MINISTY OF FINANCE, ECONOMIC PLANNING & DEVELOPMENT

Overcoming Poverty in Malawi through Sustainable Environment and Natural Resource Management

Identifying Policy Options to Accelerate Poverty Reduction

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in association with

Agriculture and Natural Resources Management Consortium (ANARMAC) (ANARMAC)

TABLE OF CONTENTS

LIST OF TABLES

List of Figures

List of Boxes

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Notwithstanding the contributions of the various players to the production of this report, all errors, omissions and misrepresentations remain the responsibility of the Consultant.

LIST OF ACRONYMS

ADF	: Augmented Dickey Fuller
AIDS	: Acquired Immuno-deficiency Syndrome
ASWAp	: Agricultural Sector-Wide approach
BCA	: Benefit Cost Analysis
CGE	: Computable General Equilibrium
CPI	: Consumer Price Index
DALY	: Disability Adjusted Life Years
DPD	: Director of Planning and Development
DPSIR	: Driving force- State - Response- Impact- Response model
ECM	: Error Correction Model/ Error Components Model
EHP	: Essential Health Package
EIA	: Environmental Impact Assessment
EIRR	: Economic Internal Rate of Return
ENR	: Environmental and Natural Resources
ENRC	: Environment, Natural Resources and Climate
ENRM	: Environment and Natural Resource Management
ESCOM	: Electricity Supply Corporation of Malawi
ESIA	: Environmental and Social Impact Assessment
FISP	: Farm Input Subsidy Programme
FAOSTAT	: Food and Agriculture Organization Statistics
FCD	: Forest Cover Degradation
GCP	: Gross Capital Formation
GDP	: Gross Domestic Product
GEXENR	: Government Expenditure on Environment and Natural Resources
GoM	: Government of Malawi
HDI	: Human Development Index
HIV	: Human Immuno-deficiency Virus
HPI	: Human Poverty Index
IEC	: Information, Education and Communication
IEP	: Integrated Energy Policy
IGPWP	: Income Generation Public Works Programme
IHS	: Integrated Household Survey
ISEW	: Index of Sustainable Economic Welfare
KII	: Key Informant Interviews
MFED	: Ministry of Finance, Economic Planning & Development
MGDS	: Malawi Growth and Development Strategy
MoAIWD	: Ministry of Agriculture, Irrigation and Water Development
MoLGRD	: Ministry of Local Government and Rural Development

MoNREM	: Ministry of Natural Resources, Energy and Mining
MPRSP	: Malawi Poverty Reduction Strategy Paper
NAMA	: Nationally Appropriate Mitigation Actions
NAP	: National Agriculture Policy
NCE	: National Council for the Environment
NEPA	: National Environmental Protection Agency
NGO	: Non-Governmental Organization
NPV	: Net Present Value
NSO	: National Statistical Office
OPC	: Office of President and Cabinet
OPA	: Organizational Performance Agreement
PEI	: Poverty Environment Initiative
PGDP	: Per capita Gross Domestic Product
PPP	: Public-Private Partnerships
PSIR	: Pressure- State- Impact- Response
PSR	: Pressure- State- Response
RBM	: Results-Based Management
SLM	: Sustainable Land Management
SPSS	: Statistical Package for Social Scientists
SWAp	: Sector-Wide Approach
TA	: Traditional Authority
UNDP	: United Nations Development Programme
UNEP	: United Nations Environmental Programme
VECM	: Vector Error Correction Model
VAAG	: Value Added Agriculture
WCED	: World Commission on Environment and Development
WHO	: World Health Organization

GLOSSARY OF TERMS

Agriculture Value Added:	This refers to the net output of the sector after adding up all outputs and subtracting intermediate inputs and is calculated without making deductions for depreciation of assets or depletion and degradation of natural resources.
Augmented Dickey Fuller Test:	This is a test for stationarity of time series data. It is executed by regressing the first differenced series of a random variable on its non-differenced values, time trend and lagged first differenced series.
Benefit-Cost Analysis:	This is a policy or project assessment method that quantifies in monetary terms the value of policy or project consequences to members of society, hence facilitating more efficient allocation of society's resources.
Gross Domestic Product:	The total final output of goods and services produced by the country's economy, within the country's territory, by residents and non-residents.
GDP per Capita:	This is total final output of goods and services of an economy divided by total population of a given economy.
Granger Causality Tests:	These are tests of direction of causality or influence between two random variables of interest. Presence or absence of causality between a dependent and independent variable is established regardless of whether the coefficient of a lagged exogenous variable is statistically significant.
Economic Internal Rate of Return:	This is an internal rate of return based on real rather than expected or projected data set.
E. N R. Sector:	The environment and natural resources sector covers environment and climate change, land, agriculture, forestry, fisheries, water and wildlife.
E.N.R. Expenditure:	Derived from government expenditure on sector ministries and departments: environment and climate change, lands, housing and urban development, agriculture, forestry, fisheries, irrigation and water, tourism, wildlife, culture, health, local councils, public enterprises.
Error Correction Model:	This is a time series econometric analysis model that estimates the impacts of independent random variables on the dependent random variable by giving short-run and long-parameter estimates (estimation coefficients). It uses the error term from a long-run model as part of the independent variables in a short-run model.

Endogeneity:	An econometric term referring to the condition whereby a random variable that is supposed to be exogenous (independent) may actually be endogenous (dependent) as it is also determined by other variables. Such an endogenous variable is believed to affect only the intercept of the outcome variable of study interest. Correction for endogeneity is through a two-step estimation technique.
Evidenced-based Decision-making:	Refers to a decision-making process that is informed by factual information rather than opinions or other factors.
E. N. R. Degradation:	This involves conditions such as deforestation, land degradation, water contamination and shortage, air pollution and loss of biodiversity.
E.N. R. Interventions:	This refers to different interventions being implemented by different stakeholders at grass roots levels seeking to conserve the ENRs or reverse ENR degradation. These include: promotion of village or community woodlots; sustainable management of water catchment areas; sustainable management of river banks; management and protection of water resources such as fish, protection of protected areas such as national parks and forest areas; individual and community forest nursery management; re-afforestation of individual or household lands; land resource conservation in form of conservation agriculture technologies such as manure-making and application in farms; amongst others, just to mention but a few.
Fixed Effects:	A condition in a panel data econometric model whereby individual intercepts do not vary over time, i.e., are time-invariant, and the individual error component is not correlated with any of the model explanatory variables.
Internal Rate of Return:	Refers to the interest rate at which the costs and benefits of a project discounted over its lifetime are equal; hence, it informs the internal profitability of an investment. It uses anticipated or projected data sets.
Logit Model:	An econometric model with a dependent or outcome variable is a binary variable, represented by a value of one (1) if the desired outcome is realized and by a value of zero (0) if it is not.
Long Run:	In the context of this study, 'long run' refers to a period of at least one year because the analysis is using annual time series data.
Macroeconomic Analysis:	Analysis of national economic conditions and relationships based on aggregated national data.

Maximum Sustainable Yield:	Refers to a particular stock size at which the quantity of net natural growth is at maximum. It is considered an ideal rate of harvest for a renewable resource since, at this point, the largest harvest is consistent with non-declining resource stock size and hence can be maintained indefinitely.
Microeconomic Analysis:	Analysis of household socio-economic behaviour using household data set. This type of data set was collected from households during household survey.
Net Present Value:	It refers to the difference between the present value of the benefits and present value of the costs. The present values for benefits and costs are obtained by adjusting the observed values with a discount rate. Positive value implies that the project could be adopted.
Trend Analysis:	An examination of patterns of data behaviour for a variable or variables over a given time period of interest.
Panel Data:	The data set comprising elements of time series and cross-sectional data. It demonstrates heterogeneity of individuals for which the data is collected. In the context of this study, for each household, the study collected three years of data on each of the variable of interest.
Peri-urban Area:	A geographical area proximate to a city or town, with the livelihoods of the populace having rural and urban lifestyles.
Productivity:	This refers to the production per unit of factor of production. In this context of the study, 'agricultural productivity' refers to production values per unit of land area used for production.
Potential Yield:	This refers to the maximum agricultural yield per unit of the land input obtained by researchers as defined in the Malawian context. However, in other literature, such maximum yield is called 'experimental yield'.
Poverty:	An unacceptable condition of being unable to meet the minimum levels of livelihood needs such as income, food, clothing, health care, shelter and other life essentials. In the context of the study, a multidimensional concept of poverty refers to household deprivation of income, food security, productivity, health and access to water.
Poverty-E. N. R. Nexus:	This refers to complex relationships between poverty and environment, involving feedback loops between poverty and environment & natural resources.

Random Effects: The condition in a panel data econometric model whereby one expects the individual intercepts to vary over time and the individual error component or unobserved effects to be correlated with the model explanatory variables.

Rural Area: An geographical area characterized by limited or poor socio-economic infrastructure such as roads, and where the majority of the populace depend upon agriculture production and harvesting of environment and natural resources for meeting their livelihood needs.

Selectivity Bias: An econometric modelling belief that a participation variable affects not only the model intercept, but also the coefficients. Correction for selectivity bias is implemented through a two-step estimation technique where the first stage is a probit/logit model used to predict the probability of household participation in an activity, then used in the second model of primary interest.

Sensitivity Analysis: This is a way of investigating the robustness of the computed net benefit estimates by acknowledging uncertainty about the estimated values obtained in predictions.

Stationary Time Series: Refers to time series with mean, variance and auto-covariance remaining the same no matter at what point we mean them, i.e., they are time-invariant.

Short Run: In the context of this study, 'short run' refers to a period of one year because the analysis is using annual time series data.

Technical Efficiency: A production analysis and measurement term referring to the ratio between the observed output and the maximum output, under the assumption of fixed input; alternatively, this refers to the ratio between the observed input and the minimum input under the assumption of fixed output.

Unbalanced Panel Data: A data set with unequal or incomplete number of values in a panel. In the case of this study, since some households could not recall all data for the three-year period, the panel data for some households fell short of the required three-year period.

Unbalanced Panel Data Econometric Model: An econometric model based on use of unbalanced panel data.

EXECUTIVE SUMMARY

This report presents insights from a series of investigations to explore the poverty-environment nexus in Malawi and to identify sustainable pathways for poverty reduction by quantifying poverty and environment linkages. The study was commissioned by the Government of Malawi through the Ministry of Finance, Economic Planning and Development with financial and technical support from the UNDP-UNEP Poverty-Environment Initiative.

Study objective

The objectives include quantifying identified environment and natural resource (ENR)-poverty linkages in Malawi in terms of the impact on various aspects of poverty and identifying policy options to accelerate poverty reduction through the more sustainable use of ENR. In so doing, the study demonstrates how unsustainable ENR use and environmental degradation impact on poverty levels.

Study approach

The study adopted a multidimensional definition of poverty that includes: incomes, productivity, food security, health and access to water. As such, analyses of the poverty-ENR nexus refer to the interactions between the various aspects of poverty and the environment and natural resources. Premised on this understanding, the study involved interrelated activities such as: review of previous empirical studies that provided the premise for the study approaches; review of the national policy landscape to identify policy gaps; collection and analysis of secondary quantitative and qualitative data from national and international institutions; and data collection and analysis from rural and peri-urban households selected from 10 disaster-prone districts.

Study Findings

Policies governing the ENR sector:

The sector is governed by several policy, regulatory and institutional frameworks, some of which have become outdated. The study has also observed that weak implementation of policies is compromising the effectiveness of the ENR sector on poverty reduction and inter- and intra-sectoral collaboration.

Mismatch between policy pronouncements and implementation:

While the need for an enabling environment for private sector participation is well recognized in almost all policy frameworks, there is a general lack of will and institutional capacity to make things happen easier, cheaper and faster for attraction of private sector in the productive sectors of the economy, including the ENR sector.

Investigations into the extent of inclusion of poverty impact assessments in

the implementation plans show that there is minimal practical use of poverty impact assessments as the basis for national and sectoral policy, programme and project developments and reviews. Much as lack of capacity and financial resources can be blamed for this situation, it is reflective of a wider structural problem of not encapsulating a systematic methodology that relies on evidence-based decision processes in the public sector in general and ENR sector in particular.

The ENR sector is critical for poverty reduction:

The study results show that a 1 percent (317 sq km) increase in forest cover degradation in the long run is likely to reduce GDP per capita by 0.6 percent (US$1.5). In real terms, this translates to a loss in income of nearly US$24 million a year. The study findings show that a 1 percent increase in expenditure in the ENR sector leads to 0.43 percent increase in per capita GDP. In quantitative monetary terms, this means that, for every US$300,000 increase in ENR expenditure, there is an additional increase in GDP per capita of US$1.1 or an additional increase in overall GDP by US$17 million based on a population of 15 million individuals.

Inquiries into the macro-level productivity and ENR linkages show that government investments (expenditure) are the main drivers of agriculture value-added in the short and long runs. For instance, the findings show that, in the short run, a 1 percent (US$2 million) increase in public expenditure in the agriculture sector results in 0.46 percent (US$500,000) increase in agriculture value-added, whereas, in the long run, a 1 percent (US$2 million) increase in agriculture expenditure leads to 3.57 percent (US$24 million) increase in agriculture value-added. This means that sustained public investments in the agricultural sector are important for the attainment of sustained agricultural productivity growth agenda.

The macro-level investigations into the national food security impacts of ENR reveal differences in the extent of short- and long-run impacts. The study findings show that public investments in the ENR sector have long-run positive food security impacts, with a 1 percent (US$300,000) increase in public investment in the ENR sector resulting in 2.01 percent (280,000 MT) improvement in national food security.

Macro-level interrogations into the health outcomes showed that access to clean water has dire short- and long-term health impacts, including a reduction in infant mortality. Of the two time periods, the findings show that a 1 percent (150,000 people) increase in access to clean water has greater impacts in the short run (-0.26 percent or 1 death) than in the long run (-2.8 percent or 2 deaths).

Agriculture sector is key to poverty reduction:

Investigations into the linkages between the agriculture sector and national income per capita growth show that, in the long run, positive changes in the agriculture value-added have significant positive poverty reduction effects. This is evidenced by the fact that a 1 percent (US$1,000,000) increase in agriculture value-added will likely increase GDP per capita by 2.3 percent (US$6) or GDP increase of US$90 million. This finding confirms the fact that a sustained growth in agricultural sector is critical for national growth and poverty reduction objectives.

Investigations into the linkages between the agriculture sector and national income per capita growth show that, in the long run, positive changes in the agriculture value-added have significant positive poverty reduction effects. This is evidenced by the fact that a 1 percent (US$1,000,000) increase in agriculture value-added will likely increase GDP per capita by 2.3 percent (US$6) or GDP increase of US$90 million

It is wise to invest in ENR programmes:

From Benefit-Costs Analyses, it is apparent that ENR investments yield significant results and incentivize communities to engage in sustainable ENR activities whilst reducing poverty. For example, at a discount rate of 4 percent, the analysis finds the economic net present value to be US$12.4 million, whilst using the official discount rate at 12 percent gives an economic Net Present Value of $5.3 million. An Economic Internal Rate of Return (EIRR) of 62 percent was also established. The results further show that, for ENR investments to realize their objectives, there is need for effective implementation of ENR policies.

Income from ENR products cushions households:

The study results show that households earned 18 percent of their income from ENR products such as charcoal, fuel wood, honey and mushrooms, 17 percent from agricultural produce and 65 percent from off-farm economic activities.

On average, 67 percent of households participate in environmental management programmes, out of which 55 percent and 12 percent were male-headed households and female-headed households, respectively. Out of the households that participated in ENR programmes, 68 percent participated in forest programmes, 66 percent in natural water fisheries and 59 percent in wildlife.

Land and gender equality are important for attainment of household food security:

There is a positive and significant relationship between landholdings and household food security, such that making available about 1.0 ha of land, representing an increase of 33 percent on the mean household land holding, is likely to result into an additional 118 kg of grain (equivalent to two months' consumption for an average household of five people) or an 18.5 percent increase in household food security computed on the basis of mean maize yield of 1.45 t/ha obtained during the survey.

In terms of gender equality, the study showed that male-headed households are likely to be 18 percent more food-secure than their female counterparts, thus demonstrating the food security vulnerability conditions of female-headed households.

Level of education and productivity:

The study findings showed that the average years of education for the households interviewed during the survey is seven years. The implications of these findings are that an additional seven years of education (equivalent to a Malawi School Certificate of Education qualification) is likely to increase food security by about 18 percent, or an extra 264 kg/ha.

Recommendations

The study sought to quantify poverty-ENR nexus in Malawi in terms of the impact on various aspects of multidimensional aspects of poverty. The study has identified critical issues that will need to be addressed by the GoM with the support of cooperating partners and other stakeholders. The following section presents recommendations to address the poverty-ENR nexus challenges.

The ENR sector should be given priority in national development planning and budgetary allocation, including devising strategies for attracting private investment. For this reason, the GoM is encouraged to:

(1) Commit to increased ENR sector investments for sustainable income growth and poverty reduction. In view of the findings from macro- and micro-analyses demonstrating that ENR investments have positive multidimensional impacts on poverty reduction, the GoM is encouraged to re-prioritize public expenditure in such a way that more resources are allocated to the ENR sector (ENR sector covers environment and climate change, land, agriculture, forestry, fisheries, water and wildlife). Efficient resource allocation to ENR-sector institutions should help address challenges such as income poverty, land and water degradation, sedimentation and siltation of water courses, deforestation, depletion of fish stocks and wildlife management. The benefit-cost analysis shows the cost effectiveness of such investments overt time and hence it is important to have a long-term perspective when undertaking such expenditures.

(2) Review the current resource envelope for the agricultural sector with a view to unlocking the full potential of the sector to contribute to sustainable poverty reduction and economic growth. These recommendations of the study findings show that investments in the agriculture sector are key to poverty reduction; for this reason, there should be continued public investment in the sector While the agriculture sector already enjoys prioritization of public expenditures, there is need to review the resource allocation patterns within a given sector (intra-sectoral resource allocation review) to prioritize investments in agricultural research and development, agricultural extension services and training to improve smallholder productivity and sustainability.

(3) Develop and generate sustained and effective information, education and communication (IEC) to all stakeholders on the poverty reduction outcomes of ENR investments. In view of the

study findings on the low level of education and non-participation in ENR programmes, it is imperative to undertake sustained IEC activities that would mobilize national support and behavioural change towards ENR management programmes and sustainable use of natural resources. While a number of avenues could be explored and used in this respect, effective use of the available reporting systems and websites would be the first ideal step. For instance, official reports such as Annual Economic Report, the State of Environment Report and the climate change website should regularly report on the poverty impacts of the various ENR interventions at national and local levels. The reporting of ENR impacts should use the standard poverty and environment indicators.

(4) Accelerate the certification of legal land rights for smallholders in order to enhance the commercial value of land as a factor of production. The study has confirmed that land has significant impact on income and food security. Land is one of the primary means of generating livelihood for most of the poor in rural areas. As an important asset, it constitutes a main vehicle for investment, wealth accumulation and transfer between generations. Hence, there is a need to continue land access initiatives. As a result, the GoM is encouraged to explore land tenure issues by scaling up land registration and certification for sustainable land use and management.

(5) Enhance broad-based community participation in ENR management programmes: The basis of the recommendation is based on the findings that more work needs to be done to mobilize communities, noting that, on average, 67 percent of households participate in environmental management and a third of the sampled households were not participating in ENR management programmes. ENRs products are important sources of household incomes for most rural and peri-urban households in Malawi. Analysis of sources of household incomes shows that 18 percent of the sampled households' incomes come from ENR products such as charcoal, fuel wood, honey and mushrooms, amongst others, compared to 17 percent from agricultural produce, while off-farm economic activities such as business are the largest contributors to household incomes (65 percent). Thus, participation in ENR programmes has positive implications for household income and food security.

(6) Institutionalize effective mechanisms for poverty impact evaluations of ENR interventions. National policy decisions relating to identification of sustainable poverty reduction pathways through ENRs can significantly benefit from institutionalized impact evaluations of all ENR interventions at the national level as well as from international empirical studies. Institutionalized poverty impact evaluations can build on the findings of this study that show linkages between income poverty and ENRs, food security and ENRs, productivity and ENRs, health outcomes and ENRs and access to water and ENRs.

(7) Review all outdated sectoral policy, legal and strategic plans to address their shortcomings in terms of sustainable ENR management: There is a need to expedite the completion of the outstanding ENR sectors' policy and legal framework reviews. The frameworks' reviews could include realigning the lifecycles of all sectoral frameworks to that of MGDS, which is the country's overarching policy and strategic framework. The next MGDS could oblige all ENR sectors to update their policy, legal and regulatory frameworks in line with the lifecycle of the MGDS. This will help ensure that ENR sectoral policies and legal frameworks are regularly reviewed to take into account the ever-changing social and economic dynamics as well as that sectoral frameworks really respond to the overarching national framework of the day

(8) Explore more opportunities for PPPs in the ENR sector, particularly forestry management, fisheries and wildlife. This would leverage private sector competencies in mobilizing finance, technical expertise and development of markets in areas such as promoting planting and harvesting of early maturing exotic trees.

(9) Create a predictable and consistent policy environment in order to make it easier and cheaper to do business. Policy inconsistencies in form of divergence between what is stated in official policy documents and what is actually implemented send mixed signals to economic operators. In spite of the GoM's commitment to implementation of market-led agricultural pricing that provides appropriate ENR investment incentives, practical agricultural marketing policies relating to maize and other commodities run counter to the policy. Consequently, there have been distortions in the market due to the introduction of export bans and discretionary minimum selling prices and market purchases that are largely unpredictable.

1.0 INTRODUCTION

1.1 Study context

Malawi's economy is heavily dependent on the agricultural sector, which accounts for 30 percent of the Gross Domestic Product (GDP) (Government of Malawi, Annual Economic Report, 2014) and 90 percent of the country's export earnings. Over 80 percent of the total labour force is employed in the agricultural sector, which also contributes 60-70 percent of the inputs to the country's manufacturing industry. This makes the country highly vulnerable to impacts of environment and natural resource (ENR) degradation and climate change. For example, unsustainable natural resource use, prolonged dry spells, droughts and floods compound the pressure on the natural resource base, negatively affecting the performance of other key sectors such as water, agriculture and energy.

The country's economy is faced with two interlinked challenges of persistently high poverty levels and high ENR degradation rates. With respect to poverty levels, Malawi's 2010 poverty headcount ratio at the national poverty line was 50.7 percent while the more inclusive Multidimensional Poverty Index indicated a poverty rate of 66.7 percent for the same year (Oxford Poverty and Human Development Initiative, 2013). The country is facing unabated deforestation rates, estimated at between 1.0 percent and 2.8 percent per annum. This is induced by the high dependence on solid fuels (fuel wood and charcoal), estimated at 98.7 percent (Ministry of Natural Resources, Energy and Environment's State of Environment Report, 2010). As a result, Malawi's forest cover decreased from 41 percent in 1990 to 35 percent in 2008 and this rate of decline is reported as the highest in the Southern Africa region (Ministry of Natural Resources, Energy and Environment, 2010; Ministry of Economic Planning and Development, 2011).

ENR degradation has macro- and micro–level impacts. At the macro level, unsustainable natural resource use is estimated to cost the country 5.3 percent of GDP every year, thereby reducing economic growth and negatively impacting on poverty reduction efforts (Yaron et al., 2011). Besides GDP growth implications, ENR degradation in the form of deforestation increases the risk and severity of flood damages, as has been witnessed during the devastating floods in early 2015. Some empirical estimates show that a 10 percent decrease in natural forest cover leads to an increase in flood frequency from 4 percent to 28 percent (Bradshaw, 2007, quoted by Yaron et al., 2011). Further, it has been estimated that, if soil erosion had been addressed and lost agriculture yields had been recovered, 1.88 million people could have been lifted out of poverty between 2005 and 2015 (ibid.). This means that food insecurity and malnutrition are poverty aspects that could partially be addressed through more sustainable ENR use and agriculture practices that would improve soil fertility and productivity levels.

Micro-level impacts are most evident for vulnerable groups, particularly poor women, who tend to depend more on natural resources for their livelihoods. For example,

lack of access to reliable sources of clean water and energy is sometimes caused by ENR degradation. In addition, ENR degradation contributes to air- and water-related diseases such as tuberculosis, malaria and cholera. For girls and women, the time spent on water and firewood collection reduces the time available for education and income-generating activities. As such, unsustainable use of ENRs is keeping Malawians in a poverty-ENR degradation loop and poses a real threat for those that have come out of poverty to fall back into poverty. This state of affairs inhibits the achievement of poverty reduction and of the Millennium Development Goals.

Current national efforts to mainstream inclusive and sustainable ENR management for poverty reduction are being advocated for and supported by the national Steering Committee on the Poverty-Environment Initiative, a national stakeholder platform led by the Ministry of Finance, Economic Planning and Development (MoFEPD). Other participants are government ministries and departments, academia and civil society organizations (CSOs). Some of the key public institutions include the Ministry of Natural Resources, Energy and Mining (MoNREM); the National Statistical Office (NSO); the Ministry of Agriculture, Irrigation and Water Development (MoAIWD); and the Ministry of Local Government and Rural Development (MoLGRD).

1.2 Rationale and objectives of the study

1.2.1 Rationale of the study

The links between poverty and sustainable ENR and Climate Change Management have been partly explored in previous studies. However, there is a need to quantify those linkages in terms of the impact on poverty and to identify policy options to accelerate poverty reduction through the more sustainable use of ENRs. The insufficient detailed identification of the links between sustainable ENR use and poverty reduction contributes towards sub-optimal policies. It also results in insufficient budgets being allocated for sustainable ENR use that would help reduce poverty and contribute to economic growth. Therefore, a more detailed analysis of the poverty and ENR nexus in macro and disaggregated terms helps to provide a basis for a future comprehensive review of ENR policies and related financing and investment programmes. Detailed evidence on how more sustainable ENR use could help reduce poverty and achieve other development goals in Malawi will increase the probability of the Government of Malawi (GoM) in designing effective policies and programmes and increase public allocations for pro-poor sustainable management of natural resources. By further defining the poverty-environment nexus in Malawi, new pathways for moving out of poverty can be identified.

In this context, the joint UNDP-UNEP Poverty-Environment Initiative (PEI) Malawi, as part of its support to the GoM, is supporting this study. The aim of the study is to identify sustainable pathways through quantification of the poverty-environment nexus and to identify policy options to accelerate poverty reduction through the more sustainable use of the environment and natural resources. The PEI has supported the GoM since 2009 in its efforts to integrate sustainable natural resources management into national and sector policy, planning and budget processes.

1.2.2 Study objectives

In view of the foregoing, the study seeks to quantify identified poverty-ENR linkages in Malawi in terms of the impact on various aspects of poverty and to identify policy options to accelerate poverty reduction through the more sustainable use of ENR. The quantified nexus will demonstrate how unsustainable natural resource use and environmental degradation impact on poverty levels, which are defined to include issues of income, health, food security and gender disparities, amongst others. The specific details of the study objectives include:

(i) Analysis of poverty-environment nexus and policy landscape in Malawi
(ii) Quantification of poverty-environment nexus at sector and district levels and assessment of implications for the achievement of poverty reduction
(iii) Policy recommendations

1.3 Limitations of the study

A few challenges encountered during the course of implementing this study must be highlighted to enable the reader to understand the context of the findings. Due to time limitations, the study employed various macro-econometric and micro-econometric techniques to quantify the linkages between various aspects of poverty and the ENRs instead of Computable General Equilibrium (CGE) modelling. The use of macro-econometric techniques such as the Error Correction Models (ECM) have been affected by the limited time series data for the key poverty and ENR variables of interest in the study such as data on proportion of households' access to water, data on the Human Development Index, data on households having food access, just to mention but a few.[1] The micro-econometric analyses, based on household models, employed panel data econometric tools to take into account unobserved heterogeneity where faced with the challenge of household recall capacity. While this problem was handled through use of unbalanced panel data estimation techniques, that approach could not correct for the missing panel data. The study also faced operational challenges, such as difficulties encountered in reaching the target villages due to the January 2015 flood disaster. Notwithstanding the various technical and operational challenges encountered during the exercise, the study obtained the statistically acceptable data that was analysed using standard tools.

1.4 Organization of the report

This report is organized as follows:

- Chapter 1: provides the introduction to the report
- Chapter 2: outlines the methodology of the study discussing the multiple analytical tools employed for secondary and primary data analyses

[1] Much as the study sought to run time series econometric analyses with data from 1964 to 2014, most of the time series data available were for the period 1980-2013.

- Chapter 3: discusses the conceptual framework for the study and reviews previous international and national empirical studies on the linkage between various dimensions of poverty and ENR
- Chapter 4: reviews the national policy landscape and institutional arrangement for implementation of ENR interventions in Malawi
- Chapter 5: presents detailed analysis and study findings on macro-level poverty-ENR linkages, using secondary data
- Chapter 6: presents detailed micro-level analysis and findings from household surveys conducted in 10 disaster-prone districts of Malawi
- Chapter 7: synthesizes the key findings of the study
- Chapter 8: outlines the recommendations of the study

2. STUDY METHODOLOGY

The study employed qualitative and quantitative methodologies. The use of qualitative tools was largely employed in the review of previous empirical studies and the Malawi policy landscape. The quantitative tools were used in the analysis of primary and secondary data to obtain policy insights on the poverty-environment nexus. The following sections include a detailed description of the different tools used in the study.

2.1 Review of empirical studies and national policy frameworks

2.1.1 Review of empirical studies

The analysis draws on previous studies identifying poverty-ENR links, including conceptual and theoretical frameworks and empirical investigations. The review of previous empirical studies and their findings focuses on discussing the study objectives, methodologies applied and lessons learnt. The review spans five dimensions of the poverty and ENR nexus: income, productivity, food security, health outcomes and access to water.

2.1.2 Review of the national policy framework

The review of national policies seeks to gain insights into the context of the national policy and institutional framework that relates to poverty and the sustainable management of ENR. The national policy review examines the policy framework objectives, scope and institutional arrangements for implementation of the given policy frameworks. It identifies the gaps or weaknesses that need attention at the time the GoM would be reviewing such frameworks. It also includes an inquiry into the extent of gender mainstreaming and the economic rationale behind the policy prescriptions.

The policy frameworks review include: the Malawi Constitution, the Malawi Growth and Development Strategy II, the Malawi Vision 2020, the National Environmental Policy, the Agriculture Sector Wide Approach, the Forestry Policy, the National Water Policy, the Fisheries and Aquaculture Policy and Strategic Plan, the Wildlife Policy, the National Energy Policy, the National Land Policy and the National Health Strategic Plan.

2.2 Stakeholder consultations

Stakeholder consultations were conducted with key GoM officials and representatives of development partners engaged in various ENR policy and management issues (refer to Annex A.7 (b)). The consultations were carried out to gain insight into the perceptions of selected stakeholder representatives on matters relating to:

- The role of ENRs in the attainment of national poverty reduction goals
- The state of policy implementation
- Institutional arrangements for policy and legal framework implementation
- Stakeholder recommendations

The role of ENRs in the attainment of national poverty reduction goals: The consultative process sought to understand the stakeholders'/institutions' perceptions of the role of ENRs in the attainment of national poverty reduction objectives. It also identified key natural resources and their impact on people's livelihoods. In addition, the consultative process provided a platform for obtaining information on the specific programmes being implemented to promote the role of ENRs in the attainment of poverty reduction objectives.

State of policy implementation: The consultative process also sought to identify the bottlenecks for implementation of the planned national initiatives on the poverty-ENR nexus. In this regard, some of the key issues discussed include:

- Establishing stakeholders' perspectives on what the poverty challenges are and how their sector is tackling them
- Ascertaining stakeholders views on the various policy and legal frameworks
- Identifying major challenges in policy implementation
- Uncovering any new issues to policy implementation

Institutional arrangements for policy and legal framework implementation: Stakeholder consultative process sought to capture their views on the current institutional arrangements for policy implementation and any gaps to be addressed in the institutional arrangements.

Stakeholder recommendations: Stakeholders were also requested to propose recommendations on feasible policy actions to enable the ENR sector to significantly contribute towards poverty reduction in Malawi.

2.3 Secondary data analyses of poverty-environment and natural resource nexus

Macro-level analyses largely used secondary data from various sources to examine the poverty-ENR nexus at macro levels. The analyses involved the different dimensions of poverty definition and the environment and natural resource sectors of interest such as forestry, fisheries and agriculture sectors. The specific secondary data analysis tools employed were:

(i) Statistical analyses mainly trend analyses
(ii) Econometric analyses
(iii) Cost-benefit analyses

2.3.1 Statistical analyses

Statistical analyses focused mainly on trend analyses relating the growth patterns of various poverty dimensions with the ENR sectors of interest. For instance, a trend analysis of national income levels (representing income poverty) is examined together with trends in fisheries, from which we observe the emerging correlations. However,

while observed correlations provide useful relations, such information does not imply causation and direction of causation, which can be provided only by econometric analyses as outlined below.

2.3.2 Econometric analyses

The study undertakes secondary data econometric analyses to establish the exact nature of relationships between the given outcome variables and a set of exogenous policy and institutional factors. For secondary and primary data analyses, the utility maximization economic theory framework is the guiding economic framework, since it shows the origins of the economic relationships being subjected to empirical modelling. The utility maximization theory, in its simplistic form, states that:

$$\max M(x_1\ x_2)$$
$$\text{st}$$
$$p_1x_1 + p_2x_2 = M$$

where: x_1, x_2 are goods and services being consumed to maximize its utility; p_1 and p_2 are prices of the same goods and services; and M is total money incomes.

For purposes of this study, the utility maximization model envisages households seeking to maximize their welfare or satisfaction from the attainment of optimal values of income earnings or expenditures, productivity, food security status, health outcomes, educational outcomes and access to potable water, all of these being subject to constraints such as market prices of these goods and services, ENR prices and quantities, and social factors such as household demographics and cultural environment.

With respect to constraints facing households as they seek to maximize their utility levels, besides market prices, there is a host of policy and institutional factors in social and economic fronts that do affect the levels of household and national optimal consumption levels (utility maximization levels); hence, there is the need to include them in the empirical modelling analyses. These include: macro-economic factors such as government expenditures on the ENR sector, inflation rate, exchange rate, trade openness, amongst others.

In view of the foregoing, the study employs econometric analyses involving unit root tests to examine the time series data stationarity. Thereafter, the study undertakes Granger causality tests to determine the direction of causality, that is, whether the poverty levels (as defined in the study) are causing ENR degradation or vice versa. In addition, where unit root tests indicate presence of unit roots in any of the specified model variables, the Error Correction Models (ECM) would be employed to determine the factors that impact on the poverty outcomes of interest. The ECM techniques are being employed to establish short-term and long-run relationships that exist between the dependent variable of interest (such as income poverty or productivity) and the identified independent variables such as land area, forest cover degradation, amongst others. For instance, from such kind of analyses, the results could show that, in the short run, degradation of forest cover does not lead to an increase in income poverty, but, in the long run, people's income poverty is heightened due to persistent degradation of forest cover. In such conditions, we could interpret the results to show that they are warning signs to various stakeholder groups against basing their ENR use decisions on the observed short-term benefits, since the long-term implications are negative.

The ECM structure can be better explained in a two-variable case as follows:

$$\Delta Y_t=\alpha+\beta_0\Delta X_{t-1}\ \beta_1 EC_{t-1}+\grave{\varepsilon}_t$$

where EC is the error correction component that measures the speed at which the prior deviations from the equilibrium are corrected. Hence, the expanded version of the ECM is

$$\Delta Y_t=\alpha+\beta_0\Delta X_{t-1}-\beta_1(Y_{t-1}+\beta_2 X_{t-1})+\grave{\varepsilon}_t$$

which can be further transformed to show the short- and long-run relationships as

$$\Delta Y_t=\alpha+\beta_0\Delta X_{t-1}+\beta_1 Y_{t-1}+\beta_2 X_{t-1}+\grave{\varepsilon}_t$$

In practical applications, ECM structure is expanded to include several exogenous variables as discussed above. Specific empirical estimation models and their results are presented and discussed in Chapter 5.

2.3.3 Benefit-cost analyses

Statistical and econometric analyses, while providing useful information in poverty-ENR nexus, do not adequately indicate the extent of economic viability, hence justification, of the interventions in the various sectors. Information of viability of ENR interventions can be obtained from benefit-cost analyses (BCAs) including Net Present Value (NPV) analyses and Internal Rate of Returns (IRR). Such BCA analyses present insights into the economic benefits of the existing or possible ENR investments and hence their justification or lack thereof. Results of BCA are presented in Chapter 5.

2.4 Primary data analyses

Micro-level analysis in the study largely utilized primary household data collected during the field work. The different analyses were done to establish the poverty-ENR relationships at household level, including descriptive statistics, non-parametric tests of differences between two categories of households, and panel data econometric analyses.

2.4.1 Statistical analyses

For each of the analyses to establish the relationship between each of the poverty variables and the ENR variables of interest, descriptive statistics were undertaken using cross tabulations in SPSS. From the descriptive associations, the study determined the extent to which ENR sectors interface with poverty levels at household level by computing the percentage share of households incomes from ENR sources, e.g., charcoal and fuelwood selling, household expenditures on ENR products, geographical location (urban or rural), district, and gender of household head.

In addition, the study employs sample tests for impact of household participation in ENR interventions versus non-participation, which are expected to establish the differences in outcome variables of interest, namely, productivity, food security, health outcomes, education and access to water. However, the foregoing statistical relations cannot define the exact causal relationships, hence must be supplemented by econometric analyses, as explained below.

