmental challenges in the district. Second, though farmers consider traditional soil conservation practices to be primitive, the practices are widely known and relatively utilised, creating a basis for self-sustaining agro-systems. Moreover, a few local government officials are encouraging the use of organic fertilisers and food crops (in contrast to cash crops) to ensure local self-sufficiency. Likewise, they promote the establishment of farmers' groups and local value addition, to reduce the socioeconomic impoverishment caused by the unequal exchange with middlemen. Finally, the need for diversifying livelihoods to supplement agriculture, fisheries and charcoal burning is acknowledged by a few respondents. These diversifications could be inspired by the practice of brickmaking, which is a good example of an economic activity with a local circular flow that does not cause an impoverishing outflow of labour, materials and energy.

6.1 Contribution to academic debate

This study shows that the theories of ecological economics and political ecology offer valuable insight to development studies. By adding the dimension of ecosystem boundaries and unequal ecological exchange, this study offers an alternative explanation of environmental degradation and economic challenges in Apac beyond poverty, ignorance and poor attitudes. Moreover, the study illustrates that the theory of ecological economics is not only relevant in the context of affluent countries, but are largely relevant in less affluent countries where rural populations being in the *ecosystem frontier* are the first in line to experience the ecosystem boundaries. In addition, the study shows that political ecology is not only applicable where multinationals companies extract resources or subcontract farmers, but it also have explanatory power to the ecological distribution conflicts that occur in a conventional market situation with exchange relations between local and regional/national/international actors.

Finally, this study exemplifies that people in the periphery are not necessarily just 'victims' of raw material extractions. By importing consumer commodities and production inputs for agriculture and fisheries, peripheral communities are themselves engaging in TSEA and ELD causing resource depletion and outflows flows of labour, materials and energy from other location of raw material extraction. Whether the labour, material and energy for these goods originate in the cores or in another periphery will have great implications for the reinforcement or reduction of global inequality. Thus, while the study is not against trade *per se*, it encourages a look beyond the economic benefits of trade and recognition of the environmental and social impacts trade entails. Trade may not be an appropriate tool to address inequality, and for it not to increase inequality there is a need to make trade systems socially and environmentally responsive.

6.2 Suggestions for further research

Being a pilot-study, this study opens doors for further research. One suggestion is to look brickmaking as an economic activity with local circular flows of labour, materials and energy, and evaluate to what extent the activity is environmentally sustainable, especially given the increasing population and subsequent increasing demand for housing. Another theme to look into, departing from this study, is how a reversal of the fisheries regulations, i.e. promoting small-scale instead of large-scale fishermen, would influence the fish stocks, biodiversity and local employment. This points towards an overall look at the local circular flows economy advocated for by ecological economics. What would the geographical span of such a local economy be? How is urban consumption to be met given the limited space for production? How large a supportive area could urban areas require without inducing unequal ecological exchange? Answering these questions would allow us to get a little closer to a more socially and environmentally sustainable society.

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Appendices

Appendix I: List of respondents and coding principles

District government officials (DG)	
District Government Officer A (DGa)	District Government Officer D (DGd)
District Government Officer B (DGb)	District Government Officer E (DGe)
District Government Officer C (DGc)	District Government Officer F (DGf)
Sub-county government officials (SC)	
Sub-county Government Official A (SCa)	Sub-county Government Official C (SCc)
Sub-county Government Official B (SCb)	
Community representatives (CR)	
Community Representative, parish A (CRa)	Community Representative, parish B (CRb)
Community Rep., parish A, village 4 (CRc)	Community Rep., parish B, village 2 (CRd)
Community Rep., parish A, village 5 (CRe)	Community Rep., parish B, village 1 (CRf)
Community Group Chairperson, parish A (CRg)	Community Group Chairperson, parish B (CRh)
CSO staff (CS)	
CSO A (CSa)	CSO D, staff 1 (CSd)
CSO B (CSb)	CSO D, staff 2 (CSe)
CSO C (CSc)	
Group interviews (GI)	
Men, parish A (GIa)	Men, parish B (GIb)
Women, parish A (GIc)	Women, parish B (GId)
Youth, parish A (GIf)	Youth, parish B (GIg)