2.4.2 Primary data econometric analyses

As explained in the case of time series econometric modelling, the models are informed by the household utility maximization economic thinking, which is applied to primary data to establish the causal relationships between multidimensional poverty variables and the various ENRs. The micro-economic modelling framework is based on the following utility maximization theory, which states that households:

$$\max_{st} U(x_1, x_2)$$
$$p_1 x_1 + p_2 x_2 = M, z^h, Inst$$

where x1, x2 are goods and services being consumed to maximize its utility; p1 and p2 are prices of the same goods and services; *M* is total household incomes; *zh* is a set of household characteristics such as age, education, household size; and *Inst* is a set of institutional factors such as distance to the market, distance to the ENR source, availability of supporting institutions in the location, amongst others, all of which have a bearing on household consumption behaviours. Institutional factors are many; hence, it may not be possible to collect data on all of them and to undertake analyses, e.g., of quality of extension services, role of traditional values and beliefs in ENR conservation, just to mention a few.

Unlike the time series analyses, micro-economic models translate into household panel data econometric models, utilizing household primary data collected during the study. The error component econometric household panel data models employed for the analysis are:

$$y_{it} = \alpha + X\beta_{it} + \lambda_{it} + v_{it}$$

where y is the dependent variable, being any one of the multidimensional poverty variables of interest; X is vector of exogenous variables discussed above; β is a set of parameter estimates that establish the relationship between the exogenous variables and the outcome variables; and λ and v are the household time-invariant and household random effects, respectively.

The applied unbalanced panel data error components models (ECM) control for unbalanced household reporting of data on different variables. The ECM models control for unobservable household random and fixed effects. In order to address estimation challenges related to endogeneity of some covariates of importance such as income (resulting in correlations between explanatory variables and the error term), instrumental variable modelling techniques are employed for selected poverty models, namely, household incomes, productivity and food security. Health outcomes and access to water are simultaneously estimated since they are strongly correlated. Results of empirical estimation models are presented and discussed in Chapter 6.

2.4.3 Data and data sources

The primary data used for analyses were collected from household interviews using structured questionnaires that were complemented and triangulated with focus group discussions (FGDs). FGDs were conducted in 40 villages across the 10 districts. For each of the variables of interest, household panel data spanning a three-year period

from 2011-2012 to 2013-2014 were collected. Household panel data were preferred to cross-sectional household data because the former enable dynamic analyses and error component modelling techniques that correct for unobserved heterogeneity in the modelling exercise.

2.4.3.1 Village and household sampling

The study targeted 10 out of 17 disaster-prone districts, thus sampling 59 percent of the country's disaster-prone districts or 36 percent of the country's total districts. The 10 sampled districts represent a national coverage of disaster patterns and were sampled based on population density, such that, within a region, a district with highest population density (as reported by the 2008 Population and Housing Census) was sampled first, followed by the district with the second greatest population density, in that order. On this premise, the sampled districts include Karonga and Nkhata Bay in the North; Salima, Dedza, and Ntcheu in the Centre; and Blantyre, Zomba, Phalombe, Balaka and Mangochi in the South.

A multistage random sampling technique was employed to sample households for interviews, as indicated in Table A.6 (b) in the Annex, from each of the 10 districts two sample Traditional Authorities (TAs) were randomly selected for a total of 20 TAs. For each district, two villages were sampled per TA, totalling four villages per district, culminating in 40 villages being selected from the 10 sampled districts. From each village, 20 households were sampled for household interviews using systematic random sampling, thus 80 households per district, culminating in a total of 800 households being sampled for the household interviews during the entire study. At the end of the household survey, 79.4 percent of the respondents were drawn from male-headed households, while 20.6 percent were from female-headed households.

Half of the sampled villages from Blantyre, Zomba, Mangochi, Dedza, Nkhata Bay and Karonga were peri-urban villages sampled because of the demonstrated high demand for natural resource products such as charcoal and fuelwood.

The sampling process used to identify the households that were interviewed in each village was carried out as follows: in each of the 10 sampled districts, the field research teams, together with the Directors of Planning and Development (DPD), identified two Traditional Authorities (TAs) with the highest levels of ENR interventions[2] by either government or non-governmental organizations (NGOs). Thereafter, in each TA, two villages were sampled on the basis of representing 'causing environment and natural resource degradation' (referred to as 'causal villages') or largely 'affected by environmental and natural resource degradation' (referred to as 'impact village's). See Table A.6 (b) in the Annex for details.

At the village level, a simple random sampling of 20 households was conducted based on the register of residents for each village. Those households that were not available for

[2] The ENR interventions refers to different interventions being implemented by different stakeholders at grass roots levels seeking to conserve the ENRs or reverse ENR degradation. These include: promotion of village or community woodlots; sustainable management of water catchment areas; sustainable management of river banks; management and protection of water resources such as fish; protection of protected areas such as national parks and forest areas; individual and community forest nursery management; re-afforestation of individual or household lands; land resource conservation in form of conservation agriculture technologies such as manure making and application in farms; amongst others, just to mention but a few.

interviews were replaced, using the same sampling procedures. For the FGDs, 10 men and 10 women were selected from among those occupying leadership positions in the village to participate in the discussions.

2.4.3.2 Primary data collection process

The data collection process focused on key issues such as household demographics, assets, farm and non-farm income sources including ENRs, household expenditure, access to credit, health conditions and participation in environment and natural resource interventions in the village or the surrounding areas. Refer to the data collection tools in Annex A.4 for further details.

While the major issues covered in the FGDs and household surveys were almost similar, the major difference was that the FGDs were based on a loose interview guide that allowed for open discussions on the issues raised. This provided opportunity for the FGD participating members to remind each other of the various issues, to have in-depth discussions and hence to bring out salient issues. The household interviews, on the other hand, were based on structured questionnaires, with respondents mainly being household heads or their spouses or both. A total of 636 male-headed households and 165 female-headed households were interviewed.

2.5 Secondary data and data sources

The secondary data requirements are based on the poverty dimensions as given and the ENR sectors of importance. Since poverty is defined as including incomes, productivity, food security, health outcomes, education and access to water, the study collected and used data on such variables as GDP per capita; agricultural GDP (as a proxy for national productivity), food crop production trends (as a proxy for food security[3]), infant mortality rates (as a proxy for health outcomes) and number of households accessing potable water incidences. These variables constituted the dependent variables for the econometric models employed in the study. In the case of exogenous variables for the study, these include: inflation rates, exchange rates, fish production or harvest trends, and forest depletion rates, amongst others. Since, in a time series setting, the cause and effect relationships between variables can be either way, the Granger causality tests have been employed to determine the actual direction of causality and the relationship between the dependent and exogenous variables.

Secondary data used in the analyses were obtained from various official sources. The data for this study are time series data captured from 1980 to 2013 from the Malawi Government Annual Economic Reports and Financial Statements, the Reserve Bank of Malawi, the National Statistics Office, the World Bank (World Economic Indicators), the Food and Agriculture Organization Statistics (FAOSTAT) and the World Health Organization. The data from these sources were collected in Microsoft Excel, where trend and other analyses were also done. However, econometric analyses were done using the Stata software package.

[3] While other food security variables could have been used, there are time series data limitations for the case of Malawi to use for meaningful time series econometric analyses

3. POVERTY-ENVIRONMENT NEXUS IN MALAWI: LITERATURE REVIEW

The Poverty-ENR nexus has been the centre of empirical investigations and policy frameworks in Malawi and the global community in the past decade or so. Since policy and strategic frameworks are largely informed by empirical studies, the study undertakes to review the national and international studies on the issue before proceeding to examine the extent of inclusion in the relevant national and sectoral frameworks. The review also includes an assessment of the institutional framework that governs the poverty-ENR nexus in Malawi.

The focus on the poverty-ENR nexus is premised on the realization that the national objectives of economic growth and poverty reduction may not be attained if corresponding attention is not given to examining and providing remedial and preventive measures to avoid environmental and natural resource degradation (Jalal, 1993). This concern is strengthened by the insights from recent empirical studies showing that poverty inhibits people's investment in land conservation and induces myopic survival strategies detrimental to the natural resource base (Holden and Shiferaw, 2002). This happens because poverty causes households to have high discount rates, thus inhibiting them from optimally investing and conserving their natural resource base (Holden and Shiferaw, 2002; Poverty-Environment Partnerships, 2005).

Over the years, various definitions of poverty have emerged. According to the World Bank Report (1992), people who have a household expenditure below the poverty line are defined as poverty-stricken. The UNDP, on the other hand, developed the Human Development Index (HDI), being a composite index of life expectancy, years of schooling and income, as a broader set of indicators that define poverty (UNDP, Human Development Report, 2014). Further, Duraiappah (1996) defines poverty in two ways, namely, indigenous poverty, which is caused by environmental degradation, and exogenous poverty, which is caused by factors other than environmental degradation. Based on the definition of indigenous poverty, the policy implication is that, if policymakers want to address the environmental challenges, they must first address the poverty problem. On the other hand, the exogenous poverty concept implies that the poverty-ENR nexus is governed by a complex web of factors such as power, greed and wealth, institutional and market failure, amongst others, all of which need to be taken into account when devising the appropriate policies to tackle poverty-ENR issues (ibid.).

In this study, we adopt a multidimensional definition of poverty, which, according to Roe and Elliot (2005), utilizes the OECD Development Assistance Committee's five key dimensions to poverty, being: (a) economic (income, livelihoods, decent work); (b) human (health, education); (c) political (empowerment, rights, voice); (d) socio-cultural (status, dignity); and (e) protective (insecurity, risk, vulnerability). For the purposes of this study, the definition of poverty will encompass incomes, productivity, food security, health outcomes and access to water.

3.1 Empirical studies on the poverty-environment and natural resources nexus

Jalal (1993) argues that the most widely known as well as most widely debated definition of sustainable development is that of the World Commission on Environment and Development (WCED), more popularly known as the Brundtland Commission, which defines sustainable development as a process in which the exploitation of resources, the direction of investment and the orientation of technological development and institutional change meet the needs of the present generation without compromising the ability of future generations to meet their own needs. The definition of sustainable development is the premise for the concept of sustainable use of the ENRs. This study, therefore, reviews empirical investigations on the nexus between poverty (as defined to include income, productivity, food security, health outcomes and access to water) and sustainable utilization of ENRs.

3.1.1 Income poverty and environment and natural resources

Several detailed studies in different countries have explored the contribution of ENRs to economic growth, with different results. For instance, Ding and Field (undated) show that countries with abundant ENRs seem to grow more slowly than those with scarce resources. Ding and Field (undated) further note that the idea that ENR endowment can be taken as an objective precondition has been contested, on the grounds that this endowment is not fixed by nature, but, in fact, endogenously determined by a country's technological capacities. Their analysis found that the economic growth impacts of ENR endowment and dependence diminishes and even vanishes with use of two-stage and three-stage econometric estimation techniques.

Comin (2007) undertakes a panel data analysis for 46 countries in which he estimates the impacts of bio-capacity on the UNDP's Human Poverty Index (HPI). Comin's analysis finds that the impact of bio-capacity levels (a measure of bio-productive area or supply) on human poverty (represented by the HPI) is highly statistically significant. The results show that bio-capacity and poverty are negatively related, such that, when bio-capacity decreases, poverty increases. In other words, when the environment is degraded, poverty increases, such that a 1 percent decrease in bio-capacity induces a 0.26 percent increase in the human poverty index (ibid.).

In the case of Malawi, the GoM Annual Economic Report (2011) argues that forest resources in Malawi are declining at an alarming rate of 2.6 percent per annum and that the country continues to suffer from forest degradation largely because of poverty, population growth, agricultural expansion, infrastructural development and over-dependency on wood fuel for energy. Over 93 percent of the population depends on biomass energy for heating and lighting.

Empirical studies on determinants of poverty in Malawi have tended to overlook the role of the ENRs. For instance, a synthesis of the current status and knowledge gaps of Malawi's poverty situation undertaken by Mussa and Pauw (2011) observes that "studies find that human capital, physical infrastructure, ownership of productive assets, access to wage employment, and participation in agriculture all tend to lower the likelihood of being poor; having additional children, on the other hand, is found to increase monetary poverty, but reduces subjective poverty." On the other hand, "severe weather shocks often drag

households below the poverty line and limit the extent to which they can invest in inputs for the next production cycle" (ibid.). There is no explicit reference to ENRs in this study of factors that determine poverty levels.

A study by Chirwa (2004), Access to Land, Growth and Poverty Reduction in Malawi, found that the major determinants of poverty in Malawi include access to land such that households with large mean land sizes were unlikely to be poor in 2002 and a unit increase in land would lead to a 1.8 percent reduction in the probability of being poor, while the marginal effects on education showed that households with more educated heads had 2.7 percent smaller probability of being poor. In addition, the health of the head of the household had a significant bearing on the poverty status of the household; hence, where the head suffered ill health, there was a 3.8 percent higher probability of being poor. Besides access to land, the Chirwa (2004) study does not include other critical variables such as forests and fish capture, which are also important income and livelihood sources. The econometric analysis results by Chirwa (2004) need to be taken with caution, since his model does not make any reference to the possible endogeneity challenges for some of the exogenous variables applied in his empirical model.

3.1.2 Productivity and environment and natural resources

The relationship between productivity and ENR capital is well documented in various research undertakings. The discourse on productivity and the ENR base usually focuses on the causes, effects or impacts and remedial measures. Impact analyses are at macro or community/household levels. Macro-level productivity effects of environmental and natural resource utilization or depletion are presented in terms of GDP or GNP growth effects.

In this regard, Comim (2007) estimates that productivity losses on tropical soils are estimated to be in the range of 0.5-1.5 percent of GNP for most economies, while World Bank Country Evaluations Analyses show that overall the costs can be substantial, up to nearly 2.7 percent of GDP. Further, Jouanjean et al. (2014) quotes Yesuf et al. (2005) showing that the estimated annual costs stemming from land degradation ranges between 2 percent to 6.75 percent of agricultural GDP. In the case of Malawi, a study by Yaron et al. (2011) observed that estimates of soil loss based on a limited number of sample sites indicate an average loss of approximately 20t/ha/year, which translates into yield losses of a suggested 4 percent to 25 percent each year. A conservative estimate is that the annual onsite loss of agricultural productivity as a result of soil degradation cost MK7.5 billion (US$54 million, or1.6 percent of GDP) in 2007.

Furthermore, a Computable General Equilibrium (CGE) model undertaken by Benin et al. (2008) on agricultural growth and investment options for poverty reduction in Malawi sought to identify all of the possible factors driving agricultural productivity and growth factors for Malawi. The Malawi CGE model captured trade-offs and synergies from accelerating growth in alternative agricultural subsectors as well as the economic nexus between agriculture and the rest of the economy. Forestry and fisheries were included in the study as part of the Malawi agriculture sector. The Malawi CGE study results confirm a symbiotic relationship between agricultural productivity and ENR use in Malawi, as it states that "in order to increase agricultural production, reduce production costs and protect the environment for sustainable agricultural production, Malawian farmers need to use improved technologies that are profitable under local farming and market conditions to

increase yields, manage water, and apply [utilize] natural resources in a more sustainable manner" (Benin et al., 2008). The Benin et al. (2008) CGE model considered forestry and fisheries as part of the agriculture sector and found that the two sectors provide minimal national growth and poverty outcomes compared to some agricultural investments in maize, tobacco and others. The two subsectors had a combined contribution of 8.1 percent to national GDP in 2004. However, as acknowledged in the study, the extent to which the role of ENRs could be analysed was constrained by inadequate availability of time series data for the sector.

In addition, Perkins (1993) argues that, in certain areas, excessive grazing by domestic livestock has led to a complete removal of grass cover, which, in turn, has led to soil erosion by wind and rain, resulting in barren land, with little usefulness for either grazing or agricultural use, as these regions gradually become desert-like. In the case of Malawi, areas with significant cattle populations such as the Shire River Basin suffer from overgrazing and removal of crop residues.

Micro level productivity impacts are usually presented in terms of household crop productivity implications of soil degradation. In this regard, the World Bank (2007) study on poverty and environmental nexus observes that changes to more sustainable ENR practices do change the return to household assets, such as agro-forestry techniques improving the productivity of household land holdings. Jouanjean et al. (2014) discuss causal factors as well as impacts, such that, in terms of causes, deforestation is one of the major causes of soil degradation that can be in various forms including soil erosion, chemical deterioration and physical degradation. Soil degradation leads to changes in soil nutrient content, water-holding capacity, organic matter content, soil reactivity, topsoil depth, salinity and biomass. These have impacts on the average and variance of yield and the total factor productivity of agricultural production, resulting in loss of income or consumption as well as increased production cost and increased income risks (ibid.). The underlying driving factors of land degradation, as pointed out by Jounjean et al. (2014), are human socio-economic activities and include: land clearance (particularly clear-cutting and deforestation); agricultural depletion of soil nutrients through poor farming practices; livestock including overgrazing; inappropriate irrigation and over cultivation; monoculture; and overuse of inputs destabilizing the local ecosystem.

A study by Thirtle et al. (2001) for developing countries indicates that agricultural productivity growth has robust and consistent poverty reduction impacts, such that a 1 percent increase in productivity is associated with a decrease of 0.62 percent to 1.3 percent of the population below the US$1-per-day poverty line. Schneider and Gugerty (2011) observe that much empirical evidence for poverty reduction is via increases in agricultural productivity, which occurs through impacts on real household incomes and other complex pathways linking agricultural productivity to real income changes that respond to various market forces. This was confirmed by the most recent analyses of Martin (2013), who, using a profit function approach to estimate the poverty effects of productivity growth, found that the agriculture sector productivity has the highest poverty-reducing effects when compared to industry and services sectors.

In particular, the Martin (2013) analysis established that globally, agricultural productivity growth had a 3.1 percentage point reduction in poverty levels, with farmers benefiting from the resulting income gains, consumers from lower food prices and agricultural labour from wage increases of productivity growth attainable through increased input use or research and development. This is corroborated by findings of Tchale and Sauer (2007), who, using a

translog stochastic frontier production function for Malawian smallholder farmers, found that integrated management, which involves the use of inorganic fertilizer and the low-cost 'best-bet' options such as grain legumes, e.g., groundnuts (Arachis hypogea), soybeans (Glycine max.), pigeon peas (Cajanascajan) and velvet beans (Mucunapruriens), is the best strategy for increasing agricultural productivity in Malawi. AGRIFOR (2006) reported that unfertilized local maize yielded 1,700 kg/ha in the 1960s and that this has fallen below 1,000 kg/ha in the 2000s. This declining productive capacity of the land is being attributed to the deterioration of soil structure and fertility.

These findings clearly imply that efforts to reduce income poverty can be attained through agricultural productivity growth, which, in turn, is achievable through adoption of soil fertility-improving technologies. Thus, economies such as that of Malawi, which seek to adopt sustainable development pathways, cannot afford to ignore the promotion of sustainable use of soil as a natural resource.

3.1.3 Food security and the environment and natural resources

Studies on the role of the environmental and natural resource capital on food security in developing countries, particularly the sub-Saharan Africa region, point to different, complex relationships. These include findings that achieving food security in Africa requires conservation of the ecosystems that provides these foods and other products such as wild species; such species include wild greens, spices and flavourings that enhance local diets, and many tree fruits and root crops assuaging pre-harvest hunger and provide famine foods when crops or the economy fails (Scherr et al., 2008; Paoletti, 2005). In addition, the analyses observe that rodents, edible insects and other small creatures have long been an important part of the rural diet in virtually all parts of the world, while capture fisheries are the main animal protein source for most poor people (ibid.).

At times, food insecurity spurs unsustainable use of natural resources. For example, Yaron et al. (2011) quote a study by Kambewa et al. (2007) that established that most charcoal producers operate at a very small scale (producing less than 30 bags a month) and are poor and turn to charcoal production as a coping mechanism against food insecurity. There are also seasonal dynamics to the charcoal business; Kambewa et al. (2007) observed that most small-scale charcoal dealers participate in the charcoal business during the rainy season, when income sources are minimal and food security challenges abound.

Environmental degradation have negative implications for food security, as reported in several studies. Yaron et al. (2011) quote a report by the Ministry of Agriculture's PROSCARP project report (1997), which observed that soil erosion is a major cause of hunger and poverty in Malawi, as it leads to reduced yields and/or increased use of inorganic fertilizers in order to produce enough food at the expense of purchasing other goods and services. In the same vein, Limbe (1998) observes, "Deforestation and erosion favour the rapid deposition of sediments and dissolved substances, especially if fertilizers and other chemical products are used in cultivated fields. The eutrophication of lakes is accelerated and species diversity is reduced. In a few impounded lakes, forest flooding has, in the short term, resulted in enriched fish production. This is attributed to the response of plankton to the abundance of organic matter. Since the very favourable conditions of fish harvesting are short-lived, the economic status of these communities, gradually deteriorates, and health conditions worsen if special measures are not taken."

Food security concerns about the fisheries sector arise because the fisheries sector is of great importance to Malawi's economy as a source of employment, food, rural income, export, import substitution and bio-diversity. The sector directly employs nearly 59,873 fishermen and indirectly over 500,000 people involved in fish processing, fish marketing, boat building and engine repair (Government of Malawi, Annual Economic Report, 2011). Furthermore, nearly 1.6 million people in lakeshore communities derive their livelihoods from the fishing industry. Fish provides over 70 percent of the dietary animal protein intake of Malawians and 40 percent of the total protein supply. It also provides vital vitamins, minerals and micronutrients. Much of the fish is consumed in rural areas, thereby contributing significantly to daily nutritional requirements to some of the vulnerable groups such as HIV and AIDS victims, orphans and the poor (GoM, Annual Economic Report 2011).

Under certain circumstances, poverty may force households to consume assets that may support a longer-term income stream. A recent World Bank report (2007), quoting Silva (2005), reports an econometric analysis done in the context of marine protected areas off Tanzania and Zanzibar, which focused on examining the poverty impacts of use of destructive fishing gear—such as gillnets, beach seine nets, and drive nets—and practices such as spear gun fishing, poison fishing and dynamite fishing. She found that poverty was associated with an increase in the use of illegal gear and practices that were harmful to the marine ecosystem such that households got a boost in their welfare, measured in terms of consumption expenditure, from the use of destructive gear. The Silva (2005) study findings, though being a static representation of a dynamic problem, provide evidence that poverty and environmental degradation can be linked in a downward spiral. Notwithstanding the short-term poverty reduction benefits of the use of destructive natural resource extraction mechanisms, the World Bank (2007) analysis argues that banning destructive gear, which would be good for the long-term health of the fisheries, is likely to hurt the poor in the short term.

3.1.4 Health and environment and natural resources

Many analysts have investigated the relationship between health outcomes and ENR in different geographical, institutional and policy settings. The study by Üstün and Corvalán (2006) on preventing disease through healthy environments argues that a better understanding of the disease impacts of various environmental factors helps in guiding policymakers to design preventive health measures that not only reduce disease, but also reduce costs to the health care system. Besides reducing disease burden, many of the same health sector measures that reduce environmental risks and exposures also can generate other co-benefits, such as improved quality of life and well-being and even improved opportunities for education and employment. In this respect, the Üstün and Corvalán (2006) analysis finds, amongst other things, that the proportion of diseases such as malaria attributable to modifiable environmental factors (42 percent) is associated with policies and practices regarding land use, deforestation, water resource management, settlement sitting and modified house design, e.g., improved drainage. However, this study is largely based on expert opinion and experience, with no quantitative techniques utilized, hence leaving the empirical validity of such claims in jeopardy.

Franz and FitzRoy (2006) undertook a study on child mortality, poverty and environment in 61 developing countries including the Central Asian Republics (CARs), using econometric analyses that take into account multicollinearity and endogeneity challenges. The study results confirmed the importance of female literacy in explaining fertility and mortality and

also found evidence of excessive mortality in the CARs most likely linked to environmental degradation in the region.

On its part, the World Health Organization (WHO) (2009) study on Global Health Risks estimates that about 20 percent of all developing countries' disability adjusted life years (DALYs) losses are due to environmental problems. The estimate for Africa is up to 30 percent (DFID et al., 2002; UNDP et al., 2005). Further, UNDP et al. (2005) present figures of 202 million DALYs lost in the developing world, with 84 million of these DALYs lost in Africa – that is, 84 million person years.

The WHO (2009) study focussing on identification of risk factors responsible for global health and DALYs finds that the major health risk factors include: childhood and maternal undernutrition; nutrition-related risk factors and physical activity; addictive substances; sexual and reproductive health; environmental risks; occupational risks; and other selected risks such as child abuse. These health risk factors are responsible for deaths attributable to each risk factor considered individually, relative to its own counterfactual risk exposure distribution, and the risks may act in part through, or jointly with, other risks. The environmental risks comprise unsafe water sanitation and hygiene, urban outdoor air pollution, indoor smoke from solid fuels, lead exposure and global climate change. The WHO (2009) study further observes that each risk has its own causes, too, and many have their roots in a complex chain of events over time, consisting of socio-economic factors, environmental and community conditions, and individual behaviour.

Edwards (2014) undertook a study on the effect of mining on non-income dimensions of human development such as health and educational outcomes. The analysis was motivated by findings from previous studies showing that decades of mining growth in many countries had systematically under-delivered long-term prosperity, where poverty is still 'unacceptably high and its pace of reduction unacceptably slow'. Edwards (2014) utilizes panel data from 135 countries, and models infant mortality (as the best proxy for health outcomes) as a function of share of mining incomes in national incomes, GDP per capita and geographical and institutional factors. The study used ordinary least squares and fixed effects models correcting for endogeneity of mining as an exogenous variable. The study found that mining growth is the worst type of growth for health and education or social development, which is not only a key driver of poverty reduction and social mobility, but of economic growth itself. It further points out that an unconditional long-run natural resources 'curse' on social development is transmitted through growth in and dependence on the mining sector.

The negative or non-significant effects of natural resources on health outcomes are not limited to the extraction industry, but also to natural resources used daily such as water, which reveal their positive and negative relationships with human social development.

The World Health Organization highlights four forms of disease caused by water pollution from human and animal waste: waterborne, water-washed, water-based and water-related. The contamination of water supplies by industrial and agricultural pollutants can also have detrimental health effects. Work by Limbe (1998) points out that, while development of water resources is essential for a wide range of human activities, some negative health outcomes do emerge as a consequence of changes introduced by construction of dams and formation of reservoirs and irrigation systems that either create or aggravate health risks in different ways (ibid., 1998). The work further points out that outstanding among the parasitic diseases exacerbated by water resources development projects are malaria,

schistosomiasis, lymphatic filariasis and onchocerciasis. However, the analysis is not supported by empirical investigations to demonstrate the extent of the negative water challenges on human health in Malawi.

3.1.5 Access to water and other environment and natural resources

Access to water resources spans issues of uses of water, water resource availability or supply factors, models of water resource management, and impacts and corrective actions for water challenges. While water itself is a natural resource, its availability is also dependent upon the state of other natural resources such as land and forests.

With respect to water use, a UNEP (1995) study estimates that 95 percent of water use in developing countries is for the agricultural sector. Excessive pumping of groundwater for irrigation, assisted by the introduction of electric pumps as well as the lack of well-defined water property rights, have caused withdrawal rates to exceed regeneration rates of the various water systems (Shah, 1993). Water availability in rural areas is dependent on the presence of perennial rivers and streams, from which gravity-fed piped water supply systems draw water for supply to the rural population.

In terms of water resource supply, the paper by Chipofya et al. (undated) on Integrated Water Resource Management (which is key to sustainable development and management of water resources in Malawi) discusses limiting factors to water supply, including increased seasonal variability in run-off, increases in population and demand for industrial production. The situation is aggravated by climate change, as evidenced by frequent drought occurrences. With respect to water management challenges and associated impacts, Chipofya et al. (undated) observe that pollution of surface and ground water resources is making water resources unavailable for use without expensive treatment. The principal causes of water resource degradation include: disposal of effluents into water sources that reduces the quality of sources of raw water; sedimentation or siltation emanating from soil erosion and deforestation due to population growth; chemical contamination from increased use of agro-chemicals such as fertilizers and pesticides for increased agricultural productivity; and encroachment into protected catchments through deforestation, human settlement and cultivation of marginal lands (ibid.). An analysis by Jouanjean et al. (2014) classifies the causes of water resource degradation into the following categories: (i) surface water depletion and river fragmentation; (ii) pollution / contamination of surface and groundwater; and (iii) ground water depletion.

Degradation of water resources, as pointed out by Jouanjean et al. (2014), has several negative effects mediated through a number of transmission mechanisms, mainly including: (a) impacts on human health, which reduces the productivity of labour (in agriculture, industry and other sectors), and on cost to households in medical treatment and to national budgets by way of health care provision; (b) impacts on the productivity (yields and quality) of irrigated crops, industrial products and fisheries and aquaculture, which may be a significant component of national economies and/or may be critical for the livelihoods and food security of poor communities; (c) increased costs of water abstraction and treatment, which are passed on to water users, be they households, farms, businesses or national/municipal governments; (d) impacts on energy production, from hydropower, but also from other sources that require cooling water, which can

raise the cost of electricity (to all users, public and private) and, in some cases, may cause outages affecting human safety and productivity; and e) damage to infrastructure, which hinders mobility and production, burdens government, businesses and individuals with the cost of repair/replacement.

The foregoing analyses, though bringing out useful insights on the determinants and impacts of water resource uses, are based on case studies and hence do not provide quantifiable relationships. For instance, the analyses do not indicate the percentage change in the health outcomes attributable to a percentage change in deforestation rates at district, rather than national, levels.

Dedicated studies on health impacts of household access to water are reported in a study by the World Bank (2007) on the poverty and environment nexus at the household level, which reports the several empirical analyses on water and health outcomes. The study results show that improving access to safe water sources has been identified as one of the most critical preventive environmental measures for reducing child mortality and morbidity in policymaking in most countries. For instance, the World Bank (2007) study quotes a study on China by Jacoby and Wang (2004) that provides strong evidence indicating that access to safe water sources is associated with lower child mortality risks, with parameter estimates showing that the largest and most significant impact on child mortality reduction comes from access to safe water, which includes water sources from pipes, inside household or public taps, and deep wells within a short walking distance. The World Bank (2007) further cites the Jacoby and Wang (2004) study results showing that improving safe water access from the average level of 33 percent in the early 1990s to universal access (100 percent) in rural China could reduce the under-five child mortality rate from 33 to about 30 per 1,000 births, representing a 9 percent reduction in the under-five mortality rate.

Poverty-Environment Partnerships (2005) found that economic rates of return on environmental investments can be high and that net economic benefits from investing in environmental assets such as clean drinking water are almost always positive. A good example is provided for the case of investments in clean drinking water and sanitation systems, which were found to yield benefit-cost ratios of 4:1 and 14:1, respectively (Poverty-Environment Partnerships, 2005).

3.2 Summary of review of empirical studies

The review of empirical studies shows that the poverty-ENR nexus is bi-directional in that, on the one hand, poverty levels can induce ENR degradation through unsustainable use and, on the other hand, sustainable ENR use can reduce poverty levels and increase food security.

The relationships between poverty outcomes and ENRs are in terms of direct and indirect linkages. Direct linkages refer to conditions where ecosystems provide food sources such as fish, fruits and root crops, spices and flavourings that enhance local diets. Indirect linkages refer to situations where the ENR sector provides the basis for cash incomes, which further supports livelihoods and food security. As such, ENR degradation can result in lost incomes, (e.g., soil fertility losses due to soil degradation reduce agricultural productivity) and thus negatively impact on food security and incomes.

If not well investigated, the direct and indirect food security and other poverty impacts of sustainable ENR management remain underestimated. Previous empirical studies have established that sustainable ENR management affects income levels that, in turn, have undoubted positive effects on many other poverty variables. Most of the empirical studies reviewed further find that, in general, ENR degradation leads to reduced national growth levels with skewed income distribution, particularly in the long term, impacting the poor.

In the same vein, a cause-and-effect analysis of access to potable water and ENR shows that soil erosion, chemical run-off, deforestation and cultivation of marginal lands are amongst the major causes of water resource degradation and/or pollution that negatively affects the attainment of health objectives.[4] Evidence indicates that access to safe water sources is associated with the attainment of desirable health outcomes such as lower child mortality.

Moreover, the literature review shows that exploitation of various ENRs significantly reduces income poverty, particularly in the short term, while, in the long term, unsustainable ENR use reveals minimal positive impacts and at times negative impacts. In other words: unsustainable ENR use compromises the effectiveness of ENRs use as a poverty reduction strategy in the long term. Societies that seek to have long-term poverty-reducing benefits from ENR utilization must be prepared to practice sustainable utilization of ENRs. The literature review indicates that sustainable use of ENRs, which maintains or improves the flow of socio-economic benefits generated from ENRs, is critical for attainment of socio-economic welfare of communities and economies depending on ENRs for their livelihoods and welfare.

While the Constitution calls for gender equality in all spheres of socio-economic life, the constitutional provisions on environment do not make any reference to gender issues, i.e., to the roles or expected impacts of participation of different gender groups in ENR managment. In addition, the environmental provisions are largely driven by a conservationist perspective, not by a sustainable use approach that involves meeting current socio-economic needs in a manner that allows for preservation of the ENRs future generations.

[4] While other factors such as water pollution from sewage are important in determining access to the water-health nexus, the reviewed available literature does not highlight such issues, especially in the case of Malawi.

4. A REVIEW OF GOVERNMENT POLICIES ON SUSTAINABLE POVERTY REDUCTION PATHWAYS

The GoM recognizes the importance of the ENR sector in contributing to the country's social and economic aspirations. This is well reflected in national policy and legal frameworks such as the Malawi Constitution, the Malawi Growth and Development Strategy II (2011-16) and the Vision 2020.

Because the definition of poverty is multidimensional and refers to incomes, productivity, food security, health, education and access to water, the study investigates the extent to which national and relevant sectoral policy frameworks recognize or mainstream each of these poverty variables. The analysis further examines the extent of gender mainstreaming in the policy frameworks and the economic reasoning behind the ENR management policies in each of the frameworks. The study discusses the policy framework review, the institutional arrangements governing policy implementation, the extent of inclusion of poverty and poverty-environment in policy implementation, and the use of impact assessments and tools in informing policy implementation.

4.1 The national legal and policy framework

4.1.1 The National Constitution and ENR sector

The Malawi Constitution (1995), being the overarching national legal and policy framework, recognizes the importance of the ENR in the attainment of national developmental goals. In this respect, Section 13 (d) of the Constitution commits the state to actively promoting the welfare and development of the people of Malawi by progressively adopting and implementing policies and legislation aimed at managing the environment responsibly in order to: (i) prevent the degradation of the environment; (ii) provide a healthy living and working environment for the people of Malawi; (iii) accord full recognition to the rights of future generations by means of environmental protection and the sustainable development of natural resources; and (iv) conserve and enhance the biological diversity of Malawi.

Understandably, the foregoing constitutional commitment to ENR management provides a strong foundation for the development of detailed ENR interventions at sectoral level. However, the constitutional provisions fail to link such interventions to the attainment of poverty reduction aspirations, i.e., to how implementation of the stated ENR management constitutional provisions would assist in the attainment of increased national and household incomes, productivity, food security, health outcomes and access to water. This gap in poverty-environment linkage may be explained by the fact that Malawi's Constitution was adopted in 1995, when only limited research on the links among ENR, poverty and economic growth existed.

4.1.2 The Vision 2020 and ENR sector

Malawi's Vision 2020 highlights a national income per capita aspiration of US$1,000. While issues of food security, health, education and access to water are well recognized, the Vision does not give specific targets for these issues, as in the case of per capita incomes aspiration.

Besides, no connection is made between the attainment of the various national aspirations (namely per capita incomes, food security, health and access to water) and sustainable ENR management. The role of the ENR sector in the attainment of the various social and economic objectives is not stated explicitly, nor are the impacts of the social-economic undertakings on the ENR sector objectives.[5] The limited discussion of poverty-environment linkages in the Vision 2020 document is reflective of the lack of appreciation of the socio-economic importance of the ENR sector at household and national levels. This, in turn, results in a weakened cause or justification for ENR interventions.

The Vision 2020 recognizes the challenge of gender inequality in the country's socio-economic life and proposes changes in cultural values, affirmative action and capacity-building for realizing gender equality. However, gender-ENR relationships are not highlighted, implying limitations in knowledge of such linkages at the time of developing the framework.

4.1.3 The Malawi Growth and Development Strategy II

Since 2002, Malawi's overarching policy and strategic actions have been espoused in three- to five-year rolling framework documents. The first one was a three-year Malawi Poverty Reduction Strategy Paper (MPRSP) (2002-2005) that was followed by the five-year Malawi Growth and Development Strategy I (MGDSI) (2006-2011). In both previous frameworks, the country witnessed a national policy shift towards focusing on the ENR sector as a key source of sustainable economic growth and contributor to national economic growth objectives.

The Malawi Growth and Development Strategy II (MGDS II) (2011-2016) is the current overarching developmental policy framework translating the national development aspirations into policies and programmes. Prior to setting out national strategies for the five-year period (2011-2016), the MGDSII undertakes a review of the first MGDS, which, with respect to ENR management, reports:

"The sector registered remarkable progress in a number of areas including compliance with the Environmental Management Plans (EMP) of development projects and programs; setting standards on pollution control and waste management; increased public awareness on environment and natural resources management; improved protection of river catchment areas; increased land area under industrial plantations from 1,609 ha in 2005 to 5,784 ha in 2010; reduced tonnage of ozone depleting substances such as chlorofluorocarbons (CFC) from 5.9 tonnes in 2005 to almost zero in 2010; and increased customary land area planted with trees from 77,810 ha in 2005 with 194,524,672 trees to 187,791 ha with about 275 million trees planted in 2010."

[5] The only exception is cultural values that have been highlighted as instruments for supporting good ENR management, Vision 2020, pp. 50-51.

Much as the foregoing review of the public ENR interventions seems apparent, areas discussed simply reflect the national commitment to global ENR best management practices and not the link between sustainable ENR and poverty reduction.

The MGDSII recognizes the economic importance of the ENRs as income sources, particularly forest products. With respect to the contribution of the ENR unsustainable natural resource use for Malawi amounts to about US$191 million, or 5.3 percent of GDP in 2010 (Government of Malawi, MGDS II, 2011). While this approach represents a shift in the role of recognition of ENRs to human welfare, it still falls short of discussing the number of households or persons whose productivity, food security, health, education and access to water have improved as an outcome of the ENRs investments.

4.1.4 The National Environment Policy, 2004

The National Environmental Policy (2004) is a national policy framework that seeks to mainstream various ENR management principles and practices into various sectors of the economy. The policy recognizes that poverty is one of the root causes of environmental degradation in Malawi and that its alleviation is critical to natural resource conservation, protection and sustainable utilization. Therefore, it proposes multi-sectoral strategic actions for improving human welfare and sustainable ENR management. These include increasing agricultural productivity; expanding investments in human resources through increased public expenditure for education, health and other social services; expanding employment opportunities and private sector investment; and improving capacity for local-level management of natural resources for sustainable livelihoods, including conservation and sustainable use and management of biodiversity.

To demonstrate its multi-sectoral approach, the policy prescribes a number of sectoral objectives necessary as part of the environment and natural resource management objectives. In the case of the agriculture sector, the policy seeks to "promote environmentally sustainable agricultural development by ensuring sustainable crop and livestock production through ecologically appropriate production and management systems, and appropriate legal and institutional framework for sustainable environmental management". In the case of forestry sector, its objective is to "sustainably manage forestry resources so as to maximize benefits to the nation", whereas, for the fisheries sector, the objective is to "manage fish resources for sustainable utilization and conservation of aquatic biodiversity". Further, in the case of the water sector, the policy indicates that the Malawi Government's objective is to manage and use water resources efficiently and effectively so as to promote their conservation and availability in sufficient quantity and acceptable quality.

The policy seeks to ensure that all sectors of the economy optimize the use of environmentally friendly technologies and undertake mitigation measures to address adverse environmental impacts. For each of the sectors, the policy proceeds to outline the guiding principles and strategies for mainstreaming environmental issues. This notwithstanding, it is not clear how the mainstreaming of environmental management principles in each of these sectors would translate into increased national incomes, productivity, food security, health outcomes, education, and access to water.

The policy advocates for adoption of economic incentives aimed at ensuring that individuals and economic entities are given appropriate incentives for sustainable resource use, conservation and environmental management. In this respect, some of the

proposed incentive mechanisms include establishing an enabling economic environment in which market prices provide appropriate incentives for sustainable natural resource use and environmental protection. Recognizing that this neoclassical economic approach may have challenges in achieving its objectives, the policy indicates that, in the case of market failure, pricing of natural resources is to be corrected through proper economic valuation of natural resources and proper assessment of user fees and taxes or the use of tax and similar incentives. Nevertheless, the policy fails to recognize the risk that market incentives may not lead to sustainable utilization of the natural resources as envisaged, but rather to over-utilization or over-exploitation of the available ENRs' capital base that does not match replenishment rate, hence compromising the sustainable utilization objective.

The policy also proposes that government departments and local communities share revenues generated from sustainable utilization of natural resources on public and customary lands in order to provide incentives and self-finance for such continued use. With respect to management of national parks and wildlife reserves, the policy states that local communities within and adjacent to such establishments shall participate in their planning and management and that there shall be a fair distribution of the benefits and revenue from sustainable utilization of wildlife resources among central government, local authorities and local communities. Benefit-sharing mechanisms are potential important instruments for ensuring that ENR revenues also contribute to the livelihoods of local communities near the ENR source. However, as the policy does not stipulate the actual mechanisms of the revenue-sharing process, implementation is unsurprisingly lagging, thereby compromising the communities' commitment to sustainable management of ENRs.

With respect to gender mainstreaming, the policy has an explicit clause on ENR sector gender mainstreaming, which calls for facilitation of women's participation and environment decision-making, resource ownership and management. It also commits government and stakeholders to the collection of gender-disaggregated information related to the environment. However, as gender constitutes a separate chapter of the policy, it is difficult to assess how different gender groups are to participate in the various strategic areas and the specific benefits they are to derive therefrom.

4.1.5 National Climate Change Investment Plan, 2013-18

The Malawi Government fully recognizes the adverse effects of climate change and has consequently implemented adaptation and mitigation measures in line with international practices. The Government has its National Climate Change Investment Plan for the six-year period of 2013-2018,[6] which elaborates the investment requirements across different sectors, institutional coordination mechanisms, a monitoring and evaluation plan, and resource requirements to respond to climate change.

According to the Ministry of Environment and Climate Change Management (2013), the development of the National Climate Change Investment Plan is motivated by the realization that approximately 80 percent of Malawians depend on renewable natural resources for livelihoods and that the foundation of the national economy is primarily rain-

[6] Though Malawi has a national climate change investment plan, the country is still developing a national climate change policy. A meteorological policy is also under development.

fed agriculture. In addition, it is widely recognized that the success of many important sectors of the Malawi economy such as agriculture, water supply and sanitation, transport, tourism, industry, health and education is dependent upon the ENR to enhance their productivity.

Nevertheless, the importance of the environment and natural resources to Malawi's economy has emerged as a major development issue that is severely impacting on people's livelihoods. As such, the Investment Plan reports:

"Malawi has experienced a number of adverse climatic hazards over the last several decades. The most serious have been prolonged dry spells, seasonal droughts, intense rainfall, river line floods and flash floods. Some of these, especially droughts and floods, have increased in frequency, intensity and magnitude over the last few decades, and have adversely impacted food security, water availability and security, energy and the sustainable livelihoods of rural communities."

In addition, the Investment Plan indicates that there are associated climate change effects, including disrupted crop calendars, with different pests, diseases and water requirements; heat waves and spread of disease to new areas; increased water demand; and reduced water availability.

The Investment Plan details the negative impact of climate change in Malawi, such as the 1.3 percent increase in national poverty owing to droughts and the 1.7 percent loss in GDP due to floods and droughts every year. . Further to that, the Investment Plan does not quantify macro- and micro-positive implications of the planned climate change investments. For instance, the Investment Plan does not indicate the GDP growth effects and equity benefits that would accrue to the US$954.5 million required for the six-year investment plan. Similarly, the Plan does not discuss micro-level outcomes such as the proportion of Malawi households that, by 2013, were facing food insecurity changes owing to climate change and whose food security would improve if the Plan were implemented; nor does it indicate either 1) the percentage of the households that are facing water access challenges due to climate change whose situation will change with the implementation of the Investment Plan or 2) the costs of property damage emanating from climate change effects.

With these gaps in empirical evidence that would inform an effective national investment plan, it would not be surprising to predict a low commitment to the implementation of the Plan as a whole. In fact, the concerns of low commitment have already been highlighted in the Investment Plan itself.

4.2 Sectoral policy and strategic frameworks defining the poverty-ENR nexus

Besides looking at the overarching national legal and policy frameworks, the study also examines the different sectoral policy and strategic frameworks that influence the ENR sector and constitute the multidimensional poverty outcomes. These include: the agriculture sector investment plan known as the Agriculture Sector Wide Approach (ASWAp); the Fisheries Policy; the Forestry Policy; the Wildlife Policy; and the National Water Policy. In addition, the review looks at the overarching national strategic plan for the health sector.

4.2.1 The agriculture sector and poverty reduction

The agriculture sector is an important beneficiary and contributor to the environment and natural resource sector capital base. All agricultural production is based on the environment and natural resources such as soils which makes sustainable land management in the agriculture sector very important. While the sector lacks an overarching policy document (the national agriculture policy is currently under development), the Agriculture Sector Wide Approach (ASWAp) (2011-2015), which is an investment framework, guides the sector. The ASWAp strategy for promoting sustainable use of natural resources is best espoused under its sustainable land management strategy, specifically:

"Actions under sustainable land management will, therefore, emphasize better land husbandry at farm level, including integrated soil nutrient management relying on both organic and inorganic technologies. Adapted conservation agriculture practices will increase the soil water and nutrient buffer capacity to ensure higher productivity of rain-fed crops and mitigate the effects of weather variability and climate change. This approach will also reduce loss of agricultural land, especially in more fragile areas, and protect vulnerable areas."

This policy statement underscores the importance the sector is attaching to sustainable land management issues as a strategy for achieving agricultural development objectives. The ASWAp does link its activities to the attainment of increased household and national incomes and wealth as well as improved nutrition.The agriculture sector is one of the ENR sectors that have effectively mainstreamed gender and HIV and AIDS issues into its policy and programming frameworks.

Besides, the agricultural sector has a number of subsectoral policy and strategic frameworks. These include the Food Security Policy, the Policy Document on Livestock, the Land Resources, the Seed Policy and the Agricultural Extension Policy in the New Millennium. Some of these subsectoral frameworks are currently being reviewed by the GoM, while some of the new frameworks (e.g., National Fertilizer Policy and the Contract Farming Strategy) have been in draft form for some years. Notwithstanding the prevalence of subsectoral policy frameworks, the sector does not have an overarching policy framework to guide the various subsectoral frameworks and its Investment Plan, the ASWAp. The draft National Agricultural Policy (NAP) has been under development for some years now; it is not clear when the process will be finalized.

The formulation of the NAP is being motivated by a number of factors, including the need for promoting subsectoral linkages which have failed to take place in the absence of an overarching sectoral policy (Ministry of Agriculture and Food Security, draft NAP, 2011). There is high expectation that the development and implementation of the NAP would help in addressing the following challenges facing the agriculture sector:

(i) Inadequate intra-sectoral coordination of activities – for instance, little or no collaboration in the implementation of irrigation and livestock development at grass roots level, or fisheries and livestock development

(ii) Compromised intersectoral collaboration with ENR and other sectors that affect the sector's performance and vice versa – for instance, deforestation and agricultural productivity

(iii) Inadequate inter-cum-intra-sectoral institutional collaboration, such that most project activities initiated by agricultural NGOs are not incorporated into government programming once the NGO activities come to an end

(iv) Absence of a clear and legitimate criterion for intrasectoral resource allocation, rendering the resource allocation process amongst the different subsectors or departments a subjective undertaking

(v) An incomplete agricultural policy reform process with some value chain stages almost fully liberalized (such as agricultural marketing) while others having heavy government interventions (such as inputs subsector)

(vi) Minimal public-private partnerships with demonstrable positive outcomes

The extent to which the NAP addresses the foregoing policy challenges will become apparent when the policy comes into place. This notwithstanding, its development is expected to bring about a turnaround in the well-known low national developmental outcomes, including sluggish development of commodity value chains with minimal private sector investments along the key stages of commodity value chains; continued narrow export concentration; low and unstable agricultural productivity; limited participation of farmers in commodity markets; limited market integration; and low and fluctuating agricultural incomes (Ministry of Agriculture and Food Security draft NAP, 2011; Ministry of Agriculture and Food Security, ASWAp, 2011; Pauw and Eldman, 2015). Ultimately, poverty remains a challenge that the country has to deal with in spite of increasing national resource allocation to the sector. All of these factors point to the need for an effective National Agricultural Policy to guide the sector's investments and operations to deal with the aforementioned challenges and to ensure the sector's full contribution to national development and poverty reduction.

4.2.2 Fisheries subsector and national poverty reduction

The fisheries sector is being guided by the National Fishery and Aquaculture Policy (2001) currently being reviewed by GoM. It seeks to maximize sustainable yields from the national waters of Malawi and man-made water bodies. The policy further aims to improve the efficiency of exploitation, processing and marketing of quality fish products. It also seeks to promote investment in the fishing industry and rural fish farming units and to exploit all opportunities to expand existing and develop new aquatic resources.

The policy recognizes the important role of fish in the national economy in terms of provision of protein supply. It is estimated that approximately 70 percent of animal protein and 40 percent of the total protein intake for the majority of the rural poor comes from fish, thus guaranteeing a nutritionally balanced diet to a population suffering from high levels of malnutrition. The fish sector is an important provider of employment and livelihood opportunities, as over 200,000 people are employed in the sector and about 14 percent of Malawi's population depends on the fishing sector (fishing, processing, marketing, fishing gear fabrication, boat building and other ancillary activities) for their livelihood. The National Fishery and Aquaculture Policy, therefore, aims at maximizing the sustainable yield from the national waters of Lakes Malawi, Malombe, Chilwa and Chiuta, from the Shire River, from other smaller river systems and from small natural and man-made water bodies. Besides, it seeks to improve the efficiency of exploitation, processing and marketing.

The policy then proceeds to present a balanced outline of government's commitment to the various plans to increase fish stocks through improved management practices. These include specific goals, objectives and implementation strategies on fisheries extension, fisheries research, fisheries training, aquaculture development, community participation in fisheries management, policy and legal framework enforcement and private sector involvement. It also discusses the institutional framework and monitoring and evaluation arrangements.

However, the policy does not provide specific poverty reduction or welfare improvement implications to be attained through the implementation of the policy objectives and activities. In other words, the policy does not state the national income changes that are likely to emanate from the attainment of policy objectives, nor does it indicate the possible indirect social benefits such as improved health, education and productivity in the national economy resulting from improvements in the fish industry. Certainly, such omission of the national economic growth and poverty reduction effects of the fish industry may have implications for national stakeholder support to the sector.

In addition, much as the private sector development objective has been incorporated into the policy and strategic framework, its development is largely informed by an interventionist approach to fisheries development, i.e., with minimal non-public sector roles. There are no specified private sector roles in fisheries extension and research, amongst others.

4.2.3 The forestry subsector and poverty reduction

The forestry subsector is one of the key aspects of the ENR sector in terms of contribution to household and national livelihoods in Malawi. In this respect, the National Forestry Policy of 1996, which is currently under review, recognizes that "both natural and man-made forests play an important role in providing basic human needs (fuel, food, fodder, fibre and pharmaceuticals), employment, income and foreign exchange, hence contributing to socio-economic development". The policy framework further acknowledges the other benefits of forestry such as maintaining fresh air, water and soil quality; influencing biochemical processes; regulating run-off and groundwater; controlling soil erosion; and reducing down-stream sedimentation and flash flooding (forests and trees may therefore be seen to provide watershed protection and to enhance water resources).

In terms of provision of energy sources, the Forestry Policy states that, as of 1996, about 90 percent of the nation's energy requirements were being satisfied by wood fuels derived from natural and planted forests and trees on farms. The reliance on forestry for energy was recognized as being more pronounced for rural dwellers, which make up the majority of the population. Rural dwellers also depend on the forest to meet other needs, from where forest bush meat and other food products, construction materials, agricultural tools and medicinal plants are derived.

However, the policy does not provide the relevant statistics such as proportion of households relying on food products, utilizing medicinal plants, and the income levels that are being realized, to support the policy assertions and statements on the various uses of the forests and forest products. However, the policy indicates that 1.0 percent to 2.8 percent of the annual decline in forest cover is due to continually increasing human activities such as agricultural expansion, overgrazing, wood fuel gathering, commercial logging and large-

scale industrial wood fuel use for tobacco curing, lime burning and brick making, amongst others. The policy does not indicate which factors are having the highest and lowest forest degradation impacts, a fact that makes it more difficult to prioritize interventions.

In addition, the policy has some overly ambitious strategies, including committing government to "review the national forest policy biennially and ensure that any updating of the policy should be done in harmony with other related policy issues". Further, it promises to introduce price incentives to promote investments in forest industries. Apparently, most of such overly ambitious goals have not been achieved, as evidenced by the fact that, so far, no clear price incentives have been introduced to promote investments in the forest sector.

The policy is premised on the principle that a proper definition of property rights of forest resources such as use of village natural resource committees, coupled with adequate information to the rural communities on the benefits of the forests and forest products, stimulates the targeted communities' interest and commitment to forest resource conservation. However, as established in empirical studies, this may not always be the case, as increased knowledge of the potential benefits of forest products actually fuels the forest resource degradation, if the communities have high discount rates.

In addition, the policy recognizes gender-forest sector linkages in terms of "supporting women not only in forest-based subsistence and informal economies but as a key agency for innovative development of the rural forestry sector, including the growing, harvesting, processing and marketing of fuelwood, domestic construction wood and industrial wood". However, it does not provide detailed information on the negative value chain implications for women from a depleted forestry subsector.

The policy further commits the government to "facilitate reduction of dependence of rural communities on agriculture as the only source of their income and subsistence by, in close collaboration with the Ministry of Commerce and Industry, promoting rural development through development of skills: encouragement of infrastructure and social services within the communities". It further calls for "provision of incentives to promote uses of alternative sources of energy". These policy statements demonstrate the need for a multisectoral approach in dealing with forest management issues. However, if the success of the forest policy is largely premised on these exogenous factors, i.e., factors outside the control of the forest sector itself, such an understanding raises a concern that it acts as a good basis for excuses by forest policymakers' failure to fix the sector's challenges. In addition, the call for a multisectoral approach is not followed by provision of information on specific quantifiable benefits to the different sectors that are to participate in the implementation of the forestry interventions.

In line with the National Forest Policy objectives, the Malawi Government declared that, each year, the rainy season constitutes a national tree-planting season during which millions of trees are planted across the country. For instance, in the 2013-2014 and 2014-2015 planting seasons, 63.2 million and 47.2 million trees were, respectively, planted across the country (GoM, Annual Economic Report, 2015). However, information on how the government arrives at the tree plantation targets and on the survival rate of the planted trees is not provided. As such, it is difficult to explain why the country is still facing challenges of deforestation in the wake of millions of trees planted during the annual national tree planting seasons.

4.2.4 The wildlife subsector and poverty reduction

The Wildlife Policy (2000), currently under review, defines wildlife as "all wild, indigenous species of animals and plants, comprising species and forms with beneficial, potentially harmful or neutral effects towards man". It further argues that, if managed appropriately, the wildlife resources can simultaneously promote the conservation of biological diversity as well as contribute to the country's economy.

The economic benefits of the sector are not clearly specified, save for policy statements such as "considerable benefits and revenues are expected to accrue from national parks and wildlife reserves" and that sustainable utilization of large mammals and birds can yield economic gains for government and communities surrounding the respective areas and that, as such, the agencies in charge of such areas are urged to consider utilization as a management option. Much as the policy recognizes the need for community participation in wildlife resource management, it explicitly outlines neither the anticipated social and economic benefits that would accrue to the participating communities nor the potential negative impacts of wildlife on communities' welfare such as the human-wildlife conflicts.

With respect to gender mainstreaming, policy principles are the only area where gender issues are highlighted in the framework, which states, "Wildlife resources should be managed in a manner which promotes gender and community empowerment." The limited references to gender in the policy have implications on the development of implementation strategies that seek the support of the different gender groups.

The policy further provides for different incentives for wildlife management, including encouraging landowners to consider wildlife conservation and management as a competitive land use option. It also commits the government to developing a coordinated trade and marketing system of wildlife and products that ensures sustainable benefits. However, whether the policy is discussing trade in wildlife or wildlife products, or management and protection of wildlife resources, the thinking is still that of an interventionist approach whereby government assumes a controlling role. There is minimal consideration of developing clear incentive systems for private investment in wildlife protection based on private economic interests. This explains why the public institutions mandated to oversee the sector tend to be overwhelmed with growing protection demands in line with diminishing capacity and resources to address these demands.

Understandably, the policy is candid in highlighting the various benefits of wildlife conservation. However, it fails to link such conservation objectives and activities to the realization of quantifiable household and national poverty reduction objectives such as incomes, food security, health, education and access to water, amongst others. This situation has implications for stakeholders' commitment to the wildlife sector.

4.2.5 The water subsector and poverty reduction

The national policy framework governing the water subsector in Malawi is the National Water Policy of 2005. The formulation and implementation of the policy is premised on the Government of Malawi's realization of the dependency of the economy on water resources and its impact on poverty reduction. The policy considers the conservation, management, development and utilization of water resources as one of the priorities on its national development agenda that require supportive policies and legislation.

The overall policy objective states, "The overall national water policy goal, is sustainable management and utilization of water resources, in order to provide water of acceptable quality in sufficient quantities, and ensure availability of efficient and effective water and sanitation services that satisfy the basic requirement of every Malawian." While gender, HIV and AIDS issues are recognized as part of the framework's overall policy objectives, no further details are being provided on how gender issues in the subsectoral policy prescriptions are to be considered or addressed.

The National Water Policy further discusses the opportunities for the development of the water subsector as well as the possible challenges being encountered. Some of the challenges highlighted in the policy framework include the degradation of water resources, inadequate service coverage, inadequate financing, increasing water demand as a result of increasing population, HIV and AIDS prevalence, insufficient capacity, lack of an integrated approach to water resources management and development, climate change and climate variability, and lack of mitigation measures for water-related disasters.

To demonstrate the multi-sectoral nature of water issues, the National Water Policy, just like the Environmental Policy (2004), discusses the different sectoral strategies that are to be implemented as part of the the National Water Policy. For instance, the forestry subsector is expected to harmonize and mutually enforce natural resources legislation to protect water resources from degradation and pollution. In the same vein, the fisheries subsector is expected to harmonize and mutually enforce fisheries and water resource legislation to protect water and fisheries resources from pollution and degradation. The Policy proceeds to discuss the specific expected roles of the different ministries such as those of agriculture, health and environment, amongst others.

While the multi-sectoral importance of the water subsector is fully recognized in the policy framework, it does not provide the quantifiable multi-sectoral benefits to the different sectors or subsectors. For instance, it does not indicate how much agricultural productivity can be improved or how the fisheries subsector output can be increased with improved water management. Nor does it indicate the positive macro-effects such as GDP growth benefits of improved water subsector management in Malawi. Apparently, such gaps in policy information are likely to negatively affect the stakeholder commitment to the national water policy implementation.

4.2.6 Land policy sector and poverty reduction

The National Land Policy of February 2002 seeks "to ensure tenure security and equitable access to land, to facilitate the attainment of social harmony and broad based social and economic development through optimum and ecologically balanced use of land and land based resources". The policy recognizes that land is the most basic of all resources available for social and economic development in Malawi and, when considered in combination with water, produces other resources including arable soils, forest, pasture, wildlife habitat and marine ecosystems valuable to people.

It has several specific objectives, including: (i) promotion of tenure reforms that guarantee security and instil confidence and fairness in all land transactions that (a) guarantee secure tenure and equitable access to land without any gender bias and/or discrimination to all citizens of Malawi as stipulated under Article 28 of the Constitution; and (b) instil order and

discipline into land allocation and land market transactions to curb land encroachment, unapproved development, land speculation and racketeering; (ii) promotion of decentralized and transparent land administration; (iii) extension of land use planning strategies to all urban and rural areas; (iv) establishment of a modern land registration system for delivering land services to all; and (v) enhancement of conservation and community management of local resources.

The land policy objectives are largely gender-sensitive, as evidenced by the commitment to guarantee secure tenure and equitable access to land without any gender bias or discrimination to all citizens as stipulated in the National Constitution. The policy further demonstrates its sense of gender sensitivity by stating, "The Government strongly supports gender-sensitive access to land and calls for changes in inheritance laws to allow the remaining spouse, children and especially orphans to inherit the property of their parents even when the deceased parent or parents die without a will". This is part of the land administration and dispute settlement policy position.

The National Land Policy, however, does not cover the specific economic benefits the country stands to gain by implementing its provisions. For instance, the policy does not specify the national economic growth and poverty reduction benefits emanating from the adoption of new rules on eligibility for freehold land, from the promotion of decentralized and transparent land administration, from the extension of land use planning strategies to all urban and rural areas, from the establishment of a modern land registration system for delivering land services to all and from the enhancement of conservation and community management of local resources.

4.2.7 Energy subsector and poverty reduction

The National Energy Policy (2003), also known as the Integrated Energy Policy (IEP), was developed to provide a transparent and dynamic operational framework for the Malawi Energy Sector. The policy also offers guidelines for energy development, supply, use, pricing and industry governance. Its long-term goals include: (i) a robust and efficient energy sector that contributes to national poverty reduction, sustainable economic development and increased labour productivity; (ii) a strongly liberalized, private sector driven energy supply industry in which pricing reflects competition and efficiency; and (iii) a transformed energy economy from a highly biomass dependent structure to a highly modernized energy mix.

The energy policy provides a candid discussion of the biomass supply industry, particularly downstream activities including harvesting, marketing and utilization of wood. It further elaborates that Malawi's energy balance is dominated by biomass (firewood, charcoal, agricultural and industrial wastes), which accounts for 97 percent of the total primary energy supply. The distribution of the biomass sources is as follows: agricultural and industrial residues (34 percent); customary land (37 percent); forest reserves (15 percent); government plantations (10 percent); and private plantations (3 percent). The policy recognizes that the biomass industry is faced with a number of utilization-related challenges, including: (i) distributional challenges of getting biomass from surplus areas to deficit areas; and (ii) low biomass end-use efficiency conversion technologies for charcoal production, which applies to domestic use (cookstoves), tobacco curing, brick burning, fish smoking and cottage industries.

Gender issues are well articulated in the IEP. It states the government's commitment to ensure that gender issues are mainstreamed into the planning and implementation of

energy programmes and projects. It promises to modernize household fuel supply systems for kitchen and agriculture for purposes of reducing heavy work burdens for men and women and promises involvement of women in decision-making in energy technology design, development and dissemination.

The IEP outlines a number of general structural challenges facing the energy sector with far reaching implications. It recognizes the sector's contribution to deforestation through wood obtained from unsustainable sources on customary land for charcoal production and firewood; the lack of formal biomass marketing structures, since most players involved are vendors; and high dependence on wood fuel, which contributes to deforestation. It points out that deforestation is largely in the form of uncontrolled tree felling for tobacco curing and also due to the rise in opportunistic trade in firewood and charcoal. Of course, the policy recognizes that deforestation is also caused by the rise in agricultural sector expansion due to its low productivity, urbanization and infrastructural development. With regard to agricultural productivity, the IEP argues that improvements in agricultural productivity are important not only for the agricultural sector growth purposes, but also for purposes of controlling deforestation and ensuring sustainable fuel wood supply.

The IEP provides an economic interpretation of the activities contributing to the exploitation of forests and forest products. It observes that most forest products such as firewood, charcoal, fruits and bamboo are grossly undervalued, particularly on the roadside markets. Existence of true market values for these products would stimulate communities to protect and manage trees and such price incentives would encourage a tree planting culture amongst communities, while low market prices would continue to dampen local communities' interest in investing in tree planting and protection. On the other hand, true market values of the forest products would discourage excessive demand for the said forest products, thereby contributing to forest protection.

The IEP's attempt to provide economic interpretations of vulnerable communities' interests in forest protection and planting of trees, fails to recognize that market prices are reflective of demand and supply conditions. As such, undue price increases emanating from government interventions in the sector market would actually reduce demand for the products to the disadvantage of the same underprivileged rural households who are dependent on them for their livelihoods. In addition, it is not clear how the IEP views the concept of true market values for forest products when most of such products are simply harvested with minimal, if any, input costs, save for harvesting labour and storage. The IEP should instead focus on the development of market value chain institutions and on how such development processes can promote price incentives for the local communities' investments in forest plantations and management.

4.2.8 The health and the ENR sector nexus

For many years, the heath sector has been guided by the Health SWAp, a coordinated investment framework for the sector. The current guiding investment framework for the sector is the National Health Strategic Plan for 2011-2016. The overall goal of the sector as espoused in the Strategic Plan is to improve the quality of life of all people of Malawi by reducing the risk of ill health and the occurrence of premature deaths and thereby contributing to the social and economic development of the country.

The sector recognizes the need for a multi-sectoral approach in the attainment of its

objectives. As such, the Strategic Plan recognizes the roles of education, income and natural resources in determining health outcomes. The linkage between the use of natural resources and health problems is duly recognized by the policy, which states, "The majority of households in 2008 were using solid fuels (approximately 98 percent), which puts children at higher risk of respiratory infection if the rooms are not well ventilated." It is, therefore, not surprising that the Ministry of Health commits itself to "ensure that a multi-sectoral approach is adopted in addressing these issues and that relevant line Ministries responsible for Agriculture, Irrigation and Water Development; Natural Resources and Energy; development partners and CSOs shall participate in implementing the proposed interventions."

4.3 Policy implementation and implications for the poverty -ENR nexus

A critical look at Malawi's policy frameworks governing the ENR sector vis-à-vis realities on the ground reveals a few contradictions and gaps. First, while almost all policies express the GoM's commitment to private sector development in various ENR sectors, limited engagement with the private sector is taking place. There is still limited private sector participation in forestry investments, agricultural commodity marketing, and the water and energy sectors, amongst others, due to general constraints on private sector development in Malawi, including limited access to financial capital, low labour productivity and delays in obtaining business licenses (GoM, Annual Economic Reports, 2014, 2015).

The continued limited private sector participation in the ENR sector is also aggravated by the fact that most policy statements of the GoM concerning its commitment to private sector development in the ENR sector are not backed by practical strategies on how exactly this is to be realized. In this respect, it can be observed that, while the GoM commits to private sector development in its implementation of food security interventions such as FISP (as outlined in the ASWAp), there are still concerns of the programme limiting private sector fertilizer sales to households. As such, Chirwa and Dorward (2013) quote a study by Chirwa et al. (2011d) that found that, for a matched sample of households that bought commercial fertilizer in the 2002-2003 and 2003-2004 seasons, a 1 percent increase in subsidized fertilizers led to a 0.39 percent reduction in commercial sales. The current FISP policy practice, therefore, has implications for the sustained private sector growth as instruments for sustainable ENR management. This concern emanates from the fact that most of the private companies participating in the FISP have emerged within the FISP period (Chirwa and Dorward, 2013), hence it is not clear whether their market presence would be sustained in the absence of the FISP. If that is not guaranteed, then the country's soil fertility management objectives through private sector participation could be in jeopardy, which would affect sustained poverty reduction objectives.

A critical review of the FISP shows that, over the years, there have been some improvements in the design and implementation of this national investment initiative, though critical gaps still remain. For instance, on gender, an analysis by Lunduka et al. (2013) quotes Fisher and Kandiwa (2013), who found that, over the years, FISP targeting of female farmers has improved such that female-headed households are more likely to receive FISP coupons than male-headed households. In terms of remaining programme gaps and challenges, Lunduka et al. (2013) find that the beneficiary targeting criteria are often

ignored by the beneficiaries themselves owing to the egalitarianism culture that prevails in Malawi such that FISP coupons are often divided amongst households rather than being given to the targeted poor. In addition, there are challenges of untimely distribution of coupons due to the lengthy processes of input procurement; and there is elite capture of coupons, resulting in wealthier households also benefiting besides the targeted poor (Lilongwe University of Agriculture and Natural Resources-National FISP Symposium, 2014; Lunduka et al., 2013).

Besides studies alluded to above, some stakeholder dialogue forums on the FISP have produced recommendations for improving the programme design and implementation; hence policymakers need to avail themselves of such information to address challenges related to programme. For instance, stakeholders at the National FISP Symposium organized by Lilongwe University of Agriculture and Natural Resources (2014) made recommendations to improve on FISP, including: the need to clearly determine the principal objectives of the programme in terms of whether it is a social welfare or an agricultural productivity enhancement tool; the need for greater involvement of private sector actors in the fertilizer procurement and distribution; and the need to conduct cost-benefit analyses to determine the best way to organize logistics of the programme in relation to procurement, transportation and distribution (Lilongwe University of Agriculture and Natural Resources-National FISP Symposium, 2014).

It is equally important that the FISP, which is a significant national investment programme being implemented since the 2005-2006 season, has had little, if any, environmental and social impact assessments (ESIA) to establish the environmental impacts of chemical fertilizer usage. The apparent reluctance to subject FISP to EIAs contradicts the principles of the National Environmental Policy and the Environmental Management Act and blocks knowledge about the environmental and social impacts of the FISP.

The divergence between what is contained in the official policy statements and GoM practical policy actions can also be noted for marketing and trade policies. Apparently, the National Environmental Policy commits the GoM to "establishing an enabling economic environment in which market prices provide appropriate incentives for sustainable natural resource use and environmental protection". In addition, the ministry responsible for agriculture through the ASWAp (2011) commits the same government to "facilitate, through dialogue with the relevant private sector associations, support to partnerships to facilitate the development of a nationwide system of outlets for agricultural inputs and purchasing arrangements for outputs". Nevertheless, a number of agricultural marketing policy decisions in Malawi run counter to the above assertions. Malawi's maize marketing policies are largely discretionary and unpredictable, thus contributing to the observed annual maize price volatility conditions, which are the highest in the Eastern and Southern Africa region (Pauw and Eldeman, 2015; Chapoto and Jayne, 2009). The discretionary and unpredictable market policies in question include imposing export or import bans, procuring grain (often at artificially high prices), disposing of grain (often at subsidized prices) or setting prices directly (e.g., minimum farm gate prices), amongst others (Pauw and Eldeman, 2015).

Government's unpredictable market behaviour sends mixed signals concerning price controls and market interventions, thus perpetuating volatile market prices that force traders to operate only if they are able to charge a high-risk premium for aggregating, storing and releasing stock later in the marketing season, while farmers are forced to become subsistence-oriented (Pauw and Elderman, 2015). This defeats the very same

objective of market liberation agenda, as it drives farmers into subsistence farming practices and thus defeats the government's objective of improving the robustness of maize yields for poverty reduction and food security (Arndt et al., 2013, quoting Benin et al., 2012). The poverty and ENR implications of such cycle of marketing policy actions is that farmers in subsistence farming are likely to engage in unsustainable ENR management activities in their agricultural production practices since, owing to loss of agricultural incomes, they cannot access productivity-enhancing technologies such as fertilizers.[7] The government can address this cycle of interrelated market policy and investment challenges by developing a rules-based approach to government intervention in the maize market to build trust and serve as an incentive to smallholder and commercial farmers to increase maize production and productivity (Pauw and Eldeman, 2015).

Contradictions in ENR policy implementation are also noted in how the various ENR policies translate into the sustainable utilization of ENR products, which in most cases, is beyond maximum sustainable yield[8] thresholds. In this respect, Yaron et al. (2013) observes that, although Malawi has an integrated fisheries and aquaculture policy framework that recognizes the need to maximize the level of sustainable fish yields from across all water bodies, the country faces declining fish stocks due to over-fishing in shallow waters. As a result, in some water bodies such as Lake Malombe and the Southwest arm of Lake Malawi, the sustainable limits of which were exceeded several years ago, the maximum sustainable yields have not been restored. This also applies to other ENRs such as forestry, wildlife and water, hence the poor indicators of national ENRs stocks.

These unsustainable ENR use practices are happening despite established policy frameworks and accompanying legal frameworks. Official policy thus seriously diverges from implementation. While limited institutional, fiscal and technical capacities are often cited as the major reasons for national failure to implement existing policies and laws, there are also situations where unsustainable ENR utilization practices occur even in the face of institutional arrangements and structures responsible for implementing policies and enforcing laws. For instance, policymakers and law enforcers well know where large quantities of charcoal and fuelwood are being unsustainably harvested, but there is no adequate action taken to control practices at the source, nor to confiscate such overexploited ENR stocks when they pass through well-manned roadblocks. This, therefore, demonstrates the failure and lack of effectiveness of the system to implement existing policies and to enforce existing laws, at the policy level".

4.4 Institutional arrangements for inclusive sustainable development

The institutional arrangements for inclusive ENR management, which are expected to translate into poverty reduction outcomes, are best described in the Environmental Management Act, 1996. Under the Act, the National Council for the Environment (NCE) is supposed to be established and to consist of: (a) the Chairman of the Council, who shall be appointed by the President on the recommendation of the Minister; (b) the Secretary to the President and Cabinet, or his representative; and (c) all Principal Secretaries of Ministries, or their representatives; all heads of parastatal organizations in the environment and natural resources sector, the university, and a representative of the National Commission

[7] This is based on the findings from several studies showing that access to markets fosters farmers' adoption of agricultural innovations, including soil fertility management (Zeller et al., 1998).
[8] For definition of the concept of maximum sustainable yields, see the Glossary of Terms

for Women in development. The NCE is supported by a Technical Committee comprising scientific experts with adequate knowledge of environmental management issues.

Though the NCE is operational, its current operations are limited to reviewing and approving Environmental Impact Assessments (EIAs) reports on the country's investment projects. It has not gone beyond the EIA scope to push for the mainstreaming of ENR issues into various sectors. However, notwithstanding the inadequate implementation of the Environmental Management Act, most sectors in Malawi recognize and comply with the legal requirement to subject their sectoral investments to EIA as per the Act.

The Environmental Management Act (1996) has been undergoing reviews over the past years, culminating in a new Environmental Management Bill that is yet to be discussed and passed by Parliament. As such, the MGDSII Annual Review Report (2015) calls for enactment of the Environmental Management Bill that establishes a National Environmental Protection Agency (NEPA) to oversee the protection of the environment in the country.

Several factors could be attributed to the limited multi-sectoral implementation of the National Environmental Policy and Environmental Management Act, including inadequate technical and financial capacity and low political will. Challenges of inadequate technical and financial capacity are reported in several studies and annual GoM official publications such as State of Environment and Outlook (2010) and Annual Economic Reports (2014, 2015), amongst others. With regard to political will, a study by Msiska (2015) observes that inadequate political will itself is an outcome of limited substantive compelling empirical evidence on the specific tangible benefits of returns to investments in environmental mainstreaming. The result is compromised multi-stakeholder commitment and political will.