Appendix II: Composition of group interviews

Men, parish A

Date: 13-12-2012

Letter	Village	Gender	Age	Level of education
A	1	M	78	S-4
B	1	M	45	S-5
C	3	M	65	P-6
D	2	M	65	P-7
E	4	M	81	P-2
F	4	M	44	S-1
G	1	M	39	S-3 Technical
H	2	M	59	P-6
I	5	M	35	P-7
J	6	M	29	S-4

P = Primary school (grade 1-7)

S = Secondary school (grade 1-6)

Women, parish A

Date: 19-12-2012

Letter	Village	Gender	Age	Level of education
A	1	F	26	P-7
B	2	F	49	S-3
C	2	F	30	P-6
D	1	F	40	P-7
E	1	F	45	P-4
F	1	F	28	P-6
G	3	F	37	S-4
H	4	F	43	P-6
I	1	F	23	S-4
J	2	F	27	S-3
K	1	F	19	S-1
L	1	F	19	P-6
M	4	F	47	P-1

P = Primary school (grade 1-7)

S = Secondary school (grade 1-6)

Youth, parish A

Date: 13-12-2012

Letter	Village	Gender	Age	Level of education
C	1	M	24	S-4
D	4	M	27	P-7
E	1	M	20	S-3
F	1	M	21	P-7
G	1	M	19	S-1
H	1	M	27	P-7
I	1	M	28	Degree
J	1	F	28	P-7
K	3	F	28	S-3

P = Primary school (grade 1-7)

S = Secondary school (grade 1-6)

Men, parish B

Date: 14-12-2012

Letter	Village	Gender	Age	Level of education
A	2	M	35	S-4
B	1	M	48	S-2
C	2	M	42	P-7
D	2	M	34	P-7
E	1	M	35	S-4
F	1	M	40	S-4
G	1	M	30	S-3
H	2	M	32	[unknown]
I	2	M		[unknown]
J	2	M	40	S-4
K	2	M	27	[unknown]
L	3	M	42	S-3

P = Primary school (grade 1-7)

S = Secondary school (grade 1-6)

Women, parish B

Date: 14-12-2012

Letter	Village	Gender	Age	Level of education
A	1	F	40	P-7
B	1	F	40	P-1
C	1	F	67	P-7
D	1	F	32	P-7
E	1	F	33	P-4
F	1	F	37	P-6
G	1	F	28	P-6
H	2	F	35	P-7
I	1	F	37	P-5
J	2	F	35	P-2
K	1	F	28	P-7
L	1	F	31	P-6

P = Primary school (grade 1-7)

S = Secondary school (grade 1-6)

Youth, parish B

Date: 14-12-2012

Letter	Village	Gender	Age	Level of education
A	1	F	17	S-3
B	1	M	19	S-4
C	1	F	15	S-1
D	1	M	20	S-3
E	1	M	20	S-1
F	2	M	19	S-6
G	2	M	19	P-7
H	2	F	18	S-4
I	2	F	17	S-4
J	1	F	19	S-4
K	4	F	17	P-7
L	5	M	16	S-4

P = Primary school (grade 1-7)

S = Secondary school (grade 1-6)

Appendix III: Interview guides

Semi-structured interviews

This interview guide was used for district government officials, sub-county government officials, community representatives and CSOs. While the overall themes were set, the specific questions were amended to the different respondents.

Presentation of study

Thank you for taking time to see me. I will start by introducing myself: My name is Inge-Merete Hougaard, I am a master student from Lund University, Sweden, where I study International Development and Management. I am conducting an internship with the [foreign CSO], and I am based with [host CSO] here in Apac.

I'm here to do a study about how we can support the communities in improving their livelihoods and develop alternative ones. Moreover, I will use the data for my own master thesis research when I come home, where I will write about opinion concerning the environment and how it influences livelihoods. So the purpose of this interview is for me to gather information about the district/sub-county and the management plans, and what challenges you face. I hope it is okay that I use this recorder so I won't spend too much time noting down, but can focus on our conversation.

So before we start I would like you to confirm that I can use what we talk about here for the two studies I mentioned?

And if you wish, you can be anonymous in the reports, and I will only cite you as 'district/sub-county government official', or I can use your name and title if you prefer that?

Do you have any questions or remarks before we start?

1. Introduction

- a. How long time have you been (working) in this position?
- b. Based on your experience here, what do you consider the greatest challenge in the district/sub-county/parish/village/community?
- c. What do you consider the greatest opportunity or strength of the district/sub-county/parish/village/community?

2. *Natural resources*

- a. What is in your opinion the most important natural resource in the area?
- b. Why is this? What function and services does the resource provide?
- c. Have you always had this opinion that this is the most important resource, or have you changed your mind in recent years, been influenced by any events?
- d. Have you experienced any change in the environment in recent years? Have you experienced these changes yourself?
- e. How has this influenced people's livelihoods? Have they changed their behaviour, tried to adjust?

3. *Livelihoods*

- a. What are the main livelihoods practiced around here?
- b. Concerning agriculture...
 - i. What are the most common crops grown?
 - ii. What is the average size of land for a household?
 - iii. What are the most common animals to have in the household?
 - iv. What is the average number of animals in a household?
 - v. Do people use fertilisers or pesticides?
 - vi. Is it normal to use irrigation? If yes, where does the water come from?
- c. What are the main challenges to agriculture?
- d. Has the output from food production in the district/sub-county/parish/village/community changed in recent years? Have the prices on food changed in recent years? What do you think is the reason behind these changes?
- e. Have people tried to improve the agricultural methods (agroforestry, intercropping, irrigation, fertilisers, etc.)?
- f. Do you have other ideas of what methods could be introduced to improve the agriculture, but are not here yet?
- g. Have people tried to introduce other forms of income-generating activities? Were they successful?
- h. Do you have other ideas of what other income-generating activities that could be introduced here?

4. *Legal framework*

- a. Are there any management plans at the district/sub-county level concerning:

- i. Environmental management?
 - ii. Disaster management?
 - iii. Agricultural development?
 - iv. Infrastructure development?
 - v. Conservation?
- b. What are the procedures for developing the plans, when were they formulated and what is the status of implementation? (DG; SC)
- c. What are the challenges of implementation? (DG; SC)
- d. Are there any plans for infrastructure development such as roads, water, electricity and energy supply in parish A and parish B? What is the status of implementation? What are the challenges? (DG; SC)
- e. How can the local communities influence the different management plans? (DG; SC)
- f. Do you feel well informed about management plans at district or sub-county level? (CR)
- g. Do you feel you can influence the different management plans? (CR)
- h. Apart from [host CSO] do you know of any other CSOs working in the area? What are they working with? (CR)
- i. Have you been cooperating with the local government? (CS)
- j. Have you worked together with other CSOs before? (CS)
- k. Have you been working with the private sector? (CS)
- l. What challenges do you face in the implementation of your activities? (CS)

5. Vision

- a. What is your vision for the district/sub-county in 20 years? How do you hope to see it? How do you imagine it is going to be?
- b. What is the role of the government in reaching this vision?
- c. What is the role of the civil society, the CSOs?
- d. What is the role of the people, the communities?

Concluding the interview

Thank very much for taking time to see me. Thank you for the information and for sharing your point of view. I will be around until the end of January, where I will present the findings from the [host CSO] study in a small report. I will circulate first draft, and there will be some time for

comments and feedback before I will share the final report. And if you have any additional comments or anything you are welcome to contact me, you have my contact information.

Do you have any questions or comments?

Thank you.

Group interviews

This interview guide was employed for the six group interviews with men, women and youth, respectively, in parish A and parish B. While the overall structure was followed, the specific questions were adapted to the flow of the conversations.

Presentation of study

Thank you for taking time to see me. I will start by introducing myself: My name is Inge-Merete Hougaard, I am a master student from Lund University, Sweden, where I study International Development and Management. I am conducting an internship with the [foreign CSO], and I am based with [host CSO] here in Apac.

I'm here to do a study about how we can support the communities in improving their livelihoods and develop alternative ones. Moreover, I will use the data for my own master thesis research when I come home, where I will write about opinion concerning the environment and how it influences livelihoods.