In spite of the absence of operational legal institutional frameworks to guide the strategies for national environmentally sustainable poverty reduction efforts, the Ministry of Finance, Economic Planning and Development is taking leadership to coordinate the mainstreaming of sustainable ENR management for poverty reduction. For instance, through the Steering Committee on Poverty-Environment Initiative, the Ministry is collaborating with various public sector institutions, academia, civil society and international development partners. These include the Ministry of Natural Resources, Energy and Mining (MoNREM)), the National Statistical Organization (NSO), the Ministry of Agriculture, Irrigation and Water Development (MoAIWD), and the Ministry of Local Government and Rural Development (MoLGRD) as well as development partners.

Those leading the platform on environmental management issues in various sectors recognize and are guided by the Environmental Management Act Chapter 3(1) provision that states, "It shall be the duty of every person to take all necessary and appropriate measures to protect and manage the environment and to conserve natural resources and to promote sustainable utilization of natural resources in accordance with this Act and any other written law relating to the protection and management of the environment or the conservation and sustainable utilization of natural resources."

4.5 Poverty-environment objectives in the MoG's development planning process

The review of inclusion and implementation of poverty and gender objectives in the environment and natural resource sector and in Malawi's broader development planning processes seeks to compliment insights from the policy, strategy and institutional

arrangements discussed above. To some degree, the review interrogates the extent to which the given policy frameworks are being translated into implementation actions, particularly in terms of mainstreaming gender, poverty and poverty-environment objectives. Further, the review examines the use of poverty and economic impact assessment in informing the decision processes at national, sectoral and district levels.

The review is based on official information from Government of Malawi budget documents (output-based budget documents for the 2014-2015 fiscal year and the Annual Economic Report, 2014) and MDGSII review reports. A few government ministries whose activities have a direct bearing on ENR management and national poverty reduction objectives have been sampled for the review and include: the Office of the President and Cabinet (OPC); the Ministry of Finance, Economic Planning and Development; the Ministry of Agriculture, Irrigation and Water Development; the Ministry of Natural Resources, Energy and Mining; the Ministry of Lands and Housing; the Ministry of Local Government and Rural Development;[9] and the Ministry of Health). For each of the ministries, the study examines the objectives, strategies and expected outputs for the 2014-2015 fiscal year. See Table A.1 in the Annex for details of the analysis.

Table A.1 in Annex 2 shows that, while almost all government ministries have ambitious objectives and strategies, the same cannot be said about the annual expected outputs, particularly for the 2014-2015 fiscal year under review. The fewer expected outputs compared to objectives and strategies can be explained by allocative inefficiency (low funding levels) to the various sectors as reported in the Annual Economic Report, 2014. With respect to inclusion and implementation of poverty and poverty-environment objectives, the study finds that few ministries make direct reference to such issues in their objectives, strategies and expected outputs. There is no attempt to indicate the number of people whose poverty levels would be reduced if the implementation of the stated strategies were implemented. Hence, similar information gaps are noticeable in the reported expected outputs. Furthermore, the plans do not show how the implementation of their objectives would help attain sustainable ENR management objectives and there is no reference to how changes in ENR management would help attain the objectives and outputs. Interestingly, even the Ministry of Finance, Economic Planning and Development is silent on the inclusion of the poverty-environment objectives in its policy and programme implementation actions.

A gender analysis of the government implementation plans also reveals a mismatch between mainstreaming gender issues into policy frameworks and annual government implementation actions, i.e., attention to gender issues are absent in the implementation. This is happening despite the due incorporation of gender issues in many national and sectoral policy and strategic frameworks. Since most policy and strategic frameworks simply include gender issues as separate topical issues and do not mainstream them into the specific policy prescriptions throughout the frameworks, it is not surprising that gender issues are forgotten when it comes to developing and implementing annual action plans.

The analysis further interrogates how well GoM policy, programme and project decision-making procedures and tools include an assessment of the likely poverty impacts of proposed and existing policies, programmes and projects and how well the GoM actually

[9] The Ministry of Local Government and Rural Development, though not a key ENR implementing ministry, was included in the analysis to represent districts councils.

includes targeted efforts to reduce poverty in its policy, budget, programme and project development. This involves review of GoM output-based budgets documents (2014-2015) and the Annual Reports (2014, 2015) of key GoM ministries and departments. The analysis finds that the Ministry of Finance, Economic Planning and Development (MFEPD) makes clear reference to policy analysis and impact assessment in general and poverty impact assessments in particular in its decision-making processes. In this regard, in the 2014-2015 output-based budget, the MFEPD commits to undertaking several sector policy analyses and user fees reports to determine its fiscal policy measures, including the determination of user fees. The Ministry of Natural Resources, Energy and Mining commits to undertaking surveys on indigenous weather knowledge and climate change, making a detailed feasibility study for an oil pipe line and facilitating coal environmental impact assessment studies.

However, the intended poverty impacts of the above interventions are not discussed and, so far, there are no reports indicating that such analyses were undertaken since there is no reference to such outputs in the MGDS Review (2015). Interestingly, while the same national 2014-2015 output-based budget document shows that the Ministry of Agriculture has important programmes and projects with poverty and food security implications, such as the Farm Inputs Subsidy Programme and the promotion of land conservation interventions and irrigation investments, amongst others, it makes no reference to the sector using poverty or any other impact assessments to determine its interventions. In the same vein, the Ministry of Lands does not indicate the poverty impact assessments related to important interventions such as physical plan development and land allocation, amongst others.

The minimal references to the use of poverty impact assessments to inform the poverty reduction policy development and reviews, implies a limited culture of evidence-based decision-making processes in the national decision-making machinery. However, the official reasons for failure to effectively implement planned government activities, including undertaking poverty impact assessments of the planned investments, include limited financial and human resources to undertake such activities (GoM, MGDS Review, 2014 & 2015).

The major challenges relating to policy and programme implementation in the public sector have been attributed to limitations in financial and human resources. However, a critical look at the policy implementation processes as reported in the MGDSII Annual Review Reports and Annual Economic Reports shows even much deeper underlying challenges. First, the performance indictors against which government ministries, departments and agencies are assessed are not ambitious; hence, the reviews show impressive performances despite continued ENR degradation and the general decline in economic conditions due to inflation rates of over 22 percent during the past two years. For instance, despite the continued ENR degradation, the MGDS II Annual Review Report (2015) reports, "The [ENR] sector has performed impressively with respect to MGDS result indicators since 24 out of 27 indicators have either met or exceeded the target. This represents about 89 percent achievement on MGDS outcome performance." Second, despite the implementation of initiatives such as organization performance agreements (OPAs) and results-based management systems in government, no clearly established punitive measures follow non-performance by public officers.

4.6 Summary: Review of national policy and institutional frameworks

The review of the national and sectoral policy framework has covered the National Constitution, the Vision 2020, the Malawi Growth and Development Strategy II, the National Environmental Policy and the National Climate Change Investment Plan. The first three frameworks, being multi-sectoral in scope, provide concise but critical guidance on ENRs issues. The ENR guidance is further elaborated in the National Environmental Policy and the National Climate Change Investment Plan.

The review shows that Malawi's policy landscape has a diverse set of sectoral policies related to ENRs developed by various ministries and departments building on the national frameworks. The sectoral policies have been developed at different time periods, with some dating 20 years back, while others have been developed during the past two years. Most of the older sector policies (e.g. forestry, fisheries and wildlife), together with their accompanying legal provisions, are under review to update them to provide policy guidance that is relevant for today's social, economic and institutional conditions. The policy review processes are expected to benefit from the growing stock of empirical investigations into the poverty impacts of the ENR sectors. In so doing, it is envisaged that the revised policy frameworks will better generate national commitment to the ENR sector as a poverty reduction pathway, thus generating the much-needed increase in investments in the sector.

The national and sectoral frameworks do highlight and recognize that ENR issues are cross-sectoral, as is the case with climate change and social issues such as poverty, gender, HIV and AIDS, human rights and good governance. It is apparent from the national and sectoral policies that Malawi's agro-based economy is heavily dependent on the sustainable management of ENRs and that it is critical for achieving short-, medium- and long-term national development objectives. However, the different immediate quantifiable sectoral benefits of sustainable ENR management are not fully elaborated in the policy frameworks, which contributes to the low commitment of sectoral policymakers to promote sustainable ENR management.

While almost all sectors and subsectors have national policy frameworks that define their operations, some sectors, such as agriculture, do not have a concise operational policy. Because there is no National Agricultural Policy, resource allocation amongst the subsectors is a subjective process, inter- and intra-sectoral collaboration is compromised, there are policy inconsistencies along the commodity value chains and there is limited NGO and government collaboration such that most NGO-initiated investments are not fully incorporated into government activities. The results are continued low productivity, low agricultural incomes and poverty.

The enabling environment for private sector participation is well highlighted in several policy frameworks. However, it is not clear what exactly constitutes an enabling environment for private sector investment under different conditions. Private sector development requires a combination of policy, institutional and structural arrangements that interact to create conditions of entry, growth and sustenance of private sector investments in the ENR sector. Some policy frameworks have attempted to explain local communities'

limited investments in ENR management in terms of lack of true market incentives – namely, low market prices. However, such economic interpretations fail to recognize the fundamental market factors that determine market prices, such as availability of substitutes. In this regard, such frameworks should be advocating for the development of vibrant value chain systems that ensure local communities' linkage with end markets.

The need to address gender issues and to promote gender equality is well recognized in almost all policy frameworks, though with different levels of detail. In most frameworks, gender issues are presented in separate 'gender mainstreaming' sections, which contradicts the principle of mainstreaming. The consequence of this approach is that gender issues and gender equality objectives often are forgotten when it comes to developing and implementing annual action plans.

There are apparent inconsistencies between what is stipulated in policy frameworks and what is happening on the ground. For instance, despite the existence of the National Environmental Policy and Environmental Management Act, some government interventions such as FISP are rarely subjected to EIAs although they are a national investment priority. In addition, on the market aspect, current agricultural marketing policies are not in line with the call by the National Environmental Policy for an economic environment in which market prices provide appropriate incentives for sustainable natural resource use and environmental protection. Government policy actions in the agricultural sector, such as unpredictable and discretionary market policy actions that include export bans and the setting of minimum prices and market purchases, drive farmers into subsistence condition. Such policy actions reduce agriculture incomes and hence reduce demand for improved farmer technologies such as fertilizers; this, in turn, results in continued unsustainable use of land and soil resources. In the long run, this perpetuates poverty, thus defeating government poverty reduction and sustained economic growth policies and programmes. The resulting price volatility conditions also stifle private sector operations.

What is more, some policy measures proposed in the frameworks have not been implemented. For instance, the institution of user fees and taxes as incentive mechanisms for investment in ENRs, as proposed in the National Environmental Policy (2004), remains absent. This implies that the country's efforts to promote sustainable ENR utilization should start with the implementation of the available policy proposals before new ones are proposed and implemented.

Although policy and regulatory frameworks promote the sustainable use of ENRs, ENR degradation continues. Government institutions (GoM, MGDS Reviews, 2014 & 2015) have cited limited financial and human capacities as the major reasons for the failure to implement policies and laws. However, deeply rooted structural problems within institutional arrangements and structures contribute to government failure to implement policy and to enforce laws that would safeguard the sustainable use of ENRs. For example, the policy and legal framework implementing machinery is fully aware of where large quantities of charcoal and fuelwood are being unsustainably harvested, but no one control these practices. Furthermore, when stocks of overexploited ENRs pass through well-manned roadblocks, little or no action is taken. This failure to effectively implement and enforce existing policies and laws indicate weak governance systems and

the apparent lack of political will for sustainable management of ENRs of the country.

Institutional arrangements for coordinating implementation of the various ENR policy frameworks are outlined in national and various sectoral frameworks. However, while multi-sectoral collaboration is fully recognized in the policy frameworks, it is not clear how this is practically implemented on the ground. Continued ENR degradation despite the existence of the diverse and elaborate policy, legal and institutional arrangements and frameworks, is an indication not only of insufficient investment support, but also of insufficient collaboration and coordination between sectors in the implementation of policy frameworks.

With respect to the inclusion of poverty impact assessments in the implementation plans, the analysis shows that there is minimal practical use of poverty impact assessments as the basis for national and sectoral policy, programme and project developments and reviews. For instance, in the agriculture and natural resources sectors, some investment initiatives that could have significant poverty impacts are being implemented, yet there is no clear reference to the anticipated poverty reduction targets of such investments. These are deficiencies in the culture of evidence-based decision-making processes, which need to be addressed and fully mainstreamed into the national decision-making machinery.

5. SUSTAINABLE PATHWAYS FOR POVERTY REDUCTION: EMPIRICAL FINDINGS FROM MACRO-LEVEL ANALYSES

5.1 Model specification

In this section, a Vector Error Correction Model (VECM) is used to examine the causal relationship between macro-level variables that influence the poverty-environment and natural resource nexus. The VECM has been chosen over alternative techniques because macroeconomic variables are often affected not only by exogenous variables, but also by their own past values. In addition, the method has favourable response to small and large sample sizes. The specification of the multivariate models for estimating the causal relationship among the study variables of income poverty, productivity, food security, health and access to water have been guided by the evolution of theories and developments in econometric modelling, development economics, environmental economics and sustainable development.

The theories have identified various macro-level factors that influence the growth of a country from the classical, neo-classical and the new growth theories. These factors include: physical assets, financial assets, human assets and capital (labour, education, skills, health), environmental assets, social assets, government expenditure, consumption, investment, innovation, technology, financial deepening, economic policies, foreign aid, trade openness, institutional frameworks, socio-cultural factors, demography, productivity, food security and many others. In order to examine the empirical evidence of macroeconomic determinants of the poverty-environment and natural resource nexus, the study considers some of the factors.

The models for Income Poverty and ENR nexus, Productivity and ENR nexus, Food Security and ENR nexus, Health and Environment and ENR nexus, Access to Water and ENR nexus are specified as follows:

Income poverty and ENR nexus

Real GDP per capita (PGDP) is a function of environmental assets (Fish (FISH), Forest cover (FCD)), government expenditure on ENR sector (GEXENR), agriculture productivity (VAAG) and gross capital formation (GCF)

.

Productivity and ENR nexus

Productivity (VAAG) is a function of government expenditure on ENR (GEXENR), government expenditure on agriculture (AEXTOT), access to credit from commercial banks by private sector (CREDITP), Inflation (CPI) and crop production (CRI).

Food security and ENR nexus

National food production is a function of share of crop land to agriculture land, government expenditure on ENR (GEXENR, and inflation (CPI).

Health and ENR nexus

Food security (FDP) is a function of labour market (AVAPW), land available for crop cultivation (CRPALND), government expenditure on ENR and inflation (CPI).

Access to water and ENR nexus

Access to water is a function of government expenditure on ENR (GEXENR), GDP per capita (PGDP), forest cover (FCD) and population (POPN).

These are mathematically expressed as follows:

PGDP=f(FISH, FCD, GEXENR, VAAG, GCF) ----------5.11

VAAG=f(AEXTOTEX, CREDITP, CPI, CRI) ----------5.12

FDP =f(AVAPW, CRPALND, GEXENR, CPI) ----------5.13

HLTH=f(HLTEXGDP, IATWS, IATSF) ----------5.14

IATWS=f(GEXENR, PGDP, FCD, POPN) ----------5.15

Equations 5.11, 5.12, 5.13, 5.14 and 5.15 are transformed into log-linear format in order to include the proliferate effect of times series data and resolve the problem of heteroscedasticity. Therefore, the transformed log-linear equations are expressed as follows:

Model

$$\log PGDP_t = \alpha_0 + \alpha_1 \log FISH_t + \alpha_2 FCD_t + \alpha_3 \log GEXENR_t + \alpha_4 \log VAAG_t + \alpha_5 \log GCF_t + U_t \quad -----5.16$$

Model II

$$\log VAAG_t = \beta_0 + \beta_1 log AEXTOTEX + \beta_2 \log CREDITP_t + + \beta_3 \log CPI_t + \beta_4 \log CRI_t + 1\varepsilon_t \quad --- ----5.17$$

Model III

$$\log FDP_t = \gamma_0 + \gamma_1 \log AVAPW_t + \gamma_2 \log CRPALND_t + \gamma_3 GEXENR_t + \gamma_4 CPI_t + \tau_t) \quad ---------5.18$$

Model IV

$$\log HLTH_t = \emptyset_0 + \emptyset_1 \log HLTHEXGDP_t + \emptyset_2 IATWS_t + \emptyset_3 IATSF_t + \omega_t) \quad ----------5.19$$

Model V

$$\log IATWS_t = \lambda_0 + \lambda_1 \log GEXENR_t + \lambda_2 \log GDPCC_t + \lambda_3 \log FCD_t + \lambda_3 POPN_t + \psi_t) \quad -----5.20$$

$\alpha_0, \beta_0, \gamma_0, \emptyset_0$ and λ_0 are the intercepts. The rest of the $\alpha_s, \beta_s, \gamma_s, \emptyset_s$ and λ_s are thepartial elasticities of the models. The U_t, τ_t, ω_t and ψ_t are stochastic error terms .

Definition of the variables in Models I-V in Malawi is presented in Table 5.1.

Table 5.1: Definition of variables, sources and hypothesized effects for long-run coefficient

Variable Name	Expected Sign	Description
PGDP	+	Annual rate of change in natural logarithm for Gross Domestic Product per capita from 1980 to 2013
GEXENR	+	Annual rate of change in natural logarithm for Government Expenditure on Environment and Natural Resources
FCD	_	Annual rate of change in natural logarithm for Forest Cover Degradation
VAAG	+	Annual rate of change in natural logarithm for Agriculture Value Added, which is used as a proxy for agriculture productivity
GCF	+	Annual rate of change in natural logarithm for Gross Capital Formation
AEXTOTEX	+	Annual rate of change in natural logarithm for Agriculture Expenditure to Total Government Expenditure
FDP	+	Annual rate of change in natural logarithm for Food Production Index
CRPAGLND	+	Annual rate of change in natural logarithm for Share of Crop Land to Agriculture Land
FISH	+	Annual rate of change in natural logarithm for Index of Fish catches
CRL	+	Annual rate of change in natural logarithm for Index of Cereals
CRI	+	Annual rate of change in natural logarithm for Index of Crops
CPI	+	Annual rate of change in natural logarithm for Consumer Price Index
HLTH	-	Annual rate of change in natural logarithm for Number of Under-Five Deaths
HLTHEXGDP	-	Annual rate of change in natural logarithm for Share of Health Expenditure to GDP
IATWS	-	Annual rate of change in natural logarithm for Improved Access to Water Services
IATSF	+	Annual rate of change in natural logarithm for Improved Access to Sanitation Facilities

5.1.1 Data sources and diagnostic tests

The data for this study are time series data that have been captured from 1980 to 2013 from the Malawi Government Annual Economic Reports and Financial Statements, Reserve Bank of Malawi, National Statistics Office, World Bank (World Economic Indicators), FAOSTAT and World Health Organization. The time span is sufficient to capture the long-term relationship among variables to ensure quality data analysis.

The diagnostic tests on the secondary data used Stata and PSPP Statistical packages, which, among other things, generated results for descriptive statistics, unit root test, cointegration analysis, VECM parameter estimates and other post-estimation tests results.

5.1.1.1 Descriptive statistics

Descriptive statistics were used to describe the major variables of interest using means, modes and median presented.

5.1.1.2 Unit root testing

In time-series econometric analysis, most economic variables have mean and variance that are not stationary and the Unit Root Test is important to avoid spurious regression, which is a common challenge when estimating a regression line with data whose generation process follows a times trend. However, valid estimates are possible if non-stationary variables are

used that have a long-run relationship between and among them – in other words, if the variables are cointegrated. In an attempt to establish whether the variables are stationary, the study uses the Augmented Dickey-Fuller (ADF) and Johansen's maximum likelihood procedure to check whether the macroeconomic variables are integrated of the order one (I(1)) or otherwise before proceeding to the estimation procedure. The results of the unit root test for the study variables are summarized in Table 5.2.

From Table 5.2, all variables are integrated at first order, I(1). As a result, the Johansen cointegration approach can be used to determine the number of cointegrating equations.

5.1.1.3 Johansen Cointegration Test

After ascertaining that the variables are integrated of the same order, (I(1), the study proceeded with testing the co-integration among variables of interest. The purpose of the co-integration test is to determine whether a group on non-stationary series is co-integrated. The Johansen's Co-integration Maximum Likelihood Method of Co-integration was applied to determine the number of co-integrating vectors. The study further applied the trace test and maximum eigenvalue test to identify the co-integrating vectors. If variables were found to be co-integrated, the study estimated the error correction model using VECM and diagnostic tests.

5.1.1.4 Validity of results

Other tests were performed to evaluate the validity of results and to check compliance to the necessary statistical properties of the models. Different diagnostic tests were performed, such as normality test (Jarque-Bera chi-square), (ARCH) for heteroskedasticity test, specification test (Ovtest Ramsey RESET), multi-collinearity test (Variance Inflation Factor-VIF), (Breusch-Godfrey Correlation LM) test for autocorrelation and Granger causality test.

5.2 Empirical results and discussion

This section presents empirical macro-level result estimates of Income Poverty and ENR Nexus (Model I), Productivity and ENR Nexus (Model II), Food Security and ENR Nexus (Model III), Health and ENR Nexus (Model IV) and Access to Water and ENR Nexus (Models V) using the technique of VECM after having ascertained that ordinary regression analysis would not be appropriate since the variables have a unit root and are stationary at their first differences (Table 5.2). The VECM adjusts to short-run changes in variables and deviations from equilibrium. The coefficient of lagged error correction term shows the speed of adjustment to long-run solution that enters to influence short-run movements in variables. It should be negative and less than unity in absolute terms because it is unlikely that any of the variables will adjust instantaneously or 100 percent to a shock. Before presenting the estimated results, a trend analysis of the key dependent variables as specified in Models I to V is outlined to provide the attributes of the study variables.

Table 5.2: Unit root test results for variables used in models I-V

Variable	ADF	1%	5%	10%	Lag	Order of Stationarity
GDP per Capita	-6.977**	-3.702	-2.98	-2.622	0	1
Govt. Expenditure on ENR	-6.229**	-3.702	-2.98	-2.622	0	1
Forest Cover Degradation	-8.093**	-3.702	-2.98	-2.62	0	1
Share of Agr. in GDP	-8.928**	-3.702	-2.98	-2.622	0	1
Merchandise trade to total trade	-8.409**	-3.702	-2.98	-2.622	0	1
Agr. Expenditure to GDP	-7.776**	-3.702	-2.98	-2.622	0	1
FISH Catch	-9.247**	-3.702	-2.98	-2.622	0	1
Cereal Production	-9.016**	-3.702	-2.98	-2.622	0	1
Tobacco production	-6.050**	-3.702	-2.98	-2.622	0	1
Agriculture land devoted to crops	-5.903**	-3.702	-2.98	-2.622	0	1
Consumer Price Index	-3.131**	-3.702	-2.98	-2.622	0	1
Real Gross Domestic Product	-7.580**	-3.702	-2.98	-2.622	0	1
Improved Access to Water Services	-4.307 **	-3.709	-2.983	-2.623	0	1
Improved Access to Sanitation	-3.736**	-3.709	-2.983	-2.623	0	1
Govt. Health Expenditure to GDP	-4.345**	-3.75	-3	-2.63	0	1
Education Expenditure to GDP	-7.228**	-3.702	-2.98	-2.622	0	1

**ADF stationary at 1% and 5% critical value

5.2.1 Trend analyses

Before undertaking any time series econometric analysis of the data, a broad trend and behaviour of the variables is explored, which may help in interpreting the model results later. For this purpose, time series plot is drawn for all variables as shown in Figure 5.1, 5.2, 5.3, 5.3 and 5.4.

5.2.1.1 Trends of income poverty and ENR nexus

The study examined trends of GDP per capita (PGDP) as a poverty measure, which is a function of environmental assets, forest cover degradation, government expenditure on ENR sector, agriculture value-added and grosses capital formation. Economic growth has depicted mixed results over the three decades, starting from 1980 to 2013, as shown in Figure 5.1. The index of GDP per capita (PGDP) has fluctuated between 121 in 2013 and 108 in 1980. The observed trend gives an indication that there has been little response to poverty reduction since Malawi is still classified amongst the poorest countries in the world.

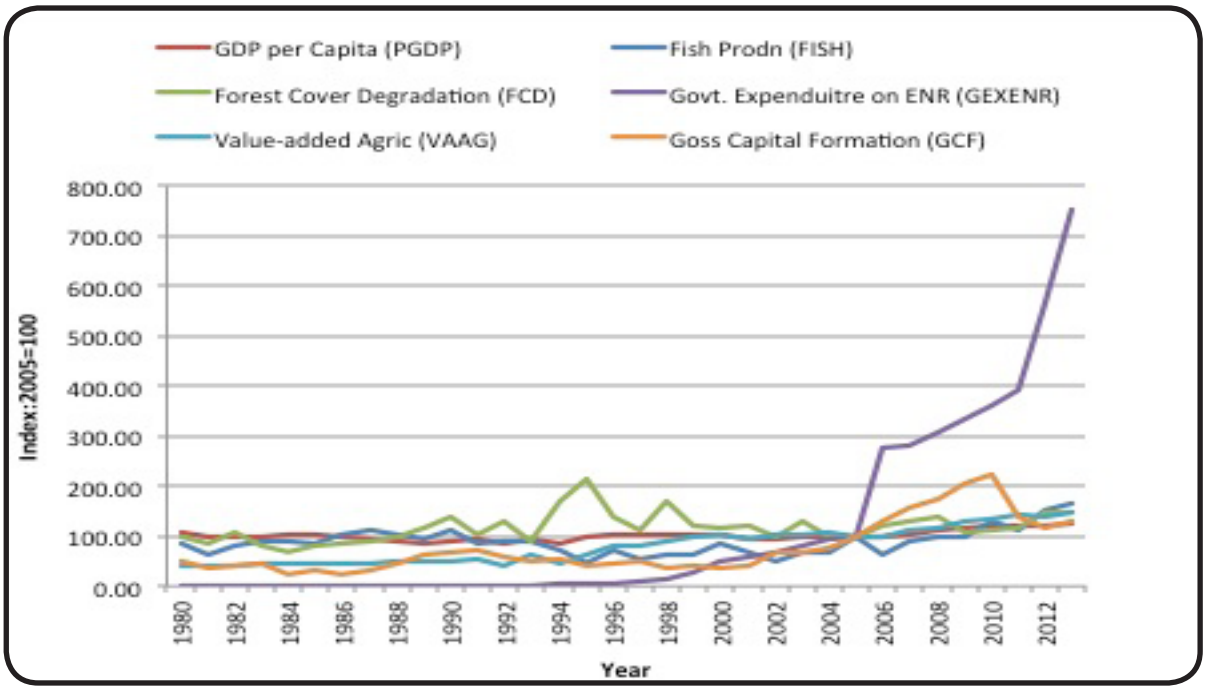


Figure 5.1: Trends of variables in the income poverty and ENR nexus

The analysis of Forest Cover Degradation (FCD) reveals that, over the past 30 years, Malawi's forests have been subject to significant degradation. During the consultations with stakeholders, the Department of Forestry indicated that it is facing challenges in addressing this problem, especially in a context of limited public sector funding for forestry and a perception that the sector has little to contribute to the economy or to the well-being of the population.

Fish production (FISH) was relatively stable between 1980 and 1990, but declined considerably in the 1990s. The raw figures of fish catches reveal a decline from an average of 60,000 metric tonnes in the period of 1976-1990 to 49,000 metric tonnes in 1991-2003. Production picked up 2004 to 116,000 metric tonnes in 2014.

The agriculture value-added (VAAG) grew steadily between 1980 and 2012 from about US$0.5 billion in 1980 to about US$1.3 billion in 2014. The capital investments in Malawi (GCF) has experienced a five-year cycle of oscillating increases from around US$0.3 billion in 1980 to around US$0.8 million in 2012, reaching a maximum of US$1.4 billion in 2010. Government expenditure on ENR (GEXENR) was relatively stable and small between 1980 and 1989. Modest increases between 1990 and 2005 were followed by a very rapid increase between 2006 and 2012.

5.2.1.2 Trends of productivity and ENR nexus

Agriculture value-added is used as proxy for productivity in agriculture. It is mirroring the performance of the agriculture sector.

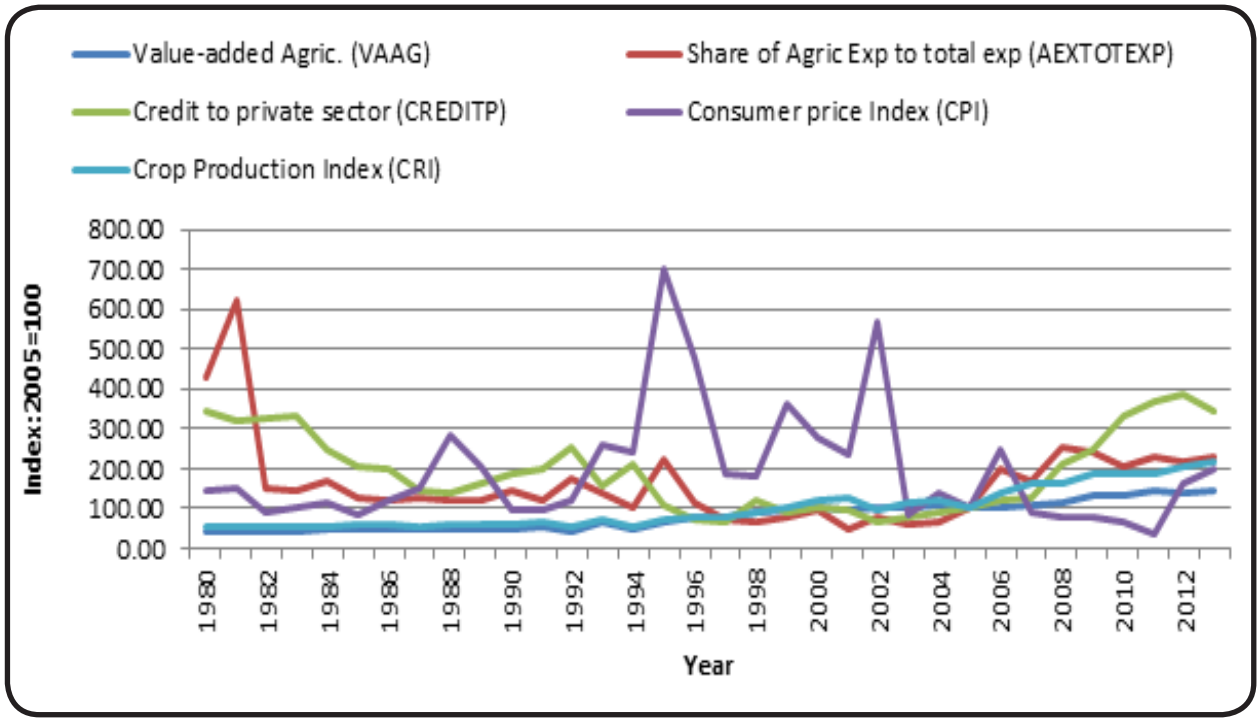


Figure 5.2 Trends in variables in agricultural productivity and ENR nexus

The proportion of spending on agriculture to total national spending (AEXTOTEXP) in Malawi was quite high, averaging around 32 percent prior to 1980. It declined to about 17 percent from 1980 to 1990, with further decline to about 10 percent between 1991 and 2000 and slightly increasing to 13 percent in 2013.

The index of CPI peaked at about 700 in 1995, signifying that inflation in that year was almost seven times higher than the base year inflation in 2005. The Crop production Index (CRI), which captures agricultural production, increased from 45 in 1980 to 215 in 2014.

The index of Malawi's bank credit to the private sector (CREDITP) averaged 193. It registered a steep decline from 341 in 1980 to 68 in 1997 and 1988 with a mild recovery between 1989 and 1992 before sliding further to 67 in 2002. The index improved to 345 in 2012.

5.2.1.3 Trends of food security and ENR nexus

National food production (FDP) has been used as a proxy for food security in terms of food availability at national level. Figure 5.3 shows that food production nearly stagnated between 1980 and 1992. Mild peaks and troughs followed until 1992. Then a steady increase was registered between 1995 and 2000 and was followed by another period of stagnation until around 2005, when a major turnaround occurred.

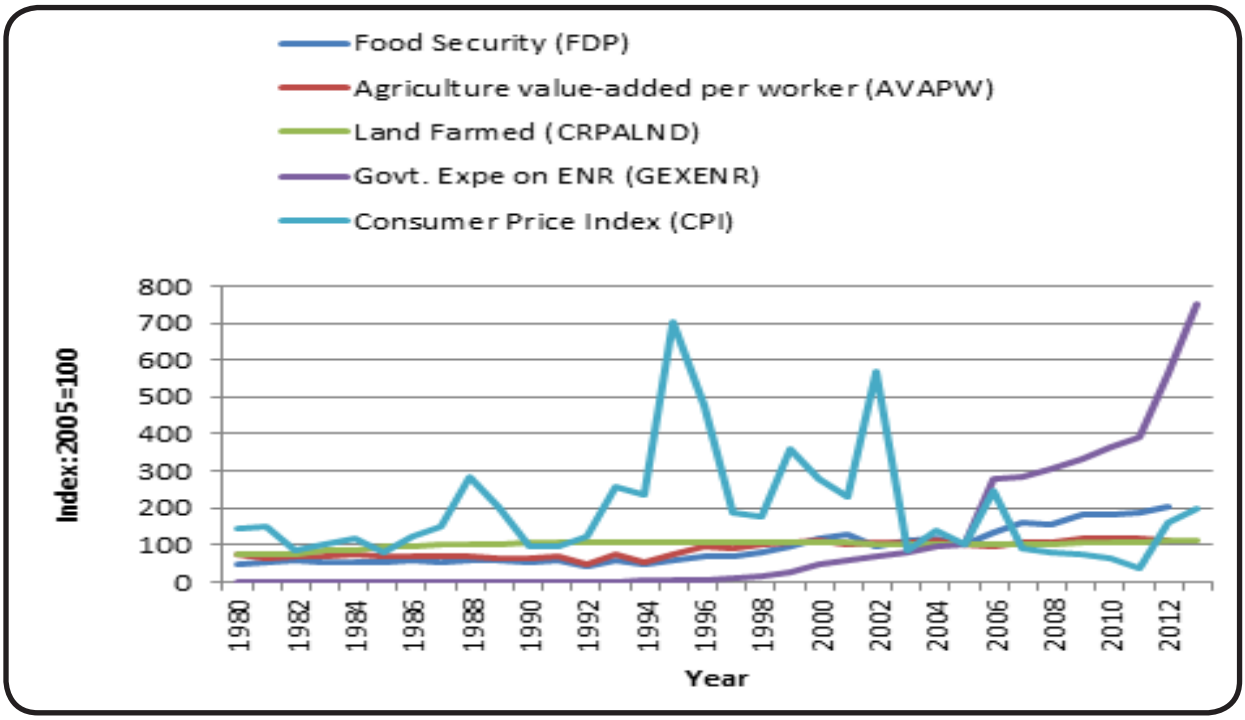


Figure 5.3: Trends in variables in the food security and ENR nexus

The index of Agriculture Value-added Per Worker (AVAPW) remained within a very narrow band, starting with 73 in 1980 and reaching 114 in 2012.

There was no significant change in the agricultural land under crop cultivation (CRPALND) between 1980 and 2012. The index of CRPALND fell within the range 74 to 112

5.2.1.4 Trends of health and ENR nexus

The number of under-five deaths (HLTH) is used as a proxy for the health of the population. The number of under- five deaths was quite high between 1980 and 1990. However, the situation has been reversed, and the number of under-five deaths now is at half of the 1990 level.

The share of Government Expenditure on Health in Gross Domestic Product (HLTHEXGDP) has increased considerably from 1980. The index increased from 20 in 1980 to 112 in 2012.

The population with improved access to water supply services has been steadily as depicted by the increase in the index from just under 40 percent in 1980 to nearly 85 percent in 2012. The population with access to improved access to sanitation facilities remained relatively small during the period under review.

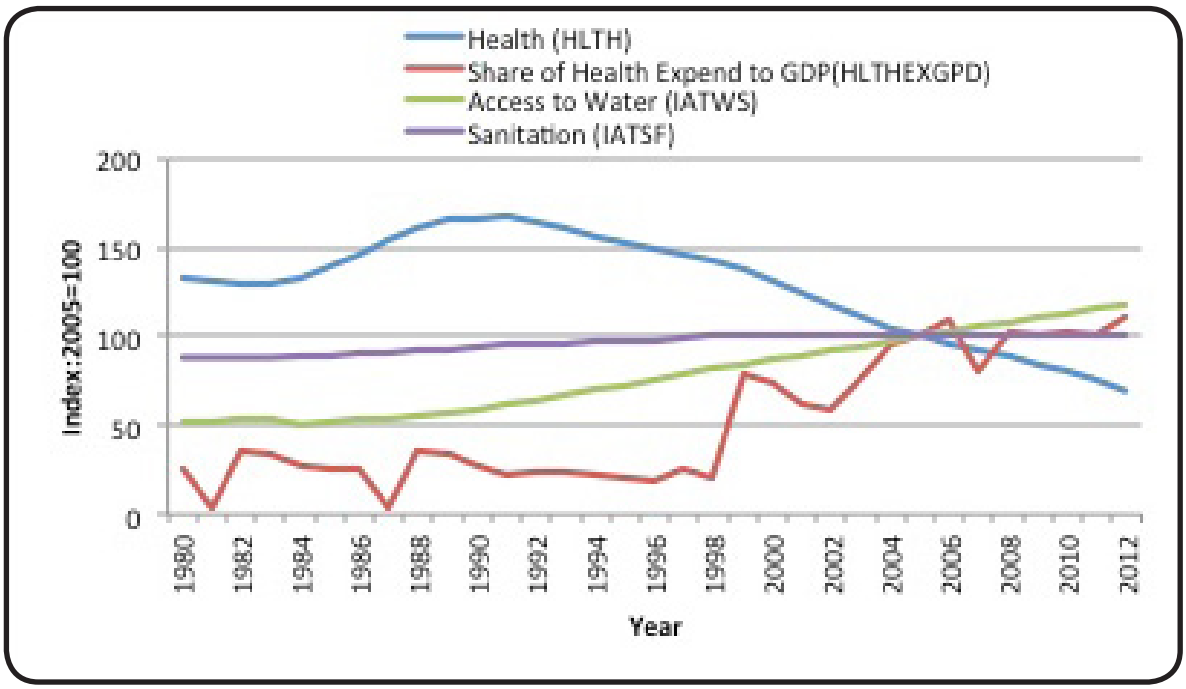


Figure 5.4: Trends in variables in the health and ENR nexus

5.2.1.5 Trends of access to water and ENR nexus

Figure 5.4 capture the indices for Improved Access to Water Supply (IATWS), Government Expenditure on ENR (GEXENR), GDP per capita (PGDP), Forest Cover Degradation (FCD) and Population (POPN). The analysis is performed population (POPN) because the other variables have been dealt with in the previous sections.