The purpose of this group interview is to get your opinions and views, so please be honest; we want to hear your personal ideas and thoughts. And please feel free to say anything you want – I'm just a student and I cannot make any decision for the organisation, so please try to put [host CSO] aside and we will have a normal conversation. I am very new to Uganda and as I said I am here to learn, so maybe I will ask some questions where you feel the answer is obvious, but please try to answer the questions anyway.

I hope it is okay that I use this recorder so I won't spend too much time noting down, but can focus on our conversation.

The format of the group interview will be that I will ask some questions in English, [gatekeeper] will translate and you are free to discuss the matter among yourselves. It is a discussion and you can react to other people's opinion, not only to my questions. I would like if everyone feel free to say his or her opinion if they feel they have anything to contribute with. For the discussion to run smoothly let's settle a few ground rules: Please respect each other and allow other people to speak, respect the different opinions expressed and say your own opinion if you disagree. Please only speak one at a time, and indicate to [gatekeeper] or me if you want to say something. Feel free to speak in English or Langi and [gatekeeper] will translate.

To ensure confidentiality you have all been given a letter, and I don't know you names; we have only registered some basic information about you so we get an idea about who we are talking with. As I encourage you to respect each other's opinions during the discussion I also encourage you to respect it when you leave this room. You have all signed this registration form to show your consent, but I should also inform you that if you are not comfortable with being in this group, you are free to leave at any time. I will be around until the end of January, and if you feel there is something you need to say, that you don't want to express here, you can contact me or [gatekeeper] anytime and we can arrange an individual interview where you also can express your opinion freely.

Do you have any questions or remarks before we start?

1. Introduction

- a. What do you consider the greatest challenge in the community?
- b. What do you consider the greatest opportunity or strength of the community?

2. Livelihoods

- a. What are the main livelihoods practiced around here?
- b. Can you help me construct a seasonal calendar of what economic activities take place in the community during the year? How is the weather pattern throughout the year?
- c. How does a typical day go by for you? And for a woman/man?
- d. What is the good size of a family?
- e. What are the advantages and disadvantages of having a large/small family?
- f. Did you grow up around here?

- g. How was agriculture in your childhood? What has changed and what has stayed the same?
- h. What are in your opinion the main challenges for agriculture today?
- i. Do you think there have been any changes in the overall amount of food produced in the parish in recent years? Why?
- j. Do you think there have been any changes in the price of food for the farmer the last 5-10 years? Why?
- k. Have people tried to improve the methods for agriculture in different ways?
- l. Do you know of any other methods that you think could be interesting to introduce?
- m. How is your cooperation with the local agricultural extension worker?
- n. Before you mentioned fishing/charcoal burning/brick-making as other livelihoods practiced here. What are the challenges for the different livelihoods?
- o. Can you think of any alternative livelihoods that you have heard of and that you would like to try in the community?

3. *Natural resources*

- a. What is in your opinion the most important natural resource in the area?
- b. Why is this? What function and services does the resource provide?
- c. Do you consider water as something you should pay for as any other good or something you should be able to access for free?
- d. Have you experienced any change in the environment in recent years? (e.g. change in the quality or amount of water, land, soil, plants, air, etc.)
- e. How have these different changes influenced your livelihoods?
- f. How have people reacted to these changes? Have they tried to change their behaviour?

4. *Legal framework*

- a. Do you know about any policies, plans, projects or bylaws from the district or sub-county level concerning agricultural development or management of the natural resources?
- b. Do you feel well informed about these plans?
- c. Do you feel you can influence what is decided on district or sub-county level?

- d. Apart from [host CSO] what other CSOs have been or are still working in the area? What type of activities have they implemented? Are they still here? What have you learned from working with these organisations?

5. Vision

- a. Describe the world you would wish your children or grandchildren to grow up in?
- b. How do you imagine the area here will look in 20 years?
- c. What is the role of the government in reaching this vision?
- d. What is the role of the civil society, the CSOs?
- e. What is the role of the people, the communities?

Concluding the interview

Thank very much for taking time to see me. Thank you for the information and for sharing your point of view. I will be around until the end of January, where I will present the findings from the [host CSO] study at a community meeting like this one. Then we can discuss the findings and I will include your comments and feedback in the final report. And if you have any additional comments or anything you are welcome to contact me, you have my contact information.

Do you have any questions or comments?

Thank you.