The index for population increased from 48 in 1980 to 126 in 2013, representing a rapid population increase from about 6 million in 1980 to nearly 16.3 million in 2013.

5.2.2 Model estimates-Vector Error Correction Model

This section outlines the VECM estimates for Models I to V and separate results are presented for long-run and short-run parameters. The VECM estimation technique allows the introduction of previous disequilibrium to be part of a set of the model independent variables explaining the dynamic behaviour of the dependent variables.

5.2.2.1 Model I estimates-factors affecting income poverty and ENR nexus in Malawi

With the presence of a long-run relationship between GDP per capita and the variables predicting confirmed, the long-run equation was estimated using the VECM (Model I) and results are summarized in Table 5.3.

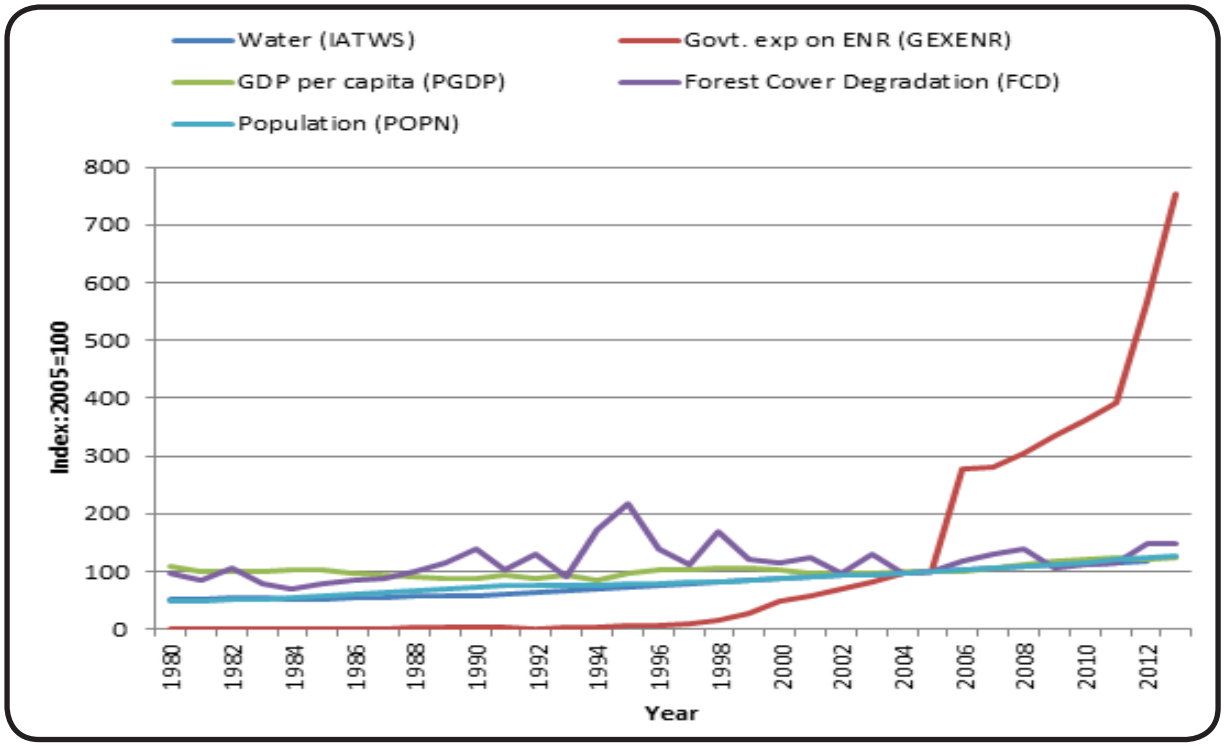


Figure 5.4: Trends in variables in the access to water and ENR nexus

Table 5.3: Factors that influence PGDP-income poverty in Malawi (Long-Run Equation)

Variables	Coefficient
Constant	-49.36
Fish catches (LFISH)	0.296 -0.18
Forest cover degradation (LFCD)	-0.60*** -0.19
Government expenditure on ENR (LGEXENR)	0.43*** -0.08
Agriculture value-added (LVAAG)	2.24*** -0.39
Gross capital formation (LGCF)	0.01 -0.12

Standard errors in parentheses; *** significant at 1%; ** at significant at 5%; *significant at 10%

From Table 5.3, we observe that the coefficients have the expected signs and that agriculture value-added and government expenditure on ENR have significant positive impacts on GDP per capita while forest cover degradation has a significant negative influence on GDP per capita. The long-run coefficient for government expenditure gives an indication that a 1 percent increase in expenditure on ENR is likely to increase per capita GDP by 0.43 percent. Similarly, a 1 percent increase in agriculture value-added will likely increase GDP per capita by 2.3 percent.

The coefficient of forest cover degradation has a significant negative influence on GDP per capita. A 1 percent increase in forest cover degradation is likely to reduce GDP per capita by 0.6 percent. The coefficients of fish production and gross capital formation have an insignificant positive influence on GDP per capita.

The results of the short-run error correction model are summarized in Table 5.4. The VECM captures the short-run dynamic relationship and the set of short-run coefficients in the VECM and associates the changes in GDP per capita to change with other lagged variables and the disturbance term of the lagged periods.

Table 5.4: Error correction model estimates of factors that influence income poverty (Short-Run Equation-Model I)

Variables	ΔGDP per Capita	ΔFish catches	ΔForest Cover Degration	ΔGovt. Expend. On ENR	ΔAgric. Value added	ΔGross Capital Formation
Speed of Adjustment (Error Correction)	-0.12*** -0.02	-0.04 -0.13	-0.21* -0.13	-0.17 -0.18	-0.28*** -0.05	-0.09 -0.14
Constant	0.024*** -0.01	0.03 -0.05	-0.02 -0.05	0.21*** -0.07	0.08*** -0.02	0.045 -0.05

Standard errors in parentheses; *** significant at 1%; ** at significant at 5%; *significant at 10%

The results in Table 5.4 above show that the coefficients of speed of adjustment (error correction term) for GDP per capita are significant and correctly signed. This shows that there are approximately 12 percentage points of previous year's error taking place in the current year. The immediate impact of the explanatory variables shows that, in one year, all-explanatory variables have negative impact on GDP per capita. These impacts were statistically significant for forest cover degradation and agriculture value-add. Hence, an increase in forest cover degradation and agriculture value-add will likely decrease GDP per capita by 21 percentage points and 28 percentage points, respectively

The results of the Granger causality test are summarized in Table 5.5 in order to provide an insight into the nature and direction of causality between income poverty and the variables of fish catch, government expenditure on ENR, agriculture value-add and gross capital formation.

The results of the Granger causality test in Table 5.5 show that there is a significant joint influence of all variables (fish catch, forest over degradation, government expenditure on

ENR, agriculture value-added and gross capital formation) on GDP per capita and income poverty. A unidirectional causality exists involving government expenditure and GDP per capita, fish and GDP per capita and gross capital formation and GDP per capita. There is also bidirectional causality between agriculture value-add and GDP per capita, forest cover degradation and GDP per capita and fish and GDP per capita.

The findings of the study have confirmed that the ENR sector is critical in propelling the growth of national income. Therefore, these findings strengthen the case for sustainable use of natural resources.

The study findings also show that government's expenditure on poverty-related ENR interventions is significantly improving incomes. Hence, the major thrust of ENR expenditures should not only aim to help the poor to better access the natural and environmental assets, but also increase the efficiency with which the assets are converted into broad-based well-being of the poor.

Table 5.5: Granger causality test based on VECM (Model I)

Variables →	ΔGDP per Capita	ΔFish catches	ΔForest Cover Degration	ΔGovt. Expend. On ENR	ΔAgric. Value added	ΔGross Capital Formation
Error corr. GDPPC	-	-0.05	-0.21*	-0.17	-0.28***	-0.09
Error corr. FISH	-0.03***	-	0.0599*	0.05	-0.08***	-0.03
Error corr. FCD	0.07***	0.02	-	-0.1	0.17***	0.05
Error Corr. Got Exp. ENR	0.05***	0.017	-0.0893*	-	0.12***	0.04
Error Corr. agric VAAG	-0.26***	-0.09	0.47*	0.39	-	-0.2
GCF	-0.000240***	-7.81E-05	0.000423*	0.000347	-0.000565***	-

Standard errors in parentheses; *** significant at 1%; ** at significant at 5%; *significant at 10%

5.2.2.2 Model II estimates-agricultural productivity and poverty nexus

The results of a VECM (Model II), which provide the main factors that influence agriculture productivity, are presented in **Table 5.6.**

Table 5.6: Factors that influence VAAG-agricultural productivity in Malawi (Long-Run Equation)

Variables	Coefficients
Constant	-19.99
Δ Agricultural expenditure	3.57 *** -0.66
Δ Access to credit	1.14 *** -0.29
Δ Consumer price index	-1.06 -0.28
Δ Crop production index	3.96 *** -1.018

Standard errors in parentheses; * significant at 1%; ** at significant at 5%; *significant at 10%**

The results that are summarized in Table 5.6 reveal that agriculture expenditure, credit to the private sector and crop production significantly influence agricultural productivity. Thus, a 1 percent increase in agriculture expenditure is likely to increase agricultural productivity by 3.6 percent; similarly, a 1 percent increase in access to credit is likely to increase agricultural productivity by 1.14 percent and a 1 percent increase in crop production is likely to increase agricultural productivity by 3.96 percent.

The results of the short-run error correction model, which provide an insight into how adjustments are made to short-run changes in variables and deviations from equilibrium, are indicated in **Table 5.7.**

The coefficient of speed of adjustment (error correction term) in Table 5.7 is significant in the short run. This shows that there is a 15.4 percentage point adjustment each year towards the long-run periods. Hence, agricultural productivity cannot be stabilized quickly once a shock is experienced in the agricultural system.

Table 5.7: Error correction model estimates of factors that influence agricultural productivity (Short-Run Equation-Model II)

Variables	(1) Agric. VA	(2) Agric. Exp.	(3) Credit	(4) Consumer Pr. Index	(5) Crops
Error Correction	-0.15***	-0.26***	-0.029	-0.02	-0.06
	-0.04	-0.05	-0.11	-0.05	-0.06
Agric. VA	-0.69***	-0.90***	1.29**	0.26	-0.24
	-0.21	-0.27	-0.56	-0.24	-0.3
Agric. Exp.	0.46***	0.72***	-0.5	-0.42**	0.26
	-0.17	-0.22	-0.44	-0.19	-0.24
Credit	0.18**	0.25**	-0.17	0.052	0.18*
	-0.07	-0.1	-0.2	-0.08	-0.11
Consumer Pr. Index	0.67***	0.70***	-1.64***	0.60***	0.55***
	-0.14	-0.19	-0.39	-0.17	-0.21
Crops	-0.50***	-0.74***	0.28	-0.01	-0.57**
	-0.18	-0.24	-0.48	-0.2	-0.26
Constant	0.02	0.015	0.22**	0.05	0.01
	-0.03	-0.04	-0.089	-0.04	-0.05
Observations	32	32	32	32	32

Standard errors in parentheses; *** significant at 1%; ** at significant at 5%; *significant at 10%

The results of the Granger causality test are summarized in Table 5.8 to identify the direction of causality among variables of agriculture value-add, agriculture expenditure, access to credit, consumer price index and crop production.

Table 5.8: Results of Granger causality test (Model II)

Variables	(1) Agric. VA	(2) Agric. Exp.	(3) Credit	(4) Consumer Pr. Index	(5) Crops
Agric. VA	-	-0.91***	1.29**	0.26	-0.24
Agric. Exp.	0.46***	-	-0.5	-0.42**	0.26
Credit	0.18**	0.25**	-	0.05	0.18*
Consumer Pr. Index	0.67***	0.70***	-1.64***	-	0.55***
Crops	-0.49***	-0.75***	0.28	-0.01	-

Standard errors in parentheses; *** significant at 1%; ** at significant at 5%; *significant at 10%

The results of Granger causality generated by VECM show that all four variables (agriculture expenditure, access to credit, consumer price index and crop production) jointly influence agriculture value-added. A bidirectional causality can be seen between agriculture expenditure and agriculture value-added, access to credit and agriculture value-added. The unidirectional causality is established between consumer price index and agriculture value-added and crop production and agriculture value-added.

The analysis of the macro-level productivity and environment and natural resource linkages shows that government investments (expenditure) on ENR significantly affect agriculture productivity in the short and long runs. These findings strengthen the case for improved of market access in promoting agricultural production and productivity of various commodities.

5.2.2.3 Model III estimates-factors affecting food security and ENR nexus in Malawi

The VECM has produced long-run estimates of the food security equation, which are presented in Table 5.9.

Table 5.9: Factors that influence food security in Malawi (Long-Run Equation: Model III)

Variables	Coefficient
Constant	-35.2
Agriculture value-added per worker	4.78 ** -2.38
Land farmed	2.33 *** -4.03
Govt. expenditure on ENR	2.01*** -0.38

Standard errors in parentheses; *** significant at 1%; ** at significant at 5%; *significant at 10%

The long-run estimates of the VECM in Table 5.9 reveal that the expenditure on ENR, land under cultivation and agriculture value-add per worker are quite important in sustaining food security in Malawi. In particular, the coefficient of land farmed shows that a one percent increase in land farmed would increase food production by 2.3 percent.

The short-run dynamics for food security are explored through a VECM, whose results are captured in Table 5.10. The results in Table 5.10 show that a 6.7 percentage point adjustment takes place each year towards the long-term target. The immediate impact of this adjustment on the explanatory variables is that the previous year's production, agriculture value-added and government expenditure on ENR have a negative impact on crop production.

Table 5.10: Error correction model estimates of factors that influence food security (Short-Run Equation-Model III)

Variables	(1) Crop production	(2) Agri. VA	(3) Land farmed	(4) Gov. Exp. ENR
Adj. factor.	-0.07	-0.04**	-0.03***	0.016
	-0.04	-0.02	-0.01	-0.06
Past year Crop prod'n	-0.16	-0.14	-0.11**	-0.36
	-0.27	-0.1	-0.05	-0.36
Agri. VA	-1.12*	-0.19	0.25*	0.65
	-0.66	-0.25	-0.13	-0.87
Land farmed	1.38*	0.51*	-0.05	-0.6
	-0.77	-0.29	-0.149	-1.016
LD.LGEXENR	-0.12	0.01	-0.10***	0.03
	-0.18	-0.07	-0.03	-0.27
Constant	0.04	0.01	0.03**	0.25***
	-0.06	-0.02	-0.01	-0.08
Observations	32	32	32	32

Standard errors in parentheses; *** significant at 1%; ** at significant at 5%; *significant at 10%

Granger causality test (Model III)

The presence of co-integration vector shows that there must exist a Granger causality in at least one direction. The VECM estimates of the coefficients are presented in Table 5.11. The model has associated changes in the food production to the change with the other lagged variables.

Table 5.11: Granger causality test (Model III)

Variables	(1) Crop prod'n	(2) Agri. VA	(3) Land farmed	(4) Gov. Exp. ENR
Crop production	-	-0.14	-0.10**	-0.36
Agri. VA	-1.12*	-	0.25*	0.65
Land farmed	1.38*	0.51*	-	-0.6
Gov. Exp. ENR	-0.12	0.01	-0.09***	-

Standard errors in parentheses; * significant at 1%; ** at significant at 5%; *significant at 10%**

From Table 5.11, the Granger causality generated by the VECM shows that there is a statistically significant dual causality between agriculture value-added and food production and land under crop cultivation and crop production.

The analysis of the national food security impacts of environment and natural resources reveal that land farmed has a significant impact on food security. In addition, the findings show that public investments in the environment and natural resources sector have long-run positive food security impacts, with a 1 percent increase in public investment in the environment and natural resources sector resulting in 2.01 percent increase in national food security. Hence, prompt action should be taken to improve the productivity of the available agricultural land.

5.2.2.4 Model IV estimates-factors affecting health and ENR nexus in Malawi

The model estimates in Table 5.12 generated by the VECM to identify the significance and impact of the government expenditure on health, improved access to water services and improved access to sanitation facilities on under-five deaths. The result of VECM in Table 5.12 shows that all three variables significantly contribute to the reduction in under-five deaths.

Table 5.12: Factors that influence health in Malawi (Long-Run Equation=Model IV)

Variable	Coefficients
Constant	0.062
Government Expenditure on Health	-0.27* -0.05
Improved Access to Water Services	-0.64** -2.06
Improved Access to Sanitation Services	-2.81* -2.96

Standard errors in parentheses; *** significant at 1%; ** at significant at 5%; *significant at 10%

The VECM estimates of the coefficients in Table 5.13 are short-run dynamic behaviour of the variables that are now dependent variables. The model has also associated changes in under-five deaths to the change with the other lagged variables. The coefficient of the speed of adjustment indicates that, although a change of only 2 percentage points adjustment takes place every year towards the long-run targets, increased government expenditure on health and improved access to water would reduce the number of under-five deaths.

Table 5.13: Error correction model estimates of factors that influence health (Short-Run Equation-Model IV)

Variables	(1) Under-five deaths	(2) Health Exp.	(3) Access to Water	(4) Sanitation
Adjustment Coeff.	-0.02 -0.02	-0.92*** -0.88	-0.05** -0.02	0.01 -0.01
Under-five deaths	0.96*** -0.08	6.54* -3.55	-0.12 -0.1	0.10*** -0.03
Health Exp.	-0.01 -0.01	0.08 -0.17	0.01 -0.01	-0.01 -0.01
Access to Water	-0.26* -0.13	-11.01* -5.98	0.08 -0.17	0.13*** -0.04
Sanitation	0.06 -0.57	-77.78*** -25.54	1.09 -0.71	0.042 -0.18
Constant	0.01 -0.01	-4.10E-05 -0.204	0.01 -0.01	0.02*** -0.01
Observations	31	31	31	31

Standard errors in parentheses; *** significant at 1%; ** at significant at 5%; *significant at 10%

The study also established the causal direction of the health model. The VECM Granger coefficients are summarized in Table 5.14 and indicate that there is a statistically significant bidirectional causality between health expenditure and under-five deaths, improved access to sanitation facilities and under-five deaths.

Table 5.14: Granger causality test (Model IV)

Variables	(1) Under-five deaths	(2) Health Exp.	(3) Access to Water	(4) Sanitation
Under-five deaths	-	6.538*	-0.12	0.104***
Health Exp.	-0.0019	-	0.00444	-0.00156
Under-five deaths	-0.260*	-11.01*	-	-
Sanitation	0.0562	-77.78***	1.091	0.0422

Standard errors in parentheses; *** significant at 1%; ** at significant at 5%; *significant at 10%

The study results show that improved access to clean water and sanitation will likely improve health outcomes. The analysis further reveals that access to potable water is the major significant driver of improvement in national health outcomes, namely reduction in under-five mortality rates. However, in the long run, besides access to water, the other drivers of improved national health conditions include government expenditure in the health sector and access to sanitation facilities. The findings also show that access to water has greater impacts in the long run (-2.8%) than in short run (-0.26%). From the literature review, we observed that many environment health diseases are preventable or treatable, but people living in poverty are often unable to access and pay for basic health care and medicines. Because a range of factors determines health, preventative health interventions and activities need to be integrated into holistic national and community development programmes.

5.2.2.5 Model V estimates-factors affecting access to water and ENR nexus in Malawi

The VECM long-run estimates of the coefficients of the key variables that influence access to water have been summarized in Table 5.15. The results in Table 5.15 show that, in the long run, a 1 percent increase in government expenditure on ENR and GDP per capita improves access to water by 25 percent and 3 percent, respectively, while a 1 percent increase in population and forest cover degradation is likely to decrease access to improved water supply services by 1.2 percent and 2.3 percent, respectively. Further research is needed to identify the specific economic connections between forests and drinking water based on the available science. This research can be used to: a) put advance planning for water supply and forest conservation at the forefront of community issues; b) make the case for forest conservation to protect drinking water; c) encourage the use of incentives for forest conservation and tree planting that are more reflective of their true value; and d) factor in the costs of drinking water supply and treatment when evaluating development alternatives.

Table 5.15: Factors that influence improved access to water supply services in Malawi (Long-Run Equation=Model V)

Variables	Coefficient
Constant	8.39
Government expenditure on ENR	0.05**
	-0.02
GDPP per capita	0.31
	-0.19
Forest cover degradation	-0.43***
	-0.08
Population	-0.79***
	-0.18

Standard errors in parentheses; *** significant at 1%; ** at significant at 5%; *significant at 10%

The short-run VECM estimates in Table 5.16 shows that a 9.33 percentage point adjustment is accomplished each year towards the long-run target. In the process, the immediate impact on the other variables reveals a negative influence from all variables.

Investigation into the determinants of national access to potable water show that government expenditure in the environment and natural resources sector is having the desired positive impacts. However, as expected, forest cover degradation is having significant negative impacts, with a 1 percent increase in forest cover degradation producing a 0.432 percent reduction in national access to potable water. This confirms the negative effects of forest degradation on the ecosystem and ecosystem services.

Table 5.16: Error correction model estimates of factors that influence water supply services (Short-Run Equation-Model V)

Variables	(1) Access to water	(2) Govt. ENR Expenditure	(3) GDP per capita	(4) Forest cover degradation	(5) Population
Adjustment Coeff.	-0.09***	0.21	-0.24***	0.46	0.04***
	-0.03	-0.8	-0.08	-0.51	-0.01
Access to water	-0.09	1.19	-1.32***	1.79	0.01
	-0.2	-4.84	-0.49	-3.11	-0.06
Govt. ENR Exp.	-0.01	-0.22	-0.02	0.1	0.014
	-0.01	-0.22	-0.02	-0.14	-0.01
GDP per capita	-0.04	-0.11	-0.24	-0.92	0.04*
	-0.06	-1.51	-0.15	-0.97	-0.02
Forest cover deg.	-0.02	0.17	0.04	-0.33	0.01**
	-0.02	-0.38	-0.04	-0.24	-0.01
Population	-0.19	-6.93	-1.56***	0.99	0.87***
	-0.24	-5.6	-0.57	-3.61	-0.07
Constant	0.05***	0.43	0.12**	-0.13	-0.01
	-0.01	-0.29	-0.02	-0.19	-0.01

Standard errors in parentheses; *** significant at 1%; ** at significant at 5%; *significant at 10%

Table 5.17: Granger causality test (Model V)

Variables	(1) Access to water	(2) Govt. ENR Expenditure	(3) GDP per capita	(4) Forest cover degradation	(5) Population
L._ce1	-0.09***	0.21	-0.24***	0.46	0.04***
Govt. ENR Exp.	-0.01	-0.22	-0.015	0.11	0.01
GDP per capita	-0.04	-0.11	-0.24	-0.92	0.04*
Forest cover deg.	-0.02	0.18	0.04	-0.33	0.01**
Population	-0.19	-6.93	-1.55***	0.99	0.87***

Standard errors in parentheses; *** significant at 1%; ** at significant at 5%; *significant at 10%

5.3 Benefit-cost analyses of ENR interventions

A number of studies have shown that unsustainable ENR use is usurping Malawi's growth prospects. A total of 5.3 percent of GDP is lost annually comprising: i) soil loss at 1.9 percent; ii) loss of forestry resources at 2.4 percent; loss of fisheries resources at 0.86 percent; and loss of wildlife at 0.1 percent (Yaron et al., 2011). In other words, the country is losing US$196.4 million based on 2013 GDP at current US dollars. Looked at differently, this is income foregone if we do not invest in ENR and continue with the current stance in the governance of the ENR sector. To provide further examples of empirical benefit cost analyses, this study analyses the country's two major ENR projects: the Forestry Income Generation Public Works Programme (IGPWP) and the public-private sector partnership on capacity-building for sustainable land management (SLM) in the Shire Valley Basin. The projects have been chosen as examples as they can provide practical demonstration of national benefits of sustainable ENR use because of their national importance.

5.3.1 Forestry income generation public works programme

The report first considered the study done by Yaron et al. (2010) on the Forestry Income Generation Public Works Programme (IGPWP). The IGPWP aims at reducing poverty by increasing local production of fuelwood, timber and poles through community woodlots and those on own farms. The assumptions made by Yaron et al. (2010) were maintained with slight modifications as follows:

I. The team used the data from the completed phase one project of the EU-funded IGPWP.

II. There is an incentive per club member of US$10 to grow 858 trees that would, at the end of five years, supply a family of five with 2.5 years of fuelwood, assuming that they all survive and that there are no forest fires.

III. It is further assumed that, as the trees coppice after the first harvest, they will provide half of their fuelwood requirements for the rest of their lives again, assuming that no forestry fire occurrences. Private benefits include labour savings on account of avoided wood gathering, estimated at US$80 spread over five years, after the trees are harvested in year five and own-use or sale of poles estimated at US$0.43 per pole. A further assumption is that there is a 50:50 split between firewood use and the utilization of trees as poles.

IV. Externalities for the unsustainable use of resources were captured. However, because historical loss of forest cover has been so extensive, the impact on offsite benefits was considered modest and only a US$3.3 per year per club member was estimated.

V. The imputed time spent for project activities per club member was estimated at US$13 over two years.

The benefit-cost analyses are undertaken using two discount rates, namely, a 4 percent discount rate reflecting the rate at which donor funds are sourced and a 12 percent discount rate that is the official Malawi Government discount rate to calculate the Net Present Value (NPV). Using the discount rate of 4 percent, the analysis finds the economic net present value to be US$12.4 million, whilst using the official discount rate at 12 percent gives an economic Net Present Value of $5.3 million. An Economic Internal Rate of Return (EIRR) of 62 percent was also established (see Table A.2.1 in the Annex). The analysis excluded social benefits to arrive at how private individuals would assess project worth.

5.3.1.1 Sensitivity analysis for the IGPWP

The sensitivity analysis results are presented in the Table 5.18 below.[10] An increase in the discount rate from 4 percent to 20 percent shows that the project is still viable. A 10 percent increase in costs reduces the EIRR to 60 percent and the NPV to $10.5 million. Again, a reduction of 10 percent in private benefits shows similar robustness. However, the sensitivity analysis showed that, as a private project, this is a marginal project, with the NPV turning negative when project costs go up by 10 percent or when project benefits decline by 10 percent. This means that the project should provide additional livelihood opportunities, such as bee keeping, to go along with afforestation to make the project more attractive.

Table 5.18: NPV Sensitivity to various discount rates for IGPW Project (US$ million)

RATE	4%	12%	15%	20%	30%	35%
NPV	$12.4	$5.3	$4.03	$2.61	$1.19	$0.53

[10] See Annex Tables A.2 for further details, including detailed sensitivity analyses.

5.3.1.2 Risk analysis for IGPWP

One of the major risks for project success is the survival rate of the tree seedlings. According to stakeholder consultations, survival rate is affected by rainfall patterns and the timing of tree planting programmes. Another factor is forest fires, which have a devastating effect on young plants or when the trees are coppicing after harvest. The latter can be addressed by giving communities or individual farmers a sense of ownership of the woodlots. Early planting would also ensure sufficient root formation to survive erratic rain patterns or bush fires.

5.3.2 Public-private sector partnership on capacity-building for sustainable land management (SLM) in the Shire Valley Basin

The study also analysed the benefits of sustainable land resources management with respect to the Shire River Basin. It is estimated that the basin sits on 689,300 hectares. However, land degradation in the Shire River Basin has reduced the productivity of the land. The low-lying areas are prone to flooding, which drives people into dire poverty. The cost of treating water during the rainy season increases eight to 10 times due to siltation and sediment loads and weed infestation. The cost of generating power increases during the wet season for similar reasons.

In our estimation of the costs and benefits, the team has drawn from the work done by Yaron et al. (2010) and the Public-Private Sector Partnership on Capacity-Building for Sustainable Land Management in the Shire Valley Basin – Project Document – 2010. According to the latter, the Electricity Supply Commission of Malawi (ESCOM) spends US$959,615 per annum on maintenance occasioned with unsustainable ENR activities. Due to load shedding especially during the rainy season also occasioned by similar factors, the company foregoes US$1,159,784 in lost revenue. Based on the constraints analysis by the Millennium Challenge Corporation, the Yaron et al. (2010) team estimated lost productivity of US$8.4 million due to similar factors.

The above are benefits if the country invested in ENRM activities. According to Yaron et al. (2010), the costs to achieve that are as follows: investment costs per hectare would be US$42/ha and labour costs would be US$32.3/ha in the first year, then dropping to US$4/ha per annum. Based on previous practice, government will need to invest an amount equivalent to 5 percent of the total investment costs, which amounts to about US$1.4 million per annum. It is not enough to invest, but sustainability is important. This, by implication, also requires an additional budgetary allocation for research and extension activities in land resources management.

5.3.2.1 Sensitivity analysis for the SLMP

As was the case with the IGPWP, the study undertook a sensitivity analysis of NPVs for the Sustainable Land Management Project (SLMP) involving different discount rates. Analysis results are below.

Table 5.19: NPV sensitivity to various discount rates for SLM Project (US$ million)

RATE	4%	12%	15%	20%	30%	35%
NPV	$159.5	$63	$44.3	$24.1	$2.78	-$3.0

The benefit-cost analysis shows that, if government invested in land resources management in the Shire River Basin and followed this up with an annual allocation of 5 percent of the initial investment as ORT, the nation, including its farmers, would yield an EIRR of 32 percent and a net present value of US$159.5 million using the discount rate of 4 percent. A sensitivity analysis shows that the project is robust from the social point of view. The above table shows that the project remains robust even when the discount rate is raised to 20 percent. A 10 percent increase in project costs reduces the NPV to US$105.5 million and an EIRR of 30 percent. A 10 percent reduction in private benefits yields similar results. An increase in the discount rate from 12 percent to 20 percent reduces the NPV from $63 million to US$24.1 million, which shows the robustness of the project as per the above table.

As with the previous project, the team considered project worth from a private individual's point of view by removing social benefits and applying a commercial discount rate of 42 percent. The results show a negative net present value of US$24.6 million and an internal rate of return of 12 percent. This implies that, in order to attract farmers in sustainable land management activities, they will need to be incentivized. At the same time, the returns from the social point of view are enormous, as government will be able to address such issues as siltation and sediment loads, which affect power generation and water treatment as well as the fisheries sector. Even the flooding that the country experiences could partially be addressed by sustainable land management activities.

The government therefore needs to address the lack of interest in SLM, especially from the private analysis point of view, which shows negative EIRR by redesigning the FISP as an incentive to support SLM among other ENRM programmes

5.3.3 Synthesis of benefit-cost analyses (BCA)

A combination or a hybrid of SLM and IGPWP could yield significant results and could incentivize Malawians to engage in sustainable ENR activities whilst reducing poverty. Discussions with stakeholders indicate that tree planting and sustainable land management do have potentials for private benefits, but suffer from forest fires and other unsustainable ENR use practices that affect the survival of the seedlings thus limiting their contributions to poverty reduction IEC is important for the success of the tree-planting programmes.

These two projects could also be promoted in areas devastated by biomass and land use overexploitation, if government implements policies and enforces the legal frameworks on sustainable ENR use. Despite the intents and purposes of the national policy frameworks such as the National Energy Policy, the National Environmental Policy, the National Land Policy and others, use of ENRs such as biomass and charcoal for energy continue since most ENR product value chain operators have no viable alternative income sources.

5.4 Summary of the key findings at macro-level analyses

The macro-level econometric results as well as the benefit-cost analyses show that ENRs are quite important drivers of national development, economic growth and poverty reduction. The key findings of the macro-level analyses are:

1. Forest cover degradation leads to a decrease in GDP. The study results show that a 1 percent (317 sq km) increase in forest cover degradation in the long run is likely to reduce GDP per capita by 0.6 percent (US$1.5). In monetary terms, this translates to a loss in income of nearly US$24 million a year. This means that degradation of the forest resources is having negative impacts on national income poverty; hence, there is a need for sustainable utilization of the forestry resources.

2. Public investments in the ENR sector yield significant national growth outcomes. For instance, the findings show that a 1 percent increase in expenditure in the ENR sector leads to a 0.43 percent increase in per capita GDP. In quantitative terms, this entails that, for every US$300,000 increase in ENR expenditure, there is an additional increase in GDP per capita of US$1.1 or an additional increase in overall GDP by US$17 million based on a population of 15 million individuals.

3. The agriculture sector remains central for Malawi's national growth and poverty reduction outcomes. Investigations into the linkages between the agriculture sector and national income per capita growth show that, in the long run, positive changes in the agriculture value-added have significant positive poverty reduction effects. This is evidenced by the fact that a 1 percent (US$1,000,000) increase in agriculture value-added will likely increase GDP per capita by 2.3 percent (US$6) or GDP increase of US$90 million.

4. The ENR sector has significant implications for national productivity outcomes. Inquiries into the macro-level productivity and ENR linkages show that government investments (expenditure) are the main drivers of agriculture value-added in the short and long runs. For instance, the findings show that, in the short run, a 1 percent (US$2 million) increase in public expenditure in the agriculture sector results in a 0.46 percent (US$500,000) increase in agriculture value-added, whereas, in the long run, a 1 percent (US$2 million) increase in agriculture expenditure leads to a 3.57 percent (US$24 million) increase in agriculture value-added. This means that sustained public investments in the agricultural sector are important for sustained growth in agricultural productivity.

5. In addition to productivity impacts of public expenditure, the analysis results show that short-run positive impacts of commodity price changes have positive productivity impacts. As such, a 1 percent increase in consumer price index results in a 0.67 percent (0.2 t/ha) increase in national crop productivity. Such findings confirm the importance of market prices in providing incentives for the production of various agricultural commodities. Hence, government should avoid interventions that distort market prices of agricultural commodities.

6. The ENR sector contributes to national food security. The macro-level investigations into the national food security impacts of ENR reveal differences in the extent of short and long-run impacts. The study findings show that public investments in

the ENR sector have long-run positive food security impacts, with a 1 percent (US$300,000) increase in public investment in the ENR sector resulting in a 2.01 percent (280,000 tonnes) improvement in national food security. In the short run, no significant relationships were observed. Furthermore, farmed land has a significant food security impacts in the short run.

7. Access to clean water has positive short- and long-term health impacts, including reduction in infant mortality. Of the two time periods, the findings show that a 1 percent (150,000 people) increase of access to clean water has greater impacts in the short run (-0.26 percent, or one death) than in the long run (-2.8 percent, or two deaths).

8. Government expenditure in the ENR sector is achieving the desired effect of increasing the number of people accessing clean water. However, as expected, forest cover degradation is having significant negative impacts: a 1 percent (317 square km) increase in forest cover degradation results in a 0.432 percent (100,000 people) reduction in national access to potable water. This shows that forest disturbance, caused by nature (e.g., wildfire, insects, disease, windstorms, drought) and humans (e.g., timber harvesting, land conversion), can have a profound effect on hydrologic and ecologic processes. Therefore, the GoM is encouraged to explore a number of different forest management options.

9. From benefit-costs analyses, it is apparent that ENR investments yield significant results and incentivize communities to engage in sustainable ENR activities whilst reducing poverty. The results further show that, for ENR investments to realize their objectives, there is need for effective implementation of ENR policies.

6. SUSTAINABLE PATHWAYS FOR POVERTY REDUCTION: EMPIRICAL FINDINGS FROM MICRO-LEVEL ANALYSES

This chapter focuses on empirical analyses of the poverty-ENR interactions at the household level, covering the different dimensions of poverty such as income, productivity, food security, health and access to water. The analysis also examines a range of social, economic and institutional characteristics that cause poverty and influence the capacity to escape poverty. Of particular interest were household participation and involvement in the following activities:

- Promotion of village or community woodlots
- Sustainable management of water catchment areas
- Sustainable management of river banks
- Management and protection of water resources such as fish
- Protection of protected areas such as national parks and forest areas
- Individual and community forest nursery management
- Re-afforestation of individual or household lands
- Land resource conservation in form of conservation agriculture technologies such as manure making and application in farms, amongst others.

The key research questions in this study are:

i) What factors account for the variation in the community-level poverty-ENR nexus across rural or urban households?

ii) Does the relationship among household-specific, community and institutional variables differ?

iii) What are the potential poverty-ENR impacts of investment/changes in some of the institutional or community-related factors that influence poverty?

The analyses of the poverty-ENR nexus at the household level are based on three-year panel data for the years 2011/2012, 2012/2013 and 2013/2014 collected from 801 households during a household survey conducted in 10 disaster-prone districts of the country during December 2014 and January 2015. Data was collected for the following variables: stocks of ENRs available in different villages being utilized by households; household participation in ENR management interventions; household demographics; household crop production; land ownership and use; access to credit; household incomes and expenditures; health conditions; amongst others.

Two major empirical tools have been employed in examining the household poverty-ENR nexus:

- Descriptive and statistical analysis of the poverty-ENR nexus at the household level. The analysis covers social economic status, productivity, income and other variables including gender and household location.

- Unbalanced panel data econometric analyses, as espoused by Baltagi (2013), were employed to establish the poverty-ENR[11] nexus by controlling for all relevant social, economic and institutional factors.

The next section presents an overview of household sample characteristics, including descriptive statistics such as means, standard deviations and minimum and maximum values of the key variables.

6.1 Characteristics of the sampled households

The characteristics of the sampled households were mapped in order to establish whether the households are representative of standard Malawian households in terms of socio-economic characteristics as defined in previous studies (Integrated Household Survey, 2012; Integrated Household Panel Survey, 2014)[12]. Tables 6.1 and 6.2, provide the summary statistics that demonstrate the household sample characteristics.

Table 6.1 shows significant variations across the sampled households in terms of income earnings from agriculture, environment and natural resources as well as total annual household income. The data show that, while some households over the three-year period earned millions of Malawi Kwacha from different sources (including ENRs), others earned nothing and thus were forced to rely on remittances and other support mechanisms. From the discussions with the communities, negative annual income earnings are usually a result of shocks from social or natural disasters. Significantly, incomes from agricultural activities and ENRs are similar: MK41,930 and MK38,683, respectively.

Table 6.1: Broad characteristics of the sampled households

Variables	Observations [13]	Mean	St dev	Minimum	Maximum
Outcome variables					
Total agricultural incomes (MK)	2,403	41,930	145,751	-	2,160,000
Net Environ & Natural Resource incomes (MK)	2,403	38,683	196,766	-	6,500,000
Net Total hhold income (MK)	2,403	236,210	656,331	-	14,617,000
Productivity (Maize yield- kg/ha)	2,179	1,444	2,453	12.25	83,303
Food Production (maize production in kg)	2,403	635	1,065	-	20,000

With respect to productivity, the study shows that the sampled households had a lower maize productivity at 1.44 t/ha, compared to 2.2 t/ha as reported in the Government Agricultural Production Estimates (Ministry of Agriculture, 2013).[14] The study findings corroborate those of the National Statistical Office (2014), which show that national maize productivity per ha of cultivated land marginally increased between 2010 and 2013 from 1.345 t/ha to 1.466 t/ha. However, it is encouraging that some households are able to achieve yields of up to over 8.3 t/ha, which is close to the potential yields of 10.0 t/ha (Ministry of Agriculture and Food Security, Guide to Agriculture Production and Natural Resource Management, 2010).

[11] The use of unbalanced panel data estimation techniques is necessitated by the fact that, in certain instances, households could not recall all data for the three-year period on the key variables of interest, while some households were new and thus did not have all three-year period data; others have shifted from certain activities and thus do not provide a full three-year panel data set.
[12] The net income figures reported in the table were computed by subtracting the total household annual income earnings from the total cost of investments to earn the reported incomes.
[13] The observations refer to the number of households multiplied by three years, since this is a three-year panel data.
[14] The low average household productivity for the study-sampled households could be due to the fact that the study focused on disaster-prone villages with ENR management programmes in the 10 disaster-prone districts.

The poverty outcomes reported in Table 6.1 are driven by a number of factors. Table 6.2 presents the patterns of the key explanatory variables. These variables are key determinants of household multidimensional poverty levels as well as environmental and natural resource utilization and/or degradation. The data set comprises continuous and binary variables. In broad terms, the main uses of forestry (trees and grass) include domestic use, food source, income, housing and agricultural production, with the most common use of forestry being domestic use, followed by housing, and the least common use being agriculture (Table A5 in the Annex). This information is also disaggregated by region. In the last three years, on average, forest use was highest (49 percent) in the south, followed by the centre (32 percent) and the north (20 percent).

Table 6.2: Descriptive statistics on poverty and ENR driving factors

Variable	Observations	Mean	St dev	Minimum	Maximum
Explanatory Variables					
Gender of household head (male=1; female=0)	2,403	0.79	0.4	0	1
Years of education for household head	2,136	6.8	3.18	1	25
Age of household head (years)	2,345	41.28	14.33	16	87
Household size	2,403	5.19	2.27	1	15
Total land area owned by hhold	2,190	0.84	0.82	0.02	12.2
Total amount of fertilizer utilized by hhold (kg)	1,985	85.59	108	1	2,000
Major types of soil found in the household garden[15]	2,193	1.99	1.4	1	5
Household keeps livestock (Yes=1; No=0)	801	0.64	0.48	0	1
Household access to credit (MK)	2,403	128,000	43,578.53	0	1,450,000
Distance to health centre (km)	798	5.56	3.4	0.1	30
Household participates in ENR programmes, e.g., afforestation (Yes=1; No=0)	1,378	0.63	0.48	0	1
Presence of an NGO in a village promoting ENR issues (Yes=1; No=0)	1,381	0.67	0.47	0	1
Household found in Village located in rural or peri-urban area of a district (Rural=1; Peri-urban=0)	2,403	0.75	0.43	0	1
Maize market selling price (MK/kg)	2,394	62	46.33	0	233
Distance to the market for agric produce sales (km)	2.39	226.92	7757.77	0	250
Household has had access to FISP	2,254	0.66	0.47	0	1

These variables include: gender of household head, years of education for household head, age of household head, household size, land area owned, major soil types in the gardens, presence of an NGO/project promoting ENR activities in the village, location of the village (rural or peri-urban), maize selling price, distance to the market and household access to FISP inputs. The average age was reported to be 41 years; average length of education was 6.8 years. The household size was 5.2, while average land owned was 0.83 hectares. These statistics compare very well with other sources of data such as IHS. The amount of fertilizer used was 85.6 kg/ha. The average amount of credit was reported as MK7,537, while distance to the nearest health centre was 5.6 kilometres.

Table 6.3 presents access to credit for rural and peri-urban households segregated for male- and female-headed households. On average, female-headed households had higher mean credit values than male-headed households. The average credit was estimated at MK145,000 and MK124,000 for peri-urban women and men, respectively. Detailed statistics are presented in Annex A3.

Table 6.3: Access to credit in rural and peri-urban areas

Location	Gender – head of household	Mean credit (Mk)	Number of respondents
Rural villages	Female	108,000	22
	Male	45,000	157
Peri-urban villages	Female	145,000	14
	Male	124,000	54
Total sample	Female	122,000	36
	Male	65,000	211

Table 6.4 presents major soil types as defined in the study and include: clay or sandy clay; alluvial soils; grey water-logged soils; shallow stony soils; dark brown soils. Major dominant soil types were reported to be clay sandy soil (60.6 percent). Shallow soils were second (17.4 percent); grey water-logged soils were least.

Table 6.4: Major soil type affecting crop production in the study area –2013/2014

Soil Type	Frequency	%	Valid %	Cumulative %
Clay or sandy clay	453	56.6	60.6	60.6
Alluvial soils	86	10.7	11.5	72.2
Grey water-logged soils	27	3.4	3.6	75.8
Shallow stony soils	130	16.2	17.4	93.2
Dark brown fertile soils	51	6.4	6.8	100
Total	747	93.3	100	
Missing data	54	6.7		
Total	**801**	**100**		

Table 6.5 presents maize yield from the different soil types for the year 2013/2014. The highest mean yield, from dark brown soils, was 1,804 kg/ha. The least mean yield, from grey water-logged soils, was 1,436 kg/ha.

Table 6.5: Maize yields (kg/ha) on the major soil types for the 2013/2014 season

Soil type	N	Mean	Median	Minimum	Maximum	Std. Deviation
Clay or sandy clay	446	1687.0154	1125	75	83303	4183.74636
Alluvial soils	79	1565.2943	1125	180	16250	2487.88525
Grey water-logged soils	27	1436.2963	1250	375	5000	1012.54701
Shallow stony soils	126	1655.7643	1068.75	75	10500	1702.52377
Dark brown fertile soils	50	1804.14	1425	250	6250	1339.82806
Total	**728**	**1667.1434**	**1125**	**75**	**83303**	**3469.71156**

Tables 6.6 (a) and (b) present crop production and ENR management programmes participation trends. The analysis was done because crop production constitutes the main livelihood of households in Malawi, as established in other studies such as the Integrated Household Surveys by the National Statistical Office (2014). In addition, household participation in ENR management programmes is of particular interest because it seeks to establish the extent to which households respond to the various ENR management programmes being promoted by government through projects such as IGPWP and SLMP and NGOs.

Table 6.6(a) shows that 94.7 percent of households used land for crop production activities, which compares well with NSO (2014) findings showing that 94.9 percent of rural households participate in agriculture activities, particularly maize production.

Table 6.6(a): Household participation in crop production activities in 2011/2012, 2012/2013 and 2013/2014

Gender of household head	Household participated in crop production activities		
	Yes	No	Total
Male responses	1,829 (76.2%)	77 (3.2%)	1,906 (79.4%)
Female responses	445 (18.5%)	50 (2.1%)	495 (20.6%)
Total responses	**2,274 (94.7%)**	**127 (5.3%)**	**2,401 (100.0%)**

Table 6.6(b) shows that 68% of the sampled households participate in ENR management programmes being promoted at grassroots level.[15] Of the 68%, 55% are male and 12% are female.[16]

[15] We could not compare this with the NSO Integrated Household Surveys findings because they are incorporated in such analyses.

[16] Figures may not add up to the exact totals due to rounding up

Table 6.6(b): Household participation in any ENR management programmes in 2011/2012, 2012/2013 and 2013/2014

Gender of household head	Household participated in ENR management programmes		
	Yes	No	Total
Male responses	1,156 (55.4%)	507 (24.3%)	1,663 (79.7%)
Female responses	253 (12.1%)	170 (8.1%)	423 (20.3%)
Total responses	**1,409 (67.5%)**	**677 (32.5%)**	**2,086 (100.0%)**

Table 6.7 presents levels of household participation in environmental management programmes. On average, 65 percent of households participate in environmental management programmes. Participation in forest programmes shows the highest proportion (68 percent), while participation in natural water fisheries is second (66 percent) and participation in wildlife is least (59 percent).

Table 6.7: Participation in environmental management programmes

		2011/2012		2012/2013		2013/2014		Average	
		Frequency	%	Frequency	%	Frequency	%	Frequency	%
Rivers and lakes	Yes	290	62.8	293	61.9	294	64.8	292	63
	No	171	37	180	38.1	160	35.2	170	37
Forestry (trees and grass)	Yes	463	68	424	68.2	428	67.6	438	68
	No	216	31.7	221	31.8	229	32.4	222	32
Forestry products	Yes	147	67.7	184	67.5	162	67.5	164	68
	No	70	32.3	74	32.5	78	32.5	74	32
Wildlife	Yes	18	64.3	24	60	25	52.1	22	59
	No	10	35.7	16	40	23	47.1	16	41
Freshwater fish	Yes	95	66.9	97	66	95	64.6	96	66
	No	46	32.4	49	33.3	51	34.6	49	33
Average (people taking part in environmental management programmes)	Yes	203	66	204	65	201	63	203	65
	No	103	34	108	35	108	36	106	35

6.2 Descriptive analyses

6.2.1 Household income patterns

Household income is used as a proxy indicator for household income poverty levels and the study examines the income levels of the sampled households over a three-year period from 2011/2012 to 2013/2014. In this respect, the analysis compares the share income earnings from the three major income sources, namely, ENR product sales (e.g., honey and mushrooms), agricultural produce sales and non-farm activities such as small-scale businesses. Table 6.8(a) provides the breakdown of household income compositions.

Table 6.8(a): Share of household income from different sources

Year	ENR Income share		Agriculture Income share		Non-Farm Income share, e.g., Businesses	
	Mean	Std	Mean	Std	Mean	Std
2013/2014	0.18	0.3	0.19	0.29	0.64	0.36
2012/2013	0.18	0.31	0.18	0.29	0.64	0.37
2011/2012	0.18	0.31	0.13	0.27	0.69	0.37
Total	**0.18**	**0.31**	**0.17**	**0.28**	**0.65**	**0.37**

Table 6.8(a) shows that, for the sampled 801 households in the 10 disaster-prone districts, income from non-farm activities constitutes the largest income share (about 65 percent), followed by income from ENR products (18 percent) and agricultural produce (17 percent). This implies that ENR products such as charcoal, fuelwood, wild honey, fruits and mushrooms are important sources of household livelihoods in the sampled districts. This confirms findings from different studies in different countries. Vedeld et al. (2004) found that approximately 22 percent of household income could be attributed to forests and that environmental incomes contributed to 32 percent of the incomes of the poor, compared to 17 percent for the rich.

Table 6.8(b) shows that various previous empirical investigations found that rich and poor households alike are dependent upon ENRs as a source of income. This means that the unsustainable use of ENR is likely to negatively affect rich and poor households in an economy. Sustainable utilization of ENRs is in the best interest of the different household groups in the various national economies.

Since household income levels are influenced by an array of social, institutional and environmental factors, the study further seeks to ascertain the impact of such factors on household incomes comprising household earning capacity. These include sex of household head, household participation in ENR management programmes (such as afforestation, land and soil conservation activities) and location of the village (whether in a rural or peri-urban area). Sample t-tests were used to establish the poverty impacts of the above factors. Table 6.9 presents the detailed findings of the analysis.

Table 6.8(b): % of environmental income relative to total income from various studies

Lead Researcher/Author	Country where study was done	Resource-rich Areas		Resource-poor/Little-		Average	
		Poor	Rich	Poor	Rich	Poor	Rich
Jodha (1980s)	India (82 villages)					9-26	1-4
Cavendish (1996–1997)	Zimbabwe (29 villages)			44	30		
Chettri-Khattri (2003)	Nepal (2 villages)	20	14	2	1		
Narain et al. (2002)	India (60 villages)	41	23	18	18		
Vedeld et al. (2004)	54 case studies – various countries (61% Africa)					32	17

Source: Poverty and Environment: Understanding Linkages at the Household Level, World Bank, 2007

Table 6.9: Sample T-tests results for selected income variable outcomes

Variable(s)	Observations	Mean Income MK	T- statistic and p-values (in parentheses)
Total household income			
Male household head	1,908	254,571	t = 2.70
Female household head	495	165,437	(0.0035***)
Total household income			
Rural village location	1.809	179,002	t = -7.54
Peri-urban village location	594	410,435	(0.0000***)
Household ENR income			
Rural village location	1809	30,962	t = -3.36
Peri-urban village location	594	62,195	(0.0004***)
Household ENR income			
female household head	495	36,371	t = -0.29
male household head	1908	39,282	-0.6153

Note: P values in parentheses;

*** significant at 1%; ** at significant at 5%; *significant at 10%

From Table 6.9, it is evident that male-headed households on average earn a higher annual total income (MK254,571) than female-headed households (MK165,437); indeed, female-headed households earn about 35 percent less than male-headed ones. However, the mean income earnings by female-headed households (MK36,371) and male-headed households (MK39,282) from ENRs are not significantly different from one another. This implies high dependence on ENRs for livelihoods by both gender groups, such that unsustainable use of ENRs is likely to have similar negative effects for men and women.

Further analyses of ENR incomes by location show that peri-urban households have higher ENR incomes (MK62,195) compared to rural households (MK30,962). This confirms the imbalances in the ENR value chain, where rural households that harvest ENR products (e.g., Figure 6.1) and sell them at the community level earn less from the resource than households or traders higher up the value chain. The story in Box 1 complements these findings and further helps to explain the migration trends from rural to urban and peri-urban areas, despite the growth poverty in these areas. The unsustainable harvesting of natural resources can result in serious land degradation, Figures 6.2 and 6.3 and story in Box 2. In fact, higher income earnings by peri-urban households were also reported for agricultural product incomes, reflecting that they find themselves higher up the value chain and with better market access.

Box 1: When poverty drives deforestation: charcoal business in Matchereza village, T/A Phambala, Ntcheu, Central Region.

village is in T/A Phambala's area in Ntcheu district, which borders Mwanza district. The main crops grown in the village are maize and cotton. Other crops do not do well in this area due to poor soils. Charcoal production has over the past years emerged as a viable livelihood strategy for some households in the area. The charcoal business complements agricultural incomes and most of the households in the village participate in charcoal production in the nearby forests.

Families sell inherited forest covered land in the hills to charcoal makers. The 'bush gate' charcoal price is MK700/per 50 kg (about US$ 1.70), and is sold to local traders from the same village. These locals transport the charcoal from bushy areas to the main road, where they, in turn, sell the bags for MK1,200 (about US$3.0) per bag to other vendors. These vendors then sell the bags along the M1 road between Blantyre and Lilongwe at about MK1,800 (US$ 4.30) per bag to Matchereza passers-by and other vendors from the cities.

A primary charcoal producer, in total, earns about MK80,000 (about US$190) a year from the business, in the process cutting down close to half an acre of natural forest. The charcoal producers are aware of the negative implications of their business: "Yes, we know [about the negative impacts], but we do not have any alternative income sources [...]; provide us with loans for small- scale businesses and we will stop the charcoal businesses." Currently, there are no efforts to re-plant the trees in the forest where the deforestation is taking place. No one has initiated this process, and there is a general feeling that there is enough forest stock to last them some years.

Box 2: Learning the importance of sustainable use of the environment and natural resource conservation in a hard way: the case of Dopa Village, T/A Mwirang'ombe, Karonga District, Northern Malawi

Dopa Village in Traditional Authority Mwirang'ombe in Karonga District is located about 55 km south of Karonga Boma. The village is sandwiched between two protected areas, the Karonga South Escarpment and Nyika National Park. The major livelihood source comes from crops, including maize, cassava, tobacco, cotton and livestock production. Due to limited access to farm inputs such as fertilizers and improved seed, as well as declining soil fertility, most households do not realize significant crop yields.

Due to the growing population in Dopa Village and low awareness about the potential consequences of environment and natural resource degradation, the harvesting of trees in the hills that lie between the village and the two protected areas was common a few years ago. At that time, no one thought of the negative consequences of such behaviour. However, as the years went by, the villages in Dopa and surrounding area started experiencing landslides during the rainy seasons due to the lack of tree cover on the hills. The landslides damaged crops, livestock and other household investments, leaving the villagers astonished by the force unleashed by nature . The damage caused by the landslides spurred encroachment into the protected areas, which, in turn, provoked a crackdown by authorities and often led to villagers having to pay fines for their offences.

To address the forest degradation and the tension between the protected areas and the communities, officials from the Forestry Department engaged with the community to raise awareness about the implications of environmental and natural resource degradation. With the experiences at hand, the communities easily understood the importance of environmental and natural conservation and sustainable natural resource use. Today, almost every person in the village is an ardent guardian of the designated village forest areas, particularly the hilly areas that pose the greatest threat of landslides. A few 'tree-cutting night sneakers' remain, but, once caught, they are fined a goat or two for every tree cut.

Figure 6.1: Bags of charcoal for sale

Figure 6.2: The 2015 flood-damaged crops at Matcheredza Village due to unsustainable ENRM

Figure 6.3: (a) Deforestation (upstream impacts) in Mtiya Ward in Zomba District,

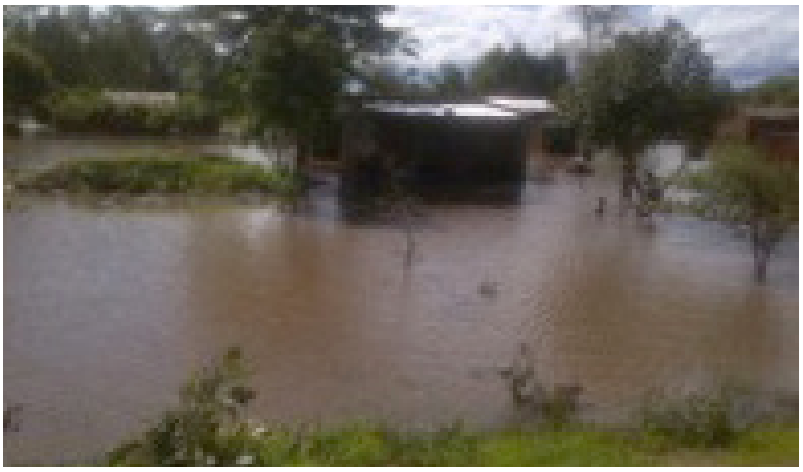
Box 3: Victims of environment and natural resource degradation: Namatapa Village, Zomba District, Southern Malawi

Namatapa Village, which is located some 27 km from Zomba city, is a victim of environmental and natural resource degradation that takes place somewhere else in the district. The village has 89 households and is located along the Likangala River at an inlet about 5 km away from Lake Chilwa.

One afternoon in mid-January 2015, the village received a call from the District Commissioner's office warning them of possible flooding in the area owing to the heavy rains in the Zomba Mountains where the Likangala River originates. The message was passed to the whole village. The households quickly mobilized to strengthen the dike built to protect the village from outbursts of the Likangala River. Sacks of sand were added to the dike. Then the villagers assembled at one place. It was not until 7 pm that they heard a strange, strong noise coming from afar and fast approaching the village. The sound was the anticipated flood. Despite their efforts at strengthening the dike, the floodwaters inundated the village. Houses collapsed, trees broke and the water carried away personal belongings, including livestock. They lost a life on this day: a woman in her late 20s.

Flooding of the Likangala River is simply a result of heavy siltation due to environmental degradation that has taken place over the years upstream, close to the Zomba Mountains. The result is not only flooding that affects the downstream villages, but also the disappearance of the much-loved Matemba fish from Lake Chilwa. There are multiple negative livelihood implications of the damage to the environment surrounding Likangala River, which needs to be stopped to avoid future natural disasters.

Source: Poverty and Environmental Nexus for Overcoming Poverty in Malawi Study, January 2015



6.3: (b) Floods in Mangochi district (Downstream impacts)

6.2.2 Statistical evidence on productivity and ENR use

Productivity, being one of the poverty dimensions, is also analysed by examining the statistical patterns as well as econometric estimations of the key explanatory variables. The t-tests examine productivity impacts of gender of household head and village location on the household productivity. The analysis utilizes maize productivity (as reported by households during the household survey) as a proxy for household productivity. Details are presented in Table 6.10.

From Table 6.10, it is evident that male-headed households achieve higher crop productivity levels than their female counterparts. In order to investigate the cause of the productivity differences amongst male- and female-headed households, sample t-tests were further conducted for fertilizer usage by the two gender groups. The focus on fertilizers in this analysis is motivated based on the argument by Chirwa and Dorward (2013) that, in Malawi, there is widespread understanding that fertilizers are critical to food security and that the government has an active responsibility to ensure food self-sufficiency by enabling widespread fertilizer access and use. The results, as shown in Table 6.10, indicate that male-headed households are utilizing more chemical fertilizers than their female counterparts. These findings agree with those of the World Bank (2014) analysis that shows that, in Malawi, women use lower levels of agricultural inputs on their plots, including fertilizer and extension services, than men, a difference that accounts for more than 80 percent of the gender gap in productivity in the country. The World Bank (2014) study also found that, in Malawi, male-managed plots produce on average 25 percent more per hectare than female-managed plots.

The analysis also shows that there is a significant difference in fertilizer use between rural and peri-urban households. Notwithstanding the differences in fertilizer use between the peri-urban and rural based households, the analysis further finds that such differences do not translate into differences in household agricultural productivity between the two groups, as evidenced by the low t-statistic shown in Table 6.7.

Further analysis (Table 6.10) shows that access to FISP inputs had no significant productivity difference. This requires a detailed study to investigate the productivity effects of FISP.

Table 6.10: Sample t-test results for selected productivity outcomes (kg/ha)

Variable(s)	Observations	Mean Values[17]	T- statistic & p-values (in parentheses)
Household Productivity levels			
Male-headed households	1,750	1,535.37	t = 3.50
Female-headed households	429	1,073.76	(0.0002***)
Household Chemical Fertilizer Use			
Male-headed households	1,582	88.81	t = 2.64
Female-headed households	403	72.94	(0.0042***)
Household Chemical Fertilizer Use			
Rural households	1,502	80.57	t = -3.66
Peri-urban households	483	101.17	(0.0001***)
Household Productivity levels			
Rural households	1,671	1,458.22	t = 0.47
Peri-urban households	508	1,399.30	-0.6355
Household Productivity levels			
Non-access to FISP inputs	722	1,524.73	t = 1.08
Access to FISP inputs	1,457	1,404.72	-0.2825

Note: P values in parentheses;

*** significant at 1%; ** at significant at 5%; *significant at 10%

6.2.3 Food security and ENRs

The study utilizes household food production levels as a proxy for food access, availability and utilization. More particularly, the total amount of maize produced by a household over the past three years is used as a food security proxy variable.[18] This assumption is realistic, given that, for most rural and peri-urban households, food security is generally measured by the extent to which a family is self-sufficient in the production of maize, the main staple in Malawi. To this effect, the study examines the impact of gender of household head, location and household food security status, using sample t-test analyses. Analysis results are presented in Table 6.11.

Table 6.11: Sample t-test results for selected food security outcomes

Variable(s)	Observations	Mean Annual Household Maize Production (kg)	T- statistic & p-values (in parentheses)
Household Food Security			
Male-headed households	1908	686.97	t = 4.72
Female-headed households	495	434.66	(0.0000***)
Household Food Security			
Rural households	1809	640.15	t = 0.41
Peri-urban households	594	619.3	-0.6791

Note: P values in parentheses;

*** significant at 1%; ** significant at 5%; *significant at 10%

[17] The mean values refer to household yield if the outcome variable for which the t-test was conducted is household productivity levels and to quantity of fertilizer used if the outcome variable is household chemical fertilizer use.

[18] Households could not easily recall and provide annual food consumption choices over the past three-year period, hence the use of food production statistics (which they could recall) as a food security proxy variable. In addition, the GoM places great emphasis on domestic maize production as a proxy to food security since most Malawians derive their livelihoods from agriculture and non-farm income is very limited or, for most families, non-existent.

Table 6.11 shows that male-headed households are more food secure than female-headed households. This means that household nutritional challenges are more likely to be prevalent among female-headed households than among their male counterparts. This corresponds to findings from other studies as well as findings discussed in this study showing that male-headed households have higher incomes and productivity levels partly from more use of chemical fertilizers.

Analysis of rural versus peri-urban households also shows no difference in food production levels, thus confirming findings presented in Table 6.9, showing no differences in household productivity between rural and peri-urban households despite some differences in chemical fertilizer applications. The findings imply that rural and peri-urban households alike are susceptible to food security risks. However, the fact that peri-urban households have relatively higher incomes than their rural counterparts (as reported in Table 6.8) justifies the prevalence of multiple public food security interventions targeting rural households compared to the peri-urban areas. Thus, the policy prescription emerging directly from this study is that income diversifications, including multiple farm enterprises, is likely to be more successful in addressing food security and livelihood needs than the current focus on maize as the sole driver of food security objectives of most families in the country.

6.2.4 Evidence from health descriptive statistics

In this study, health outcomes are defined in terms of the number of serious disease outbreaks that have affected households' productivity capacity. As with other poverty dimensions, the study sought to establish whether the gender of the household head and the household's geographical location affect the probability that a household will encounter a serious disease outbreak that would jeopardize its socio-economic life, particularly its agricultural production activities. The basic assumption here is that, since female-headed households on the average earn lower income and also obtain lower total output from the farm, female-headed households would be more susceptible to serious diseases due to lower food nutrient intake, all other things being equal. In addition, female-headed households would have lower capacity to recover from serious disease outbreak, as they would have fewer resources to seek medical attention and thus to limit the negative impact of a disease outbreak on income and farm productivity. Table 6.12 shows the details of the findings.

Table 6.12: Sample t-test results for health outcomes

Variable(s)	Observations	Probability Mean values	T- statistic and p-values (in parentheses)
Incidences of Household serious disease outbreaks			
Male-headed households	1908	0.35	t = 1.24
Female-headed households	495	0.38	-0.2145
Incidences of Household serious disease outbreaks			
Rural households	1809	0.38	t = -3.44
Peri-urban households	594	0.3	(0.0003***)

Note: P values in parentheses;

*** significant at 1%; ** significant at 5%; *significant at 10%

Table 6.12 shows, that from 2012 to 2014, contrary to prior expectations, there are no significant differences between male- and female-headed households in terms of vulnerability to serious diseases, despite the differences in other aspects of poverty. This suggests that other factors that determine serious diseases outbreaks may not have been captured in the study.

There were, however, significant differences between rural and peri-urban households with respect to incidences of serious disease, with rural households having a higher percentage (38 percent) than peri-urban households (30 percent). The results show that rural households face greater risks of suffering from serious disease attacks that can impair their effective participation in economic activities than their peri-urban counterparts.

6.3 Econometric estimates and analyses

Though providing useful insights on the interactions between income poverty and environment and natural resources at the household level, statistical analyses, including the use of correlation, do not necessarily prove causation. The relationship between ENRs and household income levels can be established by using an econometric model that takes into account the key variables (Baltagi, 2013). To this effect, a panel data econometric model specification is given as follows:

$$y_{it} = \alpha + X\beta_{it} + \lambda_{it} + \nu_{it}$$

where y_{it} is a dependent variable, namely, household total income from crops, livestock and non-farm activities, including sale of ENR products. It could also refer to a binary or dummy variable with values 1 or 0, depending upon the optimization objective being investigated. X is set of exogenous variables, including participation in ENR management programmes, household demographics and household interactions with the market. β is set of estimated coefficients that establish the relationship between the exogenous variables and the outcome variables. λ and ν are decomposed elements of a disturbance term, representing unobserved household fixed and household random effects.[19]

6.3.1 Income poverty and ENR interactions – estimation results

Having established the share of household incomes from different sources, including ENRs, in Table 6.8(a) and having undertaken descriptive statistics of factors affecting household incomes in Table 6.9 above, the analysis now seeks to empirically interrogate factors determining household income. This is done using two unbalanced panel data models taking into account random effects, and an instrumental variable that corrects for household self-selection bias[20] in participation in an ENR intervention. For both models, the unbalanced panel data modelling approach is applied to take into account the differences in time reporting or data recall by households. The data for econometric modelling is converted into a logarithm format, except for binary variables, so that the estimation parameters are elasticities that show the percentage change in dependent variables due a percentage change in the independent variables. Transforming data into logarithm format also helps to control for unnecessary deviations of the data from their mean values. The results are detailed in Table 6.13.

19 For definition of fixed and random effects, please refer to the Glossary of Terms provided earlier

20 For definition of selectivity bias, refer to the Glossary of Terms.

The econometric results in Table 6.13 show that education, total land owned by a household and the type of soils found in a household garden are the major factors affecting household incomes. The fact that education is statistically significant and has positive income effects, implies that human development is critical for Malawi to obtain welfare goals. Positive relationships between land area owned and income earnings also mean that land is an important productive asset that determines household welfare and that the landless are more likely to be poor. The findings on landholding size are corroborated by the significance of the soil type variable, implying that households that farm on rich fertile soils are likely to be richer than others, e.g., than households farming in hilly and stony areas, all other things being equal. These results confirm the findings of the World Bank (2006) that the major determinants of poverty in Malawi include household size, education, access to non-farm employment, proximity to markets and landholdings.

The study findings underscore the fact that policy measures aimed at improving households' access to productive land would provide pathways out of rural poverty. In the context of Malawi's land constrains, largely owing to the increasing population, increasing access to land might be challenging, but nevertheless of crucial importance to reducing poverty, particularly for vulnerable groups. Strengthened national initiatives to promote access to and ownership of land for all, including women, should be complimented by efforts to improve market access that, as argued earlier on, also would have significant impacts on household income.

Table 6.13: Model results for household incomes and environment and natural resources

Explanatory Variables	Model 1 Total Hhold Income, based on Unbalanced Panel Data Estimation, Random Effects	Model 2 Total Hhold Income, with correction for participation in ENR programs, Random Effects
Gender of hhold head	0.023 -0.194	-0.028 -0.215
Age of household head	-0.094 -0.258	-0.145 -0.289
Education of head	0.445*** -0.139	0.472*** -0.16
Household size	0.315 -0.199	0.258 -0.222
Total land area owned	0.521*** -0.139	0.436*** -0.16
Soil Types[21]	-0.279* -0.154	-0.396** -0.184
Distance to the market	-0.018 -0.045	-0.023 -0.02
Location of household	-0.031 -0.183	0.201 -0.188
Hhold partiptn in ENR interventions	0.007 -0.153	0.334 -0.276
Constant	11.052***	11.124***
Observations	170	151
Wald chi2(9) Prob> chi2	36.15 0	26.46 0.0017; R^2= 0.1296

Note: Standard errors in parentheses;
***** significant at 1%; ** at significant at 5%; *significant at 10%**

[21] Soil types in this study is defined as clay or sandy clay =1; otherwise =0. The same definition applies in other model table results below

6.3.2 Empirical household productivity model and estimation results

The empirical model framework for productivity analysis is the same as the one used for the income poverty analysis in the above sections. The only difference is that, now, productivity is the dependent variable being estimated using the same set of exogenous variables. The study uses maize productivity as a proxy household productivity variable. The model results are presented in Table 6.14 for an unbalanced panel data model with random effects.

Table 6.14: Model results for household productivity and environment and natural resources

Explanatory Variables	Household Productivity, based on Unbalanced Panel Data, Random Effects model	Household Productivity, with correction for self-selection into ENR programme participation, random effects
Gender of household head (male=1; female=0	0.181*** -0.063	0.431 -0.119
Age of household head	0.054 -0.084	0.305* -0.167
Years of education of hhold head	0.141*** -0.044	-0.019 -0.086
Household size	-0.053 -0.061	-0.141 -0.126
Total land area owned by household	-0.007 -0.041	-0.122 -0.081
Sales price (MK/kg)	0.011 -0.054	0.037 -0.058
Major soil types in household garden (clay or sandy clay=1; otherwise=0)	0.04 -0.052	0.096 -0.1
Household participates in ENR programs	0.039 -0.053	0.133 -0.159
Constant	6.300***	5.563***
Observations	992	281
Wald chi2(8) Prob> chi2	20.34 0.0049	21.41 0.0061

Note: Standard errors in parentheses;

*** significant at 1%; ** at significant at 5%; *significant at 10%

6.3.3 Discussion of productivity-ENR estimation results

Table 6.14 shows the unbalanced random effects model results in column 2 and the analysis results with correction for household self-selection into ENR programme participation presented in column 3. The results indicate that male-headed households are 18 percent to 43 percent more productive than their female-headed counterparts, thus agreeing with the previously cited World Bank (2014) finding that, in Malawi, male-managed plots produce on average 25 percent more per hectare than female-managed plots due to differences in access factors of production already discussed.

The study results show that household education levels are key determinants in enhancing productivity. The coefficient estimates reveal that the level of education significantly affects productivity. It is envisaged that better-educated household heads are likely to adopt productivity enhancing technologies and extension messages, but the GoM has to reach out to households with minimal education levels.

A household model with correction for self-selectivity bias shows significant and positive productivity effects of age of household head, implying that an older household head, all other things being equal, with more experience in farming is more likely to adopt the productivity-enhancing technologies than a younger household head. This is particularly confirmed by the column 3 model results (with correction for self-selection into ENR programme participation) showing that an increase in age of household head leads to an increase in agricultural productivity. The development and promotion of agricultural productivity-enhancing technologies should, therefore, note these facts, that is, pay particular attention to human capital development activities targeting the youth and less-educated households through intensification of agricultural extension activities.

6.3.4 Empirical model on household food security and ENR nexus

Further to the above statistical analyses, the study undertook empirical investigations into household food security determinants, focusing on the role of ENRs and household participation in ENR-related activities. Table 6.15 presents the detailed results of the analysis.

6.3.5 Discussion of food security and ENR interactions results

Analysis results in Table 6.15 show that male-headed households are likely to be 18 percent more food secure than their female-headed counterparts, a finding that concurs with earlier results showing that male-headed households are more productive than female-headed ones. The years of education for head of household are highly significant and will have positive food security impacts. The study findings show that the average years of education for the households interviewed during the survey is 7 years. Therefore an additional 7 years of education (equivalent to a Malawi School Certificate of Education qualification) is likely to increase food security by about 18 percent.

Table 6.15 further shows the positive and significant relationship between landholdings and household food security, such that a 10 percent increase in household landholding results in a 5.6 percent increase in household food security. These findings corroborate the findings from analysis results reported in Table 6.2 showing significant household income implications of land ownership. We can, therefore, conclude that this calls for strengthening of policy and programmatic measures that ensure effective land use for benefits, including land property rights and ownerships that encourage investments in the land.

Table 6.15: Model results for household food security and environment and natural resources

Explanatory Variables	Household Food Security, Random Effects model, with correction for self-selection into ENR participation
Gender of household head	0.175** -0.073
Age of household head	0.092 -0.097
Years of education of hhold head	0.165*** -0.049
Household size	-0.014 -0.07
Total land area owned by household	0.563*** -0.046
Location of the village	0.004 -0.07
Household had access to FISP inputs	-0.027 -0.06
Household participates in ENR programs	0.106 -0.106
Constant	5.509***
Observations	814
Wald chi2(10) = 200.74 Prob> chi2 = 0.0000	

Note: Standard errors in parentheses;

***** significant at 1%; ** at significant at 5%; *significant at 10%**

6.4 Summary of the findings on household poverty and environment and natural resource nexus

The study examined the factors contributing to poverty in the 10 disaster-prone districts. In this chapter, empirical analyses of the poverty-ENR nexus were examined covering the multidimensional aspects of poverty at the household level in those disaster-prone districts. The sample size was 801 households from rural and peri-urban areas. However, most sampled households are from rural areas. Of the total sampled, 79 percent were male-headed and 21 percent were female-headed households. Urban households constituted 24.5 percent, with rural households comprising the remaining 75.5 percent.

6.4.1 Findings from descriptive analysis

On average, 65 percent of households participate in environmental management programmes. Participation in forest programmes shows the highest proportion (68 percent), while natural water fisheries is second (66 percent). The least is participation is in wildlife (59 percent).

Access to credit is largely dominated by women. The average credit was estimated at MK145,000 for women and MK124,000 for men. Income from non-farm activities constitutes the largest income share (about 65 percent), followed by income from ENR products (18 percent) and, last, agricultural produce (16.6 percent).

Sampled households had a lower maize average productivity at 1.44 metric t/ ha, compared to the national reported average of 2.2 metric t/ ha. However, it is encouraging that some households can achieve yields of 8.3 metric t/ha, which is close to the potential yield of 10.0 mt/ha. Male-headed households achieve higher crop productivity levels than their female counterparts.

Male-headed households are more food-secure than female-headed households. Thus, household nutritional challenges are more likely to be prevalent among female-headed households than among their male-headed counterparts.

Analysis of rural versus peri-urban households also shows no significant differences between the two groups in terms of household productivity.

From 2012 to 2014, there were no differences between male- and female-headed households in terms of vulnerability to serious diseases, despite the differences in other aspects of poverty. There were, however, significant differences between rural and peri-urban households with respect to incidences of household serious disease: rural households had a higher percentage (38 percent) than peri-urban households (30 percent).

6.4.2 Findings from empirical analysis

The econometric results show that education, total land owned by a household and the type of soils found in a household garden are the major factors affecting household income earning capacity. The study findings underscore the need to address these issues with policy measures in order to provide exits from poverty.

The results for self-selected households into ENR programme participation show that male-headed households are more productive than their female-headed counterparts. Male-headed households are likely to be more food-secure than their female-headed counterparts.

Household education levels are key determinants in enhancing productivity. Years of education for head of household are highly significant and will have positive food security impacts. The study findings show that the average length of education for the households interviewed for the survey is seven years. The results show that an additional seven years of education (equivalent to a Malawi School Certificate of Education qualification) are likely to increase food security by about 18 percent.

There is a positive and significant relationship between landholdings and household food security, such that a 10 percent increase in household landholding results into a 5.6 percent increase in household food security.

7. CONCLUSIONS AND KEY FINDINGS

The results of the study have demonstrated how unsustainable natural resource use and environmental degradation affect poverty levels that are defined to include income, health, food security and gender disparities, amongst others. The key findings are presented in four broad areas:

- Poverty-environment nexus literature review
- Review of GoM policies on sustainable poverty reduction pathways
- Empirical findings from macro-level analyses
- Empirical findings from micro-level analyses

7.1 Findings from literature review

Empirical analyses of poverty-ENR nexus bring to light a number of issues that can be classified as (i) direct and indirect linkages between poverty and ENRs; (ii) cause-and-effect relationships; and (iii) short- and long-term poverty effects of ENR utilization.

Direct poverty-ENR linkages refer to conditions where ecosystems provide food sources such as fish, fruits and root crops, spices and flavourings that enhance local diets, thus contributing to food security. On the other hand, indirect relationships involve situations where cash incomes are generated from ENR use and investments. For example, empirical findings have showed that access to land has a significant impact on household income and livelihood opportunities.

Empirical analyses on cause-and-effect relationships in the poverty-ENRs nexus show that the causes of water resource degradation or pollution include factors such as soil erosion, chemical run-off, deforestation and cultivation of marginal lands, amongst others. On the other hand, the effects of polluted water include undesirable health outcomes such as disease outbreaks and high child mortality rates.

Further cause and effect analyses of the poverty-environment nexus show vicious poverty-unsustainable ENR use cycles. For instance, poverty induces households to engage in poor agricultural practices which result in soil degradation. This, in turn, leads to low crop productivity, which results in low incomes, food insecurity and ultimately the perpetuation of poverty. Societies seeking long-term poverty reduction benefits from ENR utilization must practice sustainable utilization of the ENRs.

7.2 Insights from review of GoM policies on sustainable poverty reduction pathways

The review shows that Malawi's policy landscape governing ENR sectors is characterized by a elaborate and diverse set of sectoral policies, legal instruments and institutional arrangements. The policies and legal frameworks are built on the Malawi Constitution, the Vision 2020, the Malawi Growth and Development Strategy II and the National Environmental Policy. The sectoral policies and strategic frameworks have been developed at different time periods, with some dating 20 years back, while others have been adopted in the past two years. Most of the older sector policies, together with their accompanying legal provisions, are under review to enable the policies to

provide guidance that is relevant for today's social, economic and institutional conditions.

The cross-sectoral nature of ENRs is recognized in national and sectoral frameworks, as are climate change, poverty, gender, HIV and AIDS, human rights and good governance. The fact that Malawi's agro-based economy is largely dependent on the ENRs is well recognized in all policy frameworks. This notwithstanding, information on immediate and long-term quantifiable sectoral benefits of sustainable ENRs management is not readily available in the policy frameworks. This compromises the commitment of sectoral policymakers to promote sustainable ENR management.

Most sectors have national policy frameworks that guide their operations. When the study was undertaken, the GoM had not finalized the agriculture sector policy. Speedy finalization of the policy is important since it will effectively direct the sector in terms of resource allocation among the subsectors. The absence of the policy compromises inter- and intra-sectoral collaboration, perpetuates policy inconsistencies along the commodity value chains and weakens public-private partnerships. These gaps contribute to low agricultural productivity and low agricultural incomes, leading to high poverty levels.

While the need for an enabling environment for private sector participation is well recognized in almost all policy frameworks, there is a general lack of will and institutional capacity to make things happen more easily, more cheaply and more quickly to attract the private sector in the productive sectors of the economy, including the ENR sector.

There are also inconsistencies between what policy frameworks stipulate and the practical policy decisions that the government declares and implements. For instance, while national policy commitment to subjecting all national investments to ESIAs is well elaborated in the National Environmental Policy, some government interventions such as FISP are rarely subjected to such requirements. Furthermore, despite a national commitment to having market prices that provide appropriate incentives for sustainable ENR use and investments, actual agricultural marketing policies relating to maize run counter to this policy call. Unpredictable and discretionary market policy actions that characterize the maize market such as export bans, setting of minimum prices and market purchases, discourage private sector planning of market operations, which eventually drives farmers into subsistence condition and discourages productivity while enhancing unsustainable ENR utilization practices.

Additional evidence of policy inconsistencies relates to divergence between policy commitments to manage unsustainable use of ENRs and what actually happens. As such, unsustainable ENR use practices continue to take place in the face of elaborate and well-meaning policy and legal frameworks and institutional arrangements established to correct such behaviours. Consequently, ENRs are being exploited beyond their maximum sustainable yields. This reflects the inability and perhaps lack of political will of decision makers and implementation agencies to implement existing policies and laws. While limited financial and human capacities are often reported as the major reasons for failure to implement existing policies and laws, this does not justify inaction if there are unsustainable

ENR utilization practices and if institutional arrangements and structures to implement the policies and enforce laws are available.

In the same vein, while institutional arrangements for coordinating implementation of the given policy and legal framework recognize the need for multi-sectoral collaboration, practical institutional coordination remains a challenge.

Fiscal policy measures as already proposed in the National Environmental Policy could encourage investments in sustainable ENR management, but will require strong implementation mechanisms. These could be in the form of taxes and subsides on ENR products such as charcoal and fuelwood. Depending upon how the measures are applied, they could promote the conservation of natural trees while promoting planting and utilization of exotic species.

Investigations into the extent of inclusion of poverty impact assessments in the implementation plans show that there is minimal practical use of poverty impact assessments as bases for national and sectoral policy, programme and project developments and reviews. For instance, while the Ministry of Agriculture is implementing projects that have poverty impacts (such as FISP) and pursuing land and soil conservation and irrigation development, there is no clear reference to the poverty reduction targets of such investments. Although a lack of capacity can be blamed for this, it may also simply reflect a lack of culture of evidence-based decision processes in the public sector in general and in the ENR sector in particular.

7.3 Key findings from macro-analysis

The ENR sector is critical for national income growth objectives. The study results show that a 1 percent (317 sq km) increase in forest cover degradation in the long run is likely to reduce GDP per capita by 0.6 percent (US$1.5). In monetary terms, this translates to a loss in income of nearly US$24 million a year. This means that the degradation of forest resources is having negative impacts on national income poverty. The sustainable utilization of forestry resources is thus necessary.

Public investments in the ENR sector are pivotal for national growth outcomes. The study findings show that a 1 percent increase in expenditure in the ENR sector leads to a 0.43 percent increase in per capita GDP. In quantitative terms, this means that, for every US$300,000 increase in ENR expenditure, there is an additional increase in GDP per capita of US$1.1, or an additional increase in overall GDP by US$17 million based on a population of 15 million individuals.

Investigations into the linkages between the agriculture sector and national income per capita growth show that, in the long run, positive changes in the agriculture value-added have significant positive poverty reduction effects. This is evidenced by the fact that a 1 percent (US$1,000,000) increase in agriculture value-added will likely increase GDP per capita by 2.3 percent (US$6) – a GDP increase of US$90 million. This finding confirms that sustained growth in the agricultural sector is critical for national growth and poverty reduction objectives.

The ENR sector has significant implications for national productivity outcomes. Inquiries into macro-level productivity and ENR linkages show that government investments (expenditure) are the main drivers of agriculture value-added in the short and long runs. For instance, the findings show that, in the short run, a 1 percent

(US$2 million) increase in public expenditure in the agriculture sector results in a 0.46 percent (US$500,000) increase in agriculture value-added, whereas, in the long run, a 1 percent (US$2 million) increase in agriculture expenditure leads to a 3.57 percent (US24 million) increase in agriculture value-added. This means that sustained public investments in the agricultural sector are important for the attainment of sustained agricultural productivity growth agenda.

In addition to productivity impacts of public expenditure, the analysis results show that short-run positive impacts of commodity price changes have positive productivity impacts. As such, a 1 percent increase in consumer price index results in a 0.67 percent (0.2 t/ha) increase in national crop productivity. Such findings confirm the importance of market prices in providing incentives for the production of various agricultural commodities. Hence, government should avoid interventions that distort market prices of agricultural commodities.

The ENR sector contributes to national food security outcomes. The macro-level investigations into the national food security impacts of ENR reveal differences in the extent of short- and long-run impacts. The study findings show that public investments in the ENR sector have long-run positive food security impacts, with a 1 percent (US$300,000) increase in public investment in the ENR sector resulting in a 2.01 percent (280,000 MT) improvement in national food security. In the short run, no significant relationships were observed. Furthermore, farmed land has a significant impact on food security in the short run.

The agriculture sector remains central for Malawi's national growth and poverty reduction outcomes. Investigations into the linkages between the agriculture sector and national income per capita growth show that, in the long-run, positive changes in the agriculture value-added have significant positive poverty reduction effects. This is evidenced by the fact that a 1 percent (US$1,000,000) increase in agriculture value-added will likely increase GDP per capita by 2.3 percent (US$6) – a GDP increase of US$90 million.

The ENR sector, particularly water, has implications for attainment of national health objectives. Macro-level interrogations into health outcomes showed that access to clean water has profound short- and long-term health impacts, including a reduction in infant mortality. Of the two time periods, the findings show that a 1 percent (150,000 people) increase in access to clean water has greater impacts in the short run (-0.26 percent, or one death) than in the long run (-2.8 percent, or two deaths).

It is wise to invest in ENR programmes: Benefit-Cost Analyses reveal that ENR investments yield significant results and incentivize communities to engage in sustainable ENR activities whilst reducing poverty. For example, at a discount rate of 4 percent, the analysis finds the economic net present value to be US$12.4 million, whilst using the official discount rate at 12 percent gives an economic Net Present Value of $5.3 million. An Economic Internal Rate of Return (EIRR) of 62 percent was also established. The results further show that, for ENR investments to realize their objectives, there is need for effective implementation of ENR policies.

7.4 Findings from micro-level analysis

Participation in ENR management programme. On average, 67 percent of households participate in environmental management programmes; of these, 55 percent were male-headed households and 12 percent were female. Of the households that participated in ENR programmes, 68 percent participated in forest programmes, 66 percent in natural water fisheries and 59 percent in wildlife.

Access to credit. The study findings show that women are more involved in accessing credit for their businesses. During the period under survey, the average credit was estimated at MK145,000 for women and MK124,000 for men.

ENRs products are important sources of household incomes for most rural and peri-urban households in Malawi. Analysis of sources of household incomes shows that 18 percent of the sampled households' incomes come from ENR products such as charcoal, fuel wood, honey and mushrooms, amongst others, compared to 17 percent from agricultural produce, while off-farm economic activities such as business are the largest contributors to household incomes (65 percent). The study confirms findings from several other empirical studies showing the importance of ENRs for household livelihoods.

Land and gender are important for attainment of household food security. There is a positive and significant relationship between landholdings and household food security, such that making available about 1.0 ha of land, representing an increase of 33 percent increase on the mean household land holding, is likely to result into an additional 118 kg of grain (equivalent to two months' consumption for an average household of five people). This is an 18.5 percent increase in household food security, computed on the basis of mean maize yield of 1.45 t/ha obtained during the survey.

Besides land, another factor is the gender of the household head, such that male-headed households are 18 percent more likely to be food-secure than their female-headed counterparts, a fact that demonstrates the food security vulnerability of female-headed households.

Level of education and productivity. Household education levels are key determinants in enhancing productivity and results show that length of education for head of household is highly significant and correctly signed. The study findings further show that the average length of education for the households interviewed during the survey is seven years. The implications of these findings are that an additional seven years of education (equivalent to a Malawi School Certificate of Education qualification) are likely to increase food security by about 18 percent, or an extra 264 kg/ha.

8. STUDY RECOMMENDATIONS

The study sought to quantify the poverty-ENR nexus in Malawi in terms of the impact on various aspects of multidimensional aspects of poverty. Our study has identified critical issues that will need to be addressed by the GoM with the support of cooperating partners and other stakeholders. The following are the proposed generic and specific recommendations to address the challenges of the poverty-ENR nexus:

8.1 Policy options for poverty reduction through sustainable natural resource management

8.1.1 Importance of ENRs in addressing multidimensional poverty

The ENR sector should be given priority in natio0nal development planning and budgetary allocation, including through devising strategies for attracting private investment. For this reason, the GoM is encouraged to seriously consider:

(1) **Committing to increased ENR sector investments for sustainable income growth and poverty reduction.** In view of the findings from macro- and micro-analyses demonstrating that ENR investments have positive multidimensional impacts on poverty reduction, the GoM is encouraged to re-prioritize public expenditure in such a way that more resources are allocated to the ENR sector (ENR sector covers environment and climate change, land, agriculture, forestry, fisheries, water and wildlife). Efficient resource allocation to ENR-sector institutions should help address challenges such as income poverty, land and water degradation, sedimentation and siltation of water courses, deforestation, depletion of fish stocks and wildlife management. The benefit-cost analysis shows the cost effectiveness of such investments overt time and hence it is important to have a long-term perspective when undertaking such expenditures.

(2) **Reviewing the current resource envelope for the agricultural sector with a view to unlocking the full potential of the sector to contribute to sustainable poverty reduction and economic growth.** These recommendations of the study findings show that investments in the agriculture sector are key to poverty reduction; for this reason, there should be continued public investment in the sector. While the agriculture sector already enjoys prioritization of public expenditures, there is need to review the resource allocation patterns within a given sector (intra-sectoral resource allocation review) to prioritize investments in agricultural research and development, agricultural extension services and training to improve smallholder productivity and sustainability.

Effective information, education and communication are critical for mobilizing ENR investments and the desired behavioural change. Therefore, the GoM is encouraged to:

(3) **Develop and generate sustained and effective information, education and communication (IEC) to all stakeholders on the poverty reduction**

outcomes of ENR investments. In view of the study findings on the low level of education and non-participation in ENR programmes, it is imperative to undertake sustained IEC activities that would mobilize national support and behavioural change towards ENR management programmes and sustainable use of natural resources. While a number of avenues could be explored and used in this respect, effective use of the available reporting systems and websites would be the first ideal step. For instance, official reports such as Annual Economic Report, the State of Environment Report and the climate change website should regularly report on the poverty impacts of the various ENR interventions at national and local levels. The reporting of ENR impacts should use the standard poverty and environment indicators.

(4) **Enhance broad-based community participation in ENR management programmes:** The basis of the recommendation is based on the findings that more work needs to be done to mobilize communities, noting that, on average, 67 percent of households participate in environmental management and a third of the sampled households were not participating in ENR management programmes. **ENRs products are important sources of household incomes for most rural and peri-urban households in Malawi**. Analysis of sources of household incomes shows that 18 percent of the sampled households' incomes come from ENR products such as charcoal, fuel wood, honey and mushrooms, amongst others, compared to 17 percent from agricultural produce, while off-farm economic activities such as business are the largest contributors to household incomes (65 percent). Thus, participation in ENR programmes has positive implications for household income and food security.

Land access is critical for national and household income, food security, productivity and health outcomes. Therefore, government is recommended to:

(5) Accelerate the certification of legal land rights for smallholders in order to enhance the commercial value of land as a factor of production. The study has confirmed that land has significant impact on income and food security. Land is one of the primary means of generating livelihood for most of the poor in rural areas. As an important asset, it constitutes a main vehicle for investment, wealth accumulation and transfer between generations. Hence, there is a need to continue land access initiatives. As a result, the GoM is encouraged to explore land tenure issues by scaling up land registration and certification for sustainable land use and management.

8.1.2 Cross-cutting policy options for sustainable poverty reduction

There is need for institutionalization of poverty impact evaluation culture for ENR interventions.

(6) GoM should consider institutionalization of effective mechanisms for poverty impact evaluations of ENR interventions. National policy decisions relating to identification of sustainable poverty reduction pathways through ENRs can significantly benefit from institutionalized

impact evaluations of all ENR interventions at the national level as well as from international empirical studies. Institutionalized poverty impact evaluations can build on the findings of this study that show linkages between income poverty and ENRs, food security and ENRs, productivity and ENRs, health outcomes and ENRs and access to water and ENRs.

Policy and regulatory framework implementation and review could be improved.

(7) **The GoM should consider reviewing all outdated sectoral policy, legal and strategic plans to address their shortcomings in terms of mainstreaming of ENR management.** For those frameworks for which the review process has already started, there is a need to complete the outstanding work with active engagement of all policy stakeholders and local communities who are the targeted beneficiaries. In the process of frameworks reviews, the GoM might realign the lifecycles of all sectoral frameworks with that of MGDS, the country's overarching policy and strategic framework.. This would help ensure that ENR sectoral policies and legal frameworks are regularly reviewed to take into account the ever-changing social and economic dynamics and that sectoral frameworks really respond to the overarching national framework of the day.

There is a need to strengthen and institutionalize partnerships for ENR investments and to address policy gaps and inconsistencies.

(8) **The GoM should consider exploring more opportunities for PPPs in the ENR sector, particularly forestry management, fisheries and wildlife**. This would leverage private sector competencies in mobilizing finance, technical expertise and development of markets in areas such as promoting planting and harvesting of early maturing exotic trees.

(9) **The GoM is advised to create a predictable and consistent policy environment in order to make it easier and cheaper to do business**. Policy inconsistencies in form of divergence between what is stated in official policy documents and what is actually implemented send mixed signals to economic operators. In spite of the GoM's commitment to implementation of market-led agricultural pricing that provides appropriate ENR investment incentives, practical agricultural marketing policies relating to maize and other commodities run counter to the policy. Consequently, there have been distortions in the market due to the introduction of export bans and discretionary minimum selling prices and market purchases that are largely unpredictable.

The study has unveiled a few issues that need further investigations to enhance understanding of the poverty-ENR nexus, including:

(10) **Further research is needed to identify the specific economic connections between forests and household water resources.** This research can be used to: a) put advance planning for water supply and forest management at the forefront of community issues; b) make the case for forest conservation to protect drinking water; c) encourage the use of incentives for forest conservation and tree planting that are more

reflective of their true value; and d) factor in the costs of drinking water supply and treatment when evaluating development alternatives.

(11) **Further investigations are needed on the poverty impacts of household participation in own-farm ENR management programmes versus participation in communal/village ENR management programmes.** Such a study would help guide the policymakers and ENR stakeholders in planning for appropriate types of the most effective grassroots ENR management programmes to address household poverty levels, i.e., whether to focus on household plot level ENR management programmes, on community-level ENR management programmes or on both.

(12) **The proposed fiscal measures for promoting ENR investments need to be further investigated to determine their feasibility and possible impacts.** The National Environmental Policy's proposal for use of tax measures to promote ENR investments needs to investigate how such measures can be applied in the context of Malawi and their possible impacts.

8.2 Specific recommendations and strategic action plan

Table 8.1: Strategic Action Plan on how the GoM can include poverty reduction in its policy and programme development and implementation

Poverty dimension	Major current challenge(s)	Broad policy objectives & expected outcome(s)	Outputs	Possible interventions to bring desirable change	Responsible lead institution(s)	Time schedule	Assumption for success
Income	Low per capita/household agricultural incomes	Reduced national poverty levels from 52% to less than 40%	Increased household agriculture incomes	Developing and nurturing a policy analysis culture of quantification of the economic returns for each investment initiative in the sector in line with the objectives of the agriculture, fisheries forestry, wildlife and environmental management policies & strategies Ensure that the review of each of the sectoral policy & strategic frameworks mainstreams tangible poverty reduction action plans & impacts	Ministry responsible for agriculture & ministry responsible for finance, economic planning and development	Starting with the ongoing reviews of the ASWAp, forestry policy, wildlife policy frameworks Ongoing	Availability of capacity in the agriculture sector to undertake technical analyses using different techniques
Income	Undiversified household and national income sources	Increased & diversified agricultural investments at	Growth and diversification of agriculture	Effective M&E system/ activities that ensure programme delivery according to set targets		Ongoing	The current public sector reforms to continue and to

Poverty dimension	Major current challenge(s)	Broad policy objectives & expected outcome(s)	Outputs	Possible interventions to bring desirable change	Responsible lead institution(s)	Time schedule	Assumption for success
Income		household and national levels	income sources	within the agriculture, fisheries forestry, wildlife and environmental management policy frameworks and strategies			be based on evidenced-based planning and M&E
Income	Unstable agriculture and natural resource income sources	Increased in off-farm value chain investments & employment creation	Stable & sustainable agricultural and natural resource income earnings	Undertake capacity needs on policy & investment analysis in the agriculture sector; based on that, undertake necessary training programmes as part of implementation of the agriculture, fisheries forestry, wildlife and environmental management policies and strategies	"	Ongoing	Continued national policy makers commitment to the agriculture sector
Income	Gender-skewed agriculture income distribution with limited female-headed households benefitting compared to their male-	Gender-balanced household income earnings	Gender-balanced income earning levels	Mainstreaming gender-sensitive investments as part of implementation of the agriculture, fisheries forestry, wildlife and environmental management policy frameworks and strategies	Ministry responsible for agriculture + ministry responsible for finance economic planning and development	Ongoing	Sustained national commitment to gender-balanced economic growth and income distribution

Poverty dimension	Major current challenge(s)	Broad policy objectives & expected outcome(s)	Outputs	Possible interventions to bring desirable change	Responsible lead institution(s)	Time schedule	Assumption for success
Income	headed counterparts						
Productivity	Low agriculture productivity	Improved national land use due to agric productivity increases	Increased agricultural productivity levels at national and household levels	Mainstreaming empirical investigation culture into the measures/practices for realizing highest agric productivity for each enterprise and agro-ecological zone - to be followed by evidenced-based implementation of activities	Ministry responsible for agriculture	Ongoing	Continued national commitment to the ASWAp; (Malawi Government and development partners continuing to prioritize the agriculture sector as envisaged in the ASWAp design)
Productivity	Soil fertility loss due to poor agricultural and land use practices	Sustained and improved soil fertility levels	Proportion of land area with restored soil fertility levels and farmers practicing soil fertility measures	Improve sectoral coordination for soil fertility management practices. The need for all departments in the agriculture, environment and natural resources sectors to collaborate	Ministry responsible for agriculture – spearheaded by the ASWAp Secretariat in the ministry	This is already in place, ongoing	"

Poverty dimension	Major current challenge(s)	Broad policy objectives & expected outcome(s)	Outputs	Possible interventions to bring desirable change	Responsible lead institution(s)	Time schedule	Assumption for success
Productivity	Vulnerability to climate change effects	Sustained/climate change resilient agricultural productivity levels	Proportion of farmers adopting sustained agricultural productivity technologies	Evidenced-based promotion of adoption of climate change resilient agricultural technologies in line with existing policy objectives	"	Ongoing	"
Food Security	Unstable food security situation at household & national levels	Stable household & national food security conditions Increased food incomes from domestic and international food trade	Proportion of households with stable food situation conditions Share of household and national incomes from food trade	Improved productivity measures (as discussed above)	Ministry responsible for agriculture	Ongoing	National commitment to national policy frameworks such as ASWAp, the National Export Strategy and National Environmental Policy
Food Security				Institutionalized benefit-cost analysis (BCA) practices of post-harvest losses and impact	Ministry responsible for agriculture	Ongoing	National commitment to evidenced based decision-

Poverty dimension	Major current challenge(s)	Broad policy objectives & expected outcome(s)	Outputs	Possible interventions to bring desirable change	Responsible lead institution(s)	Time schedule	Assumption for success
Food Security				assessments of post-harvest loss interventions- and on that basis, promote use of effective & environmentally friendly storage technologies	in collaboration with ministry responsible for natural resources & environment		making processes Continued national prioritization of food security issues as part of the development agenda
Food Security				Mainstreaming food safety and standards for locally consumed and internationally traded food items	Collaborative efforts of ministries responsible for agriculture & industry and trade	Ongoing	Increasing national food security awareness and consumption behaviours
Food Security				Promotion of intersectoral & interdisciplinary coordination to arrest post-harvest losses, involving different institutions and disciplines, e.g., scientists, economists and	Ministry responsible for agriculture in collaboration with ministry responsible for natural	Ongoing	Effective support from central coordination ministries such as Office of the President and Cabinet (OPC), and Ministry of

Poverty dimension	Major current challenge(s)	Broad policy objectives & expected outcome(s)	Outputs	Possible interventions to bring desirable change	Responsible lead institution(s)	Time schedule	Assumption for success
Food Security				sociologists, amongst others.	resources & environment		Finance, Economic Planning & Development
Food Security	Undiversified food stock production and utilization levels	Diversified food production based on the existing agro-ecological conditions	Proportion of households accessing & consuming diversified food commodities	Promotion of diversified agriculture and food commodities production based on the agro-ecological zones	Ministry responsible for agriculture	Ongoing	Availability of technical and administrative capacities in the ministry responsible for agriculture to continue promoting agro-based diversification
Food Security				Promotion of and marketing of farm produced & natural water & forest-harvested commodities for food security objectives	Ministries responsible for agriculture & industry and trade	Ongoing	Increase in national realization of the role of markets in attainment of national food security objectives The National Export Strategy continues to be

Poverty dimension	Major current challenge(s)	Broad policy objectives & expected outcome(s)	Outputs	Possible interventions to bring desirable change	Responsible lead institution(s)	Time schedule	Assumption for success
Food Security							a priority policy framework for the country
Food Security				Intensify natural forest conservation as sources of natural foods from forests & natural water bodies such as honey, mushrooms, wild fruits, fish, amongst others, as envisaged in the National Wildlife Policy, National Forestry Policy and Natural Environmental Policy	Ministry responsible for natural resources & environmental affairs in collaboration with ministry responsible for agriculture	Ongoing	Increase in national recognition of the role of natural foods for food security objectives
Food Security				Effective institutional collaborative efforts at all levels to achieve the above objectives	Ministries responsible for agriculture, plus natural resources and environment	Ongoing	Availability of policy support from central public offices such as OPC and ministry responsible for economic planning & development
	High instances of malnutrition in	Sustained decline in	Reducing malnutrition	Strengthen and expedite mainstreaming of	Ministries responsible for	Ongoing	Government continued

Poverty dimension	Major current challenge(s)	Broad policy objectives & expected outcome(s)	Outputs	Possible interventions to bring desirable change	Responsible lead institution(s)	Time schedule	Assumption for success
Food Security	spite of sufficient production levels	malnutrition levels, e.g., stunting levels, from the current 47%	indicators from the current levels as established in the national policy frameworks such as MGDSII	nutrition issues in various agriculture, environment and natural resource policy and programme frameworks	agriculture, health and natural resources & environmental affairs		commitment to the MDGS goal of improved nutrition levels
Food Security				Undertake and mainstream benefit-cost analysis and impact assessments of investments in various farm and non-farm nutritious food commodities	Ministry responsible for agriculture + ministry responsible for natural resources and environment	Ongoing	Government continued commitment to the MGDS goal of improved nutrition levels
Health Outcomes	Poor health indicators such as high infant mortality rates, low life expectancy rates, maternal mortality, amongst others	Improvement in national health indicators	Stable demand for health services - hence being able to match demand and supply of	Continued and sustained environment and natural resource management to reduce disease instances - based on empirical analyses of health impacts of improved ENR management	Ministry responsible for health, in collaboration with ministry responsible for natural resources and environment	Ongoing	Continued national commitment to preventive health care provision services

Poverty dimension	Major current challenge(s)	Broad policy objectives & expected outcome(s)	Outputs	Possible interventions to bring desirable change	Responsible lead institution(s)	Time schedule	Assumption for success
Health Outcomes			health care provision services				
Health Outcomes		Reduction in growth of public expenditures on curative health services, e.g., medication	Stable growth in public expenditures on health services	Intensified promotion of consumption of nutritious foods that improve human health	Ministry responsible for health Ministry responsible for agriculture	Ongoing	"
Health Outcomes				Increased national awareness activities on hygiene for preventing disease infections from crop and livestock	Ministry responsible for agriculture	Ongoing	Collaboration between agriculture and health ministries
Access to Water (for agriculture purposes)	Limited household access to irrigation services	Increased household and national economic growth owing to irrigation development	Increased public and private investment in irrigation services	Sustained promotion of irrigation development services as a climate change resilience strategy + poverty reduction strategy by using idle, fertile basin sites	Ministry responsible for agriculture	Ongoing	Increased recognition of irrigation as a climate change resilient strategy
Access to Water (for agriculture purposes)	Limited national investments in irrigation development	Sustainable agricultural growth in view of climate change	Optimal use of irrigation potential sites such as river basins	Mainstream irrigation development in other activities such as livestock development, environmental	Ministry responsible for agriculture +	Ongoing	Awareness on economic benefits of irrigation development

Poverty dimension	Major current challenge(s)	Broad policy objectives & expected outcome(s)	Outputs	Possible interventions to bring desirable change	Responsible lead institution(s)	Time schedule	Assumption for success
				management, tourism development, amongst others	ministry responsible for tourism		
Access to Water (for agriculture purposes)	Non-operationalization of irrigation development legal framework, namely, the National Irrigation Act of 2000	Conducive policy environment for improved management of irrigation sector development	Quality and managed stakeholder provision of irrigation care services	Operationalization of the Irrigation Act of 2000 or its revised version by setting up Irrigation Board to guide to sector investments	Ministry responsible for agriculture	As soon as possible, e.g., 2015/2016 financial year	Policymakers' commitment to effective sector development
Access to Water (for domestic use purposes)	Limited operationalization of the legal framework such as the Water Resources Act of 2012	Improved management of water development investments at all levels	Effective operation of the Water Resources Board established by the Water Resources Act	Sensitization of policymakers to the need for full support for water management institutions established by the Water Resources Act	Ministry responsible for water development	As soon as possible - 2015/2016 financial year	Continued national commitment to water development and availability of interested lobbying stakeholders
Access to Water (for domestic use purposes)	Limited linkage between irrigation and domestic water investments	Efficient use of water resource investments such as having multi-purpose dams	Increased national investments stimulated by water availability	Increased evidenced-based lobbying for investment in multi-purpose dams for irrigation development, eco-tourism, industrial	Ministry responsible for water development	Ongoing	"

Poverty dimension	Major current challenge(s)	Broad policy objectives & expected outcome(s)	Outputs	Possible interventions to bring desirable change	Responsible lead institution(s)	Time schedule	Assumption for success
Access to Water (for domestic use purposes)	Limited nexus among sectoral policy frameworks, e.g., the National Water Policy makes little reference to the National Irrigation Policy		for productive uses	and domestic water use purposes			
Access to Water (for domestic use purposes)	Allocative inefficiency or sub-optimal investments in water development activities	Increased national access to safe water in line with national development goals	Stable public health expenditure burden due to limited water-related infections	Effective resource mobilization strategies for water investment projects and programmes	Ministry responsible for agriculture, irrigation and water development	Ongoing	"

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ANNEX 1

UNDP-Terms of Reference for a Consultancy to Undertake a Study on Overcoming Poverty in Malawi through Sustainable Pathways: Identify Policy Options to Accelerate Poverty Reduction by Quantifying Poverty and Environment Linkages

1. Background

Malawi's Growth and Development Strategy II 2011-2016 identifies sustainable management and utilization of environment and natural resources as one out of the nine key priority areas for the achievement of poverty reduction and sustainable economic growth. Malawi's economy is heavily dependent on agricultural which account for 35-40% of the GDP and 90% of the country's export earnings. Over 80% of the total labour force is employed in the natural resources sector, which also contributes 60-70% of the inputs to the country's manufacturing industry1. Malawi's narrow economic base, makes the country highly vulnerable to the adverse impacts of environment and natural resources degradation, climate change and extreme weather events. Unsustainable natural resource use was estimated to cost the country 5.3% of GDP every year reducing economic growth and poverty reduction in a PEI supported economic valuation study of sustainable natural resource use in Malawi (2011).2

Increased climate and weather variations (e.g. in the form of prolonged dry spells, droughts, floods), have compounded the stress on the natural resource base, negatively affecting the performance of sectors such as water, agriculture and energy. This has a particular impact on the poor and especially on women and vulnerable groups that tend to depend more on natural resources for their livelihood. Malawi's poverty headcount ratio at the national poverty line was 50.7 % in 20103 while the more inclusive Multidimensional Poverty Index indicated a poverty rate of 66.7 % for the same year.4 This means that a majority of the population is vulnerable to unsustainable natural resource use and climate change.

The 2011 economic valuation study, estimated that if soil erosion was addressed and lost agriculture yields were recovered, 1.88 million people could be lifted out of poverty between 2005 and 2015. Food insecurity and malnutrition are aspects of poverty closely linked to a healthy, diverse and sustainable agriculture sector. Further, lack of access to clean water and energy is a cause of severe health issues but also a lost opportunity for many women and girls to take part in education and income generating activities due to time spent on water and firewood collection. As such, environmental degradation and unsustainable use of natural resources is keeping Malawians in poverty and poses a real threat for those that have come out of poverty to fall back into its grip. Despite some improvements in poverty levels in recent years the poverty-environment nexus continues to substantially inhibit the achievement of poverty reduction and other development goals. Poverty in Malawi is also closely linked to rural development, demographics and prevalence of HIV/AIDS.

Moreover, unsustainable agricultural practices resulting in land degradation and soil erosion reduces agricultural productivity and makes it more difficult to meet food security needs. Deforestation rates continue to be high, 98.7% of the population depend on solid fuels (fuel wood and charcoal) to meet their energy needs. Forest cover decreased from 41% in 1990 to 35% in 2008, and deforestation continues unabated (at some 2.8% / year) and is the highest in the SADC region. This is an example of how poverty is putting pressure on the environment, as poor people cannot afford paraffin or electricity and instead turn to firewood for fuel, which in turn can have a negative impact on agriculture production through, for example, deforestation related soil erosion.

While the links between poverty and sustainable environment, natural resource and climate (ENRC) management have been partly explored in previous studies5 there is a need to quantify those linkages in terms of the impact on poverty and to identify policy options to accelerate poverty reduction through the more sustainable use of ENR. The insufficient detailed identification of the links between sustainable ENR use and poverty reduction contributes towards sub-optimal policies and insufficient budgets being allocated for sustainable ENR use that would help reduce poverty and contribute to economic growth.

The timing of such an analysis is opportune as the newly elected Government of Malawi (GoM) has noted that Malawians have not yet fully benefitted from the country's natural resources largely due to the lack of a coherent and up-to-date land and natural resources and environmental policy coupled by the lack of adequate financing and investments.6 The indication that a comprehensive review of ENR policies and related financing and investment programme is to be undertaken in the foreseeable future calls for more detailed analysis of poverty and ENRC linkages in macro and disaggregated terms. Detailed evidence on how more sustainable ENR use could help reduce poverty and achieve other development goals in Malawi will substantively increase the probability of the GoM designing effective policies and programmes and increase public allocations for pro-poor sustainable management of natural resources. By further defining the poverty-environment nexus in Malawi new pathways for moving out of poverty can be identified.

It is in this context that the UNDP-UNEP Poverty-Environment Initiative (PEI) Malawi, as part of its support to the GoM towards the implementation of the MDGS II, is seeking to contract a consulting firm or consortium to quantify identified ENRC-poverty linkages in Malawi in terms of the impact on poverty and identify policy options to accelerate poverty reduction through the more sustainable use of ENR.

The analysis will draw on previous studies identifying ENRC-poverty links7 including the PEI supported economic valuation of sustainable and unsustainable natural resource management in Malawi and the national and district state of environment reports. The analysis has to be set within the context of the national policy and institutional framework that relates to poverty and the sustainable management of ENR.

The study shall also have an important process function – acting as a platform for longer term Government-led stakeholder dialogue and learning involving the public sector, academia, civil society and international development partners. The primary intended users of the study are Ministry of Finance, Economic Planning and Development (MFEPD), Ministry of Natural Resources, Energy and Mining (MoNREM) and UNDP and UNEP. Other possible users of the study are relevant ministries and state institutions such as the National Statistical Organization (NSO), Ministry of Agriculture, Irrigation and Water Development (MoAIWD); Ministry of Local Government and Rural Development (MoLGRD); UN agencies, donor community, academia, researchers and civil society.

Since 2009 the joint UNDP-UNEP PEI has supported the Government of Malawi to integrating sustainable natural resources management into national and sector policy, planning and budget processes by providing economic evidence and capacity support. This consultancy contributes to the implementation of the activities under the GoM-PEI Project Document 2014-2017.8

2. Objectives of the Consultancy

The objective of the assignment is to quantify identified ENRC-poverty links in Malawi in terms of the impact on poverty and to identify policy options to accelerate poverty reduction through the more sustainable use of ENR. Quantifying the linkages will imply analysis of how unsustainable natural resource use and environmental degradation impact on poverty levels including broader indicators such as income, health, food security and gender disparities (time women spend on water/firewood collection, access to education, etc.).

The analysis with its recommendations aims to support policy makers to better incorporate poverty-environment objectives in policies, plans and budget processes in such a way that it can contribute to poverty reduction, economic growth and the achievement of development goals.

3. Scope of Work and Tasks under the Consultancy

The consultancy assignment will draw on previous studies and existing policy frameworks and the work will be undertaken at the sector and district level with analysis at the macro level.

i. Analysis of Poverty-Environment Linkages and Policy Landscape in Malawi

Review identified poverty-environment linkages in Malawi and identify potential gaps: The consulting firm or consortium will review previous research (including methodology), relevant government UN and donor reports already identifying poverty-environment linkages in order to inform step (ii) of the assignment. The consultants will identify potential gaps in existing research, and if required explore additional poverty-environment linkages. The nature of poverty-environment linkages should be examined as a multidimensional, cross-cutting issue and disaggregated impacts including gender should be considered.

Review policy landscape: The consulting firm or consortium will examine the current policy landscape and institutional arrangements for pro-poor sustainable

natural resource and climate management to identify where improvements could be made including the extent to which these arrangements are coherent with national development and poverty reduction strategies and policies. The consulting firm or consortium will review the inclusion and implementation of general poverty9 and poverty-environment objectives in GoM development planning at national, sector and district level, including the use of poverty impact assessment in relevant ENR policy and programme design and decision-making procedures. The firm or consortium will do so in order to obtain a clear picture of what has been planned and implemented and outline barriers to improved inclusion and/or implementation of poverty-environment objectives and impact assessment tools.

ii. Quantifying Poverty-Environment Linkages at Sector and District Level and Assess Implications for the Achievement of Poverty Reduction

Quantify the poverty and broader development costs of unsustainable agriculture, forestry and water/fishery[10] practices and the poverty and development benefits of more sustainable use of these resources. The consulting firm or consortium should measure: a) both first order and multiplier impacts of costs and include gender disaggregation; b) per capita and household incomes, production and employment derived from the resource; c) per capita and household non-market benefits including on health, education attendance and food security derived from the resource.

Measure the magnitude and trends applicable to the above linkages and dependencies in targets districts.11 The consultants should sample household level data including in terms of: a) sustainability; b) production levels and productivity, incomes, food security, access to water, energy etc.; c) assess the broader impact on human well-being (i.e. on health, school attendance etc.) and; d) gender impacts.

Identify the implications for poverty reduction of sustainable ENR. Based on the sector and district work calculate the potential poverty reduction benefits of sustainable ENR use at the national levels including multiplier/general equilibrium impacts. Identify links, causality, trends and implications for achievement of poverty reduction and other development goals. Include identification of gender impacts.

iii. Policy Recommendations

Provide recommendations to increase poverty reduction through more sustainable use of ENR

Based on the review in step (i) and the analysis in step (ii) the consulting firm or consortium should a) identify priority ENR sustainability policy and programme interventions for reducing poverty; b) provide recommendations and a strategic action plan for how GoM can enhance the inclusion of poverty reduction in its policy and programme development and implementation with a focus on the sectors examined and the ENR sector as a whole.

iv. Outreach

Prepare a strategy to maximize the impact of the study findings. The consultants

will provide policy briefs using the PEI template: a) summarizing the key messages and policy recommendations of the study as a whole including recommendations on the use of poverty methodologies and tools b) separate policy briefs for the 3 sectors c) district policy brief.

Present findings. The consulting firm or consortium is expected to present the study to the Government, media, donors and key stakeholders through a stakeholder media and press brief with the support of the PEI team.

4. Methodology & Reporting Framework

The consulting firm or consortium will design an appropriate methodology to carry out the assignment which will include:

- Adequate participation of key stakeholders in ministries and relevant public sector agencies,
- Use of both quantitative and qualitative as well as primary and secondary data to identify and quantify poverty-environment linkages and provide policy recommendations
- Quantitative analysis such as econometric-optimization based Computational General Equilibrium (CGE) modelling or other relevant approach

The consultancy assignment should be undertaken with strong collaboration between the GOM, UNDP CO and the consultant(s), and efforts should be made to ensure ownership of the process and conclusions and recommendations by the GOM.

The consultancy will be under the overall supervision of Ministry of Finance, Economic Planning and Development (MFEPD) and report to the PEI Technical Adviser and National Coordinator in conjunction with UNDP Malawi and PEI Africa. UNDP Malawi, PEI Malawi and PEI Africa will provide the consultant with technical support and facilitate communication with relevant stakeholders. UNDP Malawi will arrange transport and travel for the district work.

Reporting schedule with deliverables

Task number	Task number	Task number	Task number
1.	Develop a detailed plan of the project execution explaining the approach and methodology of the study	Inception report (produce after signing the contract)	10 days
2.	Undertake relevant deskwork and stakeholder consultations for the study		Month 1
3.	Field work and data collection for the activities mentioned in the scope of the study covering (i) analysis of poverty-environment linkages and policy landscape in Malawi; (ii) quantifying poverty-environment linkages at sector and district level and assess implications for the achievement of poverty reduction; and (iii) policy recommendations	Mission report	Month 2
4.	Prepare a documentation with analysis and findings covering pointi-iii of the scope of work and submission of the data collected	First Draft Report	Month 3
5.	Facilitate and document stakeholder's inputs through national validation workshop. (This is to be undertaken during the second mission)	Revised report with incorporation of inputs and feedback from stakeholders workshop	Month 4
6.	Prepare the final draft of study	Final version of the report · electronically in several formats: · WORD document	Month 5
7.	Prepare 4 targeted policy briefs based on the findings of the study using PEI policy brief template	Policy brief	Month 5

5. Deliverables

- Inception report after 10 days of signing the contract explaining the approach and methodology of the study including timelines
- Draft report covering point i-iii of the scope of work and submission of the data collected
- Facilitate work sessions/workshops related to the assignment, and make presentations on the methodology, findings and recommendations
- Final report incorporating stakeholder feedback
- 4 policy briefs using the PEI template as specified in point iv scope of work

6. Payment Schedule

- 20 % upon submission and clearance of the inception report
- 20 % upon submission and clearance of the draft report
- 40 % upon submission and clearance of the final report
- 20 % upon submission and clearance of 4 policy briefs

7. Timeline and Travel

It is estimated that the consultant firm (or consortium) will require a maximum of 80 person days in total by a team of three consultants, one of whom should be a national, to undertake the assignment over a five month period. It is planned that the assignment will commence on 20 October 2014 and end by 20 March 2015.

Interested consulting firms (or consortiums) shall include a work plan indicating key activities and milestones as part of their technical proposal. The work plan should also indicate the total number of proposed consultant days broken down by members of the consultancy firm or consortium.

The consulting firm or consortium will be responsible for all travel (including international and national travel) and related costs. The assignment is expected to require two (2) missions to Malawi; in total 60 working days in Malawi and 20 working days outside Malawi split amongst the 3 consultants.

8. Qualifications and competencies of the consulting firm or consortium

The consulting firm or consortium should include three (3) technical specialists (one of whom should be a national) covering a set of competencies and expertise required for the assignment as listed below. The three experts are a) Development Policy and Planning Expert; b) Public Finance Management Expert and c) Natural Resources and Environmental Economist.

Development Planning Expert

- A post graduate university degree (Master's) in development economics, social sciences or other related field
- At least 10 years of professional experience working on issues related to sustainable development policy analysis; integrating poverty reduction into national, subnational and sectoral development policy and planning processes in support of achieving sustainable development; and cross-sectoral strategic planning to Government institutions and senior staff.
- Demonstrated competence in poverty assessments, which includes gender elements, and incorporation of poverty reduction in national strategies and policies, programmes and projects;

- Experience with multi-dimensional poverty indicators preferable;
- Demonstrated skills in statistical research and policy analysis and detailed knowledge of econometric and statistical tools applied in the context of environment-poverty analysis;
- Sound understanding of the poverty-environment nexus in the Africa context, and in particular in a cross-sectoral and integrated approach, preferably within the Malawian context
- Strong pro-active leadership skills, including strong interpersonal skills with ability to multi-task and maintain effective work relationships in a multi- cultural environment.
- Excellent communication skills with ability to express ideas clearly, concisely and effectively, orally and in writing.
- Fluency in English

Public Finance Management Expert

- A post graduate university degree (Master's) in public financial management, public accounting, economics or other related field
- At least 10 years of professional experience work in issues related to public administration, in particular public expenditure reviews and public sector budgeting and expenditure management, public policy and preferably linking sustainable development processes with public development planning and budgeting processes
- Demonstrated competence in poverty assessments, which includes gender elements, and incorporation of poverty reduction in national strategies and policies, programmes and projects;
- Experience with multi-dimensional poverty indicators preferable;
- Demonstrated skills in statistical research and policy analysis and detailed knowledge of econometric and statistical tools applied in the context of environment-poverty analysis;
    - Sound understanding of the poverty-environment nexus in the Africa context, and in particular in a cross-sectoral and integrated approach, preferably within the Malawian context
    - Strong pro-active leadership skills, including strong interpersonal skills with ability to multi-task and maintain effective work relationships in a multi- cultural environment.
    - Excellent communication skills with ability to express ideas clearly, concisely and effectively, orally and in writing.
    - Fluency in English

Natural Resources and Environmental Economist

- A post graduate university degree (Master's) in development economics, natural resources, environment, poverty studies or related development field;
- At least 10 years of professional experience working on issues of economic and poverty assessment and valuations in the context of ENR management and development planning in a developing country context; application of cost-benefit analysis and scenario analysis in context of ecosystems and natural resources for development planning; and/or natural capital valuation, environmental accounting and payment for environmental services.
- Demonstrated competence in poverty assessments, which includes gender elements, and incorporation of poverty reduction in national strategies and policies, programmes and projects;
- Experience with multi-dimensional poverty indicators preferable;
- Demonstrated skills in statistical research and policy analysis and detailed knowledge of econometric and statistical tools applied in the context of environment-poverty analysis;
- Sound understanding of the poverty-environment nexus in the Africa context, and in particular in a cross-sectoral and integrated approach, preferably within the Malawian context
- Strong pro-active leadership skills, including strong interpersonal skills with ability to multi-task and maintain effective work relationships in a multi- cultural environment.
- Excellent communication skills with ability to express ideas clearly, concisely and effectively, orally and in writing.
- Fluency in English

9. Technical and Financial Proposal Requirements

The consulting firm should submit technical proposal including the following documentation:

1. Profile of the company, structure, leadership, descriptions of pervious collaboration
2. Proposed Methodology, Approach and Implementation of the TOR
3. Letters of good performance from 3 former collaborators
4. Detailed schedule of implementation of total 80 working days divided among three experts
5. CVs of Proposed team(3 CVs)

Financial proposal as defined in RFP

10. Submission of Proposal

Application Process:
All applications including CV, technical and financial proposals may be submitted at or before 17:00 hour's local time on 28th September 2014 via email or courier mail to the address below:

United Nations Development Programme,
Plot 7, Area 40, P.O Box 30135, Lilongwe, Malawi.
Susan Mkandawire- Procurement Associate
procurement.mw@undp.org

ANNEX 2: Additional analytical information

Table A.1: A Review of inclusion and implementation of general poverty and poverty-environment objectives in the Malawi Government development planning and impact assessment

Policy Objectives	Strategies	Planned/Expected Outputs for the 2014-2015 Fiscal Year	Extent of inclusion of gender, poverty, poverty-environment objectives and use of impact assessment
Office of the President and Cabinet (OPC) (i) To direct and coordinate disaster management programmes (ii) To initiate and facilitate the development of policies and monitor implementation (iii) To define mandates and scope of work for ministries, departments and agencies (iv) To legalize and institutionalize universal compulsory registration of births, adults and deaths (v) To ensure sound policy and legal frameworks for effective implementation and national development agenda	(i) Build capacity at district level for effective implementation of disaster management affairs (ii) Ensure that government policies enhance the political and socio-economic development of the country (iii) Facilitate dialogue between and stakeholders on performance of government business (iv) Ensure that regulations are understood by the general public and relevant stakeholders by distributing information and conducting sensitization meetings (v) Provide strategic leadership in the management of professional, accountable, effective, well-motivated, responsive and non-partisan public service	(i) 3.5 million national identity cards, 4.5 million birth certificates and 300,000 death certificates issued (ii) Implementation and coordination of disaster risk reduction activities by district councils; (iii) Review the District Contingency Plans, etc. (iv) Irrigation Scheme construction at Chikhwawa, Karonga, and Malombe Irrigation Schemes (v) Sound Policy and legal frameworks for effective implementation of national development (vi) Provide advice to the President and Cabinet (vii) Public Service Ministries and Departments to be assessed on Organization Performance Agreements (OPA)	(i) The objectives, strategies and planned outputs for the OPC do not provide gender-disaggregated information (ii) No reference to poverty reduction (income, productivity, food security, health and access to water) outcomes (iii) The OPC, which is responsible for defining the mandates and function of ministries and ensuring effective coordination of government activities, is implementing irrigation development activities which fall under the Ministry of Agriculture, Irrigation and Water Development (iv) There is no reference to poverty-environmental issues (v) No mention of impact assessment or impact assessment tools as being a guiding framework for the

Policy Objectives	Strategies	Planned/Expected Outputs for the 2014-2015 Fiscal Year	Extent of inclusion of gender, poverty, poverty-environment objectives and use of impact assessment
			objectives, strategies and planned activities and outputs.
Ministry of Finance, Economic Planning and Development (i) To improve economic policy formulation, planning and analysis (ii) To improve human and institutional capacity, efficiency, effectiveness of the ministry (iii) To reduce poverty and enable the poor move out of poverty and vulnerability (iv) To strengthen coordination of the national M&E system for evidence-based development planning, budgeting and implementation (v) To improve development planning, implementation and coordination	(i) Enhance stakeholder consultations in policy formulation and promote research for evidence-based policy planning (ii) Strengthen mechanisms for filling in positions and management of economists in the economic common service (iii) Enhance planning and coordination of social protection policies and programmes (iv) Build national-, local- and community-level capacity for impact assessments, policy analysis and MGDS II implementation monitoring (v) Prepare public sector investment programme, ensuring that all development projects and programmes are in line with national development priorities	(i) **Economic Planning & Development**: Strengthen sector working groups, conduct sector policy analysis, align strategic plans for ministries to MGDSII, conduct MGDSII review for successor strategy, PSIP formulated and implemented (ii) **Capacity-building**: train 5 officers in project management, 2 of whom at master's level (iii) **Coordination of National Population Policy**: National Population Action Plan developed and policy implemented (iv) **Development Effectiveness and Accountability**: Institutions utilize results-based management (RBM) systems and M&E (v) Developing macro-model for MGDSII Phase 3	(i) No reference to gender in objectives, strategies and planned outputs (ii) No reference to poverty-environment in the ministry's programming despite being the host institution for the PEI initiative (iii) Impact assessment and policy analysis well recognized as a planning strategy. However, the exact impact assessment and policy analysis tools to be used are not highlighted; not sure whether the macro-model for MGDSII serves that purpose.
Ministry of Natural Resources, Energy and Mining (i) Improve delivery of management and technical services in environment, climate	(i) Enhancing capacity in environment, natural resources and	(i) 10 automatic weather stations procured and installed (ii) 4,500 ha replanted	(i) While ENR management issues are well highlighted and prioritized, the poverty reduction

Policy Objectives	Strategies	Planned/Expected Outputs for the 2014-2015 Fiscal Year	Extent of inclusion of gender, poverty, poverty-environment objectives and use of impact assessment
change and environmental affairs (ii) Improve environment, climate change, forest and other natural resources status in Malawi; (iii) Increase management and productivity of the environment, climate change, forest and other natural resources (iv) Improve weather predictions and national early warning (v) Improve adoption of climate change adaptation and mitigation measures	management and climate change management (ii) Strengthening legislations in environment, natural resource management programmes (iii) Conserving and protecting natural and customary woodlands (iv) Improving monitoring and evaluation of environment and natural resources management and climate change management programmes (v) Developing and promoting Nationally Appropriate Mitigation Actions (NAMAs), amongst others	(iii) 30 development projects undergo Environmental Impact Assessment (EIAs) (iv) Manage the existing 1.1 million ha of forest reserves and plantations (v) Environment, climate change and natural resource management regulatory framework is improved (vi) Waste management strategy is developed	impacts of implementation of such issues are not clearly indicated (ii) No reference to gender targets in ENR management and climate change activities (iii) The role of impact assessment and impact assessment tools that are to be used have not been discussed
Ministry of Agriculture, Irrigation and Water Development (i) To manage water resources in an integrated manner (ii) To increase land under irrigation farming (iii) To increase availability and accessibility of water supply for socio-economic growth and development (iv) To increase fish production (v) To increase livestock production (vi) To reduce land degradation	(i) Construction and rehabilitation of boreholes, managing and monitoring water body catchment areas (ii) Identify areas for potential irrigation agriculture (iii) Undertake rehabilitation of existing community water supply schemes (iv) Enhancing fish productivity (v) Enhancing fish livestock productivity	(i) Smallholder irrigation farming increased to 50,000 ha and commercial irrigation farming also increased to 50,000 ha (ii) 650,000 km of streams/river banks protected for sustainable land use (iii) 150,000 mt of fertilizers distributed to 1.5 million farm families (iv) Rehabilitate 15 dip tanks	(i) ENR management objectives articulated (ii) However, the poverty reduction impacts no highlighted. For instance, while productivity has been highlighted as one of the objectives, food security, health and access to water targets are not highlighted. (iii) Gender targets not included in the objectives, strategies and outputs

Policy Objectives	Strategies	Planned/Expected Outputs for the 2014-2015 Fiscal Year	Extent of inclusion of gender, poverty, poverty-environment objectives and use of impact assessment
(vii) To increase smallholder farmers' output per unit area (viii) To ensure food self-sufficiency and sustained availability	(vi) Promoting soil and water conservation technologies (vii) Improving access to inputs, providing effective extension services and appropriate technology adoption development, transfer and absorption (viii) Promote income generating activities and dietary diversification	(v) Design and construct water schemes in different parts of the country (vi) Implement 2,838 research-led trials and on-farm demonstrations	(iv) No mention of impact assessment, let alone the impact assessment tools employed for that purpose
Ministry of Land and Housing (i) To improve access to equitable to land and tenure security for socio-economic development (ii) To improve land use planning and management to ensure orderly and coordinated physical development on land (iii) To improve provision of geospatial information for sustainable management of land and land-based resources (iv) To improve access to affordable and decent housing by all income groups (v) To improve delivery of building service	(i) Create public awareness about land-related laws, policies and procedures (ii) Develop capacity for decentralized land administration (iii) Provide land ownership, management and title registration to ensure tenure security (iv) Review physical development planning standards, management guidelines and legal framework (v) Develop mechanisms for widespread dissemination of geographical information and digital mapping services	(i) 1,100 land parcels/plots allocated to developers (ii) 24 physical development plans prepared (iii) 380 km of international boundary surveyed (iv) 30 building designs produced	(i) Gender targets missing in objectives, strategies and outputs (ii) Poverty reduction implications (e.g., incomes, food security, productivity) of the stated objectives, strategies and outputs are not clearly indicated. (iii) Impact assessment of the objectives and strategies not discussed, hence it is difficult to discern the impact assessment tools being employed.

Policy Objectives	Strategies	Planned/Expected Outputs for the 2014-2015 Fiscal Year	Extent of inclusion of gender, poverty, poverty-environment objectives and use of impact assessment
	(vi) Strengthen institutional, legal and regulatory framework for housing capacity for decentralized housing delivery		
Ministry of Local Government and Rural Development (i) To provide linkages between the central and local governments; (ii) To promote socio-economic development of the rural communities; (iii) To promote and provide policy direction on rural development in Malawi; (iv) To promote an effective system of local governance and development; (v) To provide policy and legal framework for the efficient and effective operations of the councils.	(i) Support the production of local-level planning tools, thus Socio-Economic Profiles (SEPs) and District Development Plans (DDPs) which are aligned to the MGDS II; (ii) Support vulnerable groups in society to access basic needs of life; (iii) Finalize, disseminate and roll out the Integrated Rural Development Strategy; (iv) Provide rural people with capital for investment to stimulate growth; (v) Transform rural areas through creation of a conducive environment for investment to stimulate sustainable economic growth.	(i) Ensure that 35 Councils have functional sub-district structures (ii) 6 markets to be constructed (iii) 4 Rural Growth Centres constructed (iv) 35 monitoring visits to ministry's establishments	(i) The objectives, strategies and outputs have poverty reduction implications (ii) However, specific poverty reduction targets have not been indicated (iii) Gender targets are not included in objectives, strategies and expected outputs (iv) Impact assessment and its related tools have not not discussed.
Ministry of Health (i) To improve equity and efficiency in the delivery of	(i) Promote and strengthen Public-Private Partnership (PPP) for health financing (ii) Strengthen harmonization and alignment of partners for aid effectiveness	(i) Increased coverage of essential health services (ii) 92% TB treatment success rate (iii) 92% of monthly drug deliveries monitored by Facility Health Committees	(i) While some gender targets have been highlighted in the outputs, the gender reporting still leaves out gender groups such as men and youths.

Policy Objectives	Strategies	Planned/Expected Outputs for the 2014-2015 Fiscal Year	Extent of inclusion of gender, poverty, poverty-environment objectives and use of impact assessment
quality Essential Health Package (EHP) services (ii) To reduce risk factors to health (iii) To strengthen the performance of the health system to support delivery of EHP services (iv) To increase coverage of EHP interventions, payment attention to impact and quality	(iii) Promote healthy lifestyles, living and working conditions at all levels (iv) Coordinate and regulate health research (v) Enforcement of minimum norms for infrastructure, staffing, essential medicines, consumables and equipment (vi) Increase coverage of EHP services and improve access through the development of infrastructure	(iv) 75% of pregnant women who slept under insecticide treated net last night increased (v) 86% of households with access to improved sanitation increased	(ii) The income, productivity and food security implications of the health interventions have not been discussed. (iii) Impact assessment processes, let alone tools, have not been discussed.

Tables A.2: Benefit-cost Analyses

Table A.2.1: Forestry income generation public works project benefit-cost analysis

YEAR	US Dollars									
	OUTFLOWS				INFLOWS				NET BENEFITS	Cumulative Net Benefits
	PROJECT COSTS	ORT	OWN-LABOUR COSTS	TOTAL OUTFLOWS	PRIVATE BENEFITS	UTILITES BENEFITS	SOCIAL BENEFITS	TOTAL INFLOWS		
1	(29,207,939)	-	(21,869,191)	**(51,077,130)**	-	-	-	-	**(51,077,130)**	(51,077,130)
2	-	(1,460,397)	(2,757,200)	**(4,217,597)**	9,553,698	2,639,335	8,543,095	**20,736,128**	**16,518,531**	(4,558,599)
3	-	(1,460,397)	(2,757,200)	**(4,217,597)**	9,553,698	2,639,335	8,543,095	**20,736,128**	**16,518,531**	(18,040,068)
4		(1,460,397)	(2,757,200)	**(4,217,597)**	9,553,698	2,639,335	8,543,095	**20,736,128**	**16,518,531**	(1,521,537)
5		(1,460,397)	(2,757,200)	**(4,217,597)**	9,553,698	2,639,335	8,543,095	**20,736,128**	**16,518,531**	14,996,994
6		(1,460,397)	(2,757,200)	**(4,217,597)**	9,553,698	2,639,335	8,543,095	**20,736,128**	**16,518,531**	31,515,525
7		(1,460,397)	(2,757,200)	**(4,217,597)**	9,553,698	2,639,335	8,543,095	**20,736,128**	**16,518,531**	48,034,056
8		(1,460,397)	(2,757,200)	**(4,217,597)**	9,553,698	2,639,335	8,543,095	**20,736,128**	**16,518,531**	64,552,587
9		(1,460,397)	(2,757,200)	**(4,217,597)**	9,553,698	2,639,335	8,543,095	**20,736,128**	**16,518,531**	81,071,118
10		(1,460,397)	(2,757,200)	**(4,217,597)**	9,553,698	2,639,335	8,543,095	**20,736,128**	**16,518,531**	97,589,649
11		(1,460,397)	(2,757,200)	**(4,217,597)**	9,553,698	2,639,335	8,543,095	**20,736,128**	**16,518,531**	114,108,180
12		(1,460,397)	(2,757,200)	**(4,217,597)**	9,553,698	2,639,335	8,543,095	**20,736,128**	**16,518,531**	130,626,711
13		(1,460,397)	(2,757,200)	**(4,217,597)**	9,553,698	2,639,335	8,543,095	**20,736,128**	**16,518,531**	147,145,242
14		(1,460,397)	(2,757,200)	**(4,217,597)**	9,553,698	2,639,335	8,543,095	**20,736,128**	**16,518,531**	163,663,773
15		(1,460,397)	(2,757,200)	**(4,217,597)**	9,553,698	2,639,335	8,543,095	**20,736,128**	**16,518,531**	180,182,304
16		(1,460,397)	(2,757,200)	**(4,217,597)**	9,553,698	2,639,335	8,543,095	**20,736,128**	**16,518,531**	196,700,835
17		(1,460,397)	(2,757,200)	**(4,217,597)**	9,553,698	2,639,335	8,543,095	**20,736,128**	**16,518,531**	213,219,366
18		(1,460,397)	(2,757,200)	**(4,217,597)**	9,553,698	2,639,335	8,543,095	**20,736,128**	**16,518,531**	229,737,897
19		(1,460,397)	(2,757,200)	**(4,217,597)**	9,553,698	2,639,335	8,543,095	**20,736,128**	**16,518,531**	246,256,428
20		(1,460,397)	(2,757,200)	**(4,217,597)**	9,553,698	2,639,335	8,543,095	**20,736,128**	**16,518,531**	262,774,959
TOTAL FLOWS				**(131,211,473)**				**393,986,432**		**262,774,959**
Net Present Value@4%	**159,496**									
Internal Rate of Return	**32%**									

Source: Yarol Gil et al., 2011. Economic valuation of sustainable natural resource use in Malawi and the Public-Private Project on SLM

Table A.2.2: Forest income: generation public works project BCA, private benefits only

YEAR	US Dollars					
	OUTFLOWS			INFLOWS	NET BENEFITS	Cumulative Net Benefits
	PROJECT COSTS	OWN LABOUR COSTS	TOTAL OUTFLOWS	PRIVATE BENEFITS		
1	(29,207,939)	(21,869,191)	**(51,077,130)**	-	**(51,077,130)**	(51,077,130)
2	-	(2,757,200)	**(2,757,200)**	9,553,698	**6,796,498**	(44,280,632)
3	-	(2,757,200)	**(2,757,200)**	9,553,698	**6,796,498**	(37,484,134)
4		(2,757,200)	**(2,757,200)**	9,553,698	**6,796,498**	(30,687,636)
5		(2,757,200)	**(2,757,200)**	9,553,698	**6,796,498**	(3,891,138)
6		(2,757,200)	**(2,757,200)**	9,553,698	**6,796,498**	(17,094,640)
7		(2,757,200)	**(2,757,200)**	9,553,698	**6,796,498**	(10,298,142)
8		(2,757,200)	**(2,757,200)**	9,553,698	**6,796,498**	(3,501,644)
9		(2,757,200)	**(2,757,200)**	9,553,698	**6,796,498**	3,294,854
10		(2,757,200)	**(2,757,200)**	9,553,698	**6,796,498**	10,091,352
11		(2,757,200)	**(2,757,200)**	9,553,698	**6,796,498**	16,887,850
12		(2,757,200)	**(2,757,200)**	9,553,698	**6,796,498**	23,684,348
13		(2,757,200)	**(2,757,200)**	9,553,698	**6,796,498**	30,480,846
14		(2,757,200)	**(2,757,200)**	9,553,698	**6,796,498**	37,277,344
15		(2,757,200)	**(2,757,200)**	9,553,698	**6,796,498**	44,073,842
16		(2,757,200)	**(2,757,200)**	9,553,698	**6,796,498**	50,870,340
17		(2,757,200)	**(2,757,200)**	9,553,698	**6,796,498**	57,666,838
18		(2,757,200)	**(2,757,200)**	9,553,698	**6,796,498**	64,463,336
19		(2,757,200)	**(2,757,200)**	9,553,698	**6,796,498**	71,259,834
20		(2,757,200)	**(2,757,200)**	9,553,698	**6,796,498**	78,056,332
TOTAL FLOWS			**(103,463,930)**	181,520,262	78,056,332	**78,056,332**
Net Present Value@42%				**-24,588,502**		
Financial Internal Rate of Ret				**12%**		

Table A.2.3: Forest income: generation public works project BCA, private benefits only

Case Summaries						
Location (Urban/rural)	Sex of household head for year 2013/2014		Total credit amount obtained in 2013/2014 (MK)	Total credit amount obtained in 2012/2013 (MK)	Total credit amount obtained in 2011/2012 (MK)	Total Credit
Urban	Male	Number of observation	47	25	19	54
		Mean	54670.2128	113040	67421.0526	123638.89
		Minimum	1000	2000	1000	1000
		Maximum	700000	1100000	500000	1300000
		Std. Deviation	112443.33242	240493.49957	126091.81654	289353.939
	Female	Number of observation	10	9	9	14
		Mean	74700	67222.2222	75555.5556	145142.86
		Minimum	15000	5000	10000	10000
		Maximum	500000	450000	500000	1450000
		Std. Deviation	149773.19891	143877.35904	159598.01934	377238.316
	Total	Number of observation	57	34	28	68
		Mean	58184.2105	100911.7647	70035.7143	128066.18
		Minimum	1000	2000	1000	1000
		Maximum	700000	1100000	500000	1450000
		Std. Deviation	118532.49372	217951.11596	134764.67340	306463.140
Rural	Male	Number of observation	142	83	45	157
		Mean	30964.7887	21209.6386	19693.3333	44863.69
		Minimum	500	1000	200	1800
		Maximum	500000	100000	100000	615000
		Std. Deviation	51537.56077	20955.50812	21667.84799	68222.732
	Female	Number of observation	20	10	7	22
		Mean	72800	53400	53571.4286	107500
		Minimum	2000	10000	5000	2000
		Maximum	550000	250000	250000	784000
		Std. Deviation	127635.83064	70111.34002	87933.41637	195757.564
	Total	Number of observation	162	93	52	179
		Mean	36129.6296	24670.9677	24253.8462	52562.01
		Minimum	500	1000	200	1800
		Maximum	550000	250000	250000	784000
		Std. Deviation	66627.84366	31189.69165	38092.78899	95002.164
Total	Male	Number of observation	189	108	64	211
		Mean	36859.7884	42466.6667	33862.5	65024.17
		Minimum	500	1000	200	1000
		Maximum	700000	1100000	500000	1300000
		Std. Deviation	72050.42761	121751.97939	73168.02038	160547.846
	Female	Number of observation	30	19	16	36
		Mean	73433.3333	59947.3684	65937.5	122138.89
		Minimum	2000	5000	5000	2000
		Maximum	550000	450000	500000	1450000
		Std. Deviation	132800.0009	108205.29546	129632.54157	276037.177
	Total	Number of observation	219	127	80	247
		Mean	41869.863	45081.8898	40277.5	73348.58
		Minimum	500	1000	200	1000
		Maximum	700000	1100000	500000	1450000
		Std. Deviation	83557.06343	119582.85725	87331.16656	182352.243

Table A.2.4: CBA for the Shire River Basin Sustainable Land Management Project with private benefits only

Main use of River & Lakes in 2012-2014				Name of region			Total
				South	Central	North	
Domestic use	Year	2013/2014	Count	182	76	63	321
			% within Year	56.70%	23.70%	19.60%	100.00%
			% of Total	19.20%	8.00%	6.60%	33.90%
		2012/2013	Count	178	76	62	316
			% within Year	56.30%	24.10%	19.60%	100.00%
			% of Total	18.80%	8.00%	6.50%	33.30%
		2011/2012	Count	175	74	62	311
			% within Year	56.30%	23.80%	19.90%	100.00%
			% of Total	18.50%	7.80%	6.50%	32.80%
	Total		Count	535	226	187	948
			% within Year	56.40%	23.80%	19.70%	100.00%
			% of Total	56.40%	23.80%	19.70%	100.00%
Food	Year	2013/2014	Count	2		3	5
			% within Year	40.00%		60.00%	100.00%
			% of Total	12.50%		18.80%	31.20%
		2012/2013	Count	2		3	5
			% within Year	40.00%		60.00%	100.00%
			% of Total	12.50%		18.80%	31.20%
		2011/2012	Count	3		3	6
			% within Year	50.00%		50.00%	100.00%
			% of Total	18.80%		18.80%	37.50%
	Total		Count	7		9	16
			% within Year	43.80%		56.20%	100.00%
			% of Total	43.80%		56.20%	100.00%
Income	Year	2013/2014	Count	7	3	8	18
			% within Year	38.90%	16.70%	44.40%	100.00%
			% of Total	14.30%	6.10%	16.30%	36.70%
		2012/2013	Count	7	3	7	17
			% within Year	41.20%	17.60%	41.20%	100.00%
			% of Total	14.30%	6.10%	14.30%	34.70%
		2011/2012	Count	4	3	7	14
			% within Year	28.60%	21.40%	50.00%	100.00%
			% of Total	8.20%	6.10%	14.30%	28.60%
	Total		Count	18	9	22	49
			% within Year	36.70%	18.40%	44.90%	100.00%
			% of Total	36.70%	18.40%	44.90%	100.00%
Housing	Year	2013/2014	Count	1			1
			% within Year	100.00%			100.00%
			% of Total	33.30%			33.30%
		2012/2013	Count	1			1
			% within Year	100.00%			100.00%
			% of Total	33.30%			33.30%
		2011/2012	Count	1			1
			% within Year	100.00%			100.00%
			% of Total	33.30%			33.30%
	Total		Count	3			3
			% within Year	100.00%			100.00%
			% of Total	100.00%			100.00%
Agricultural production	Year	2013/2014	Count	40	48	26	114
			% within Year	35.10%	42.10%	22.80%	100.00%
			% of Total	11.70%	14.10%	7.60%	33.40%
		2012/2013	Count	41	48	25	114
			% within Year	36.00%	42.10%	21.90%	100.00%
			% of Total	12.00%	14.10%	7.30%	33.40%
		2011/2012	Count	40	48	25	113
			% within Year	35.40%	42.50%	22.10%	100.00%
			% of Total	11.70%	14.10%	7.30%	33.10%
	Total		Count	121	144	76	341
			% within Year	35.50%	42.20%	22.30%	100.00%
			% of Total	35.50%	42.20%	22.30%	100.00%
Transportation	Year	2013/2014	Count	1			1
			% within Year	100.00%			100.00%
			% of Total	100.00%			100.00%
	Total		Count	1			1
			% within Year	100.00%			100.00%
			% of Total	100.00%			100.00%
Total	Year	2013/2014	Count	233	127	100	460
			% within Year	50.70%	27.60%	21.70%	100.00%
			% of Total	17.20%	9.40%	7.40%	33.90%
		2012/2013	Count	229	127	97	453
			% within Year	50.60%	28.00%	21.40%	100.00%
			% of Total	16.90%	9.40%	7.10%	33.40%
		2011/2012	Count	223	125	97	445
			% within Year	50.10%	28.10%	21.80%	100.00%
			% of Total	16.40%	9.20%	7.10%	32.80%
	Total		Count	685	379	294	1358
			% within Year	50.40%	27.90%	21.60%	100.00%
			% of Total	50.40%	27.90%	21.60%	100.00%

Table A.4: Rural and peri-urban households main use of rivers & lakes for the three years: 2012-2014

Main use of River & Lakes in 2012-2014				Name of region			Total
				South	Central	North	
Domestic use	Year	2013/2014	Count	182	76	63	321
			% within Year	56.70%	23.70%	19.60%	100.00%
			% of Total	19.20%	8.00%	6.60%	33.90%
		2012/2013	Count	178	76	62	316
			% within Year	56.30%	24.10%	19.60%	100.00%
			% of Total	18.80%	8.00%	6.50%	33.30%
		2011/2012	Count	175	74	62	311
			% within Year	56.30%	23.80%	19.90%	100.00%
			% of Total	18.50%	7.80%	6.50%	32.80%
	Total		Count	535	226	187	948
			% within Year	56.40%	23.80%	19.70%	100.00%
			% of Total	56.40%	23.80%	19.70%	100.00%
Food	Year	2013/2014	Count	2		3	5
			% within Year	40.00%		60.00%	100.00%
			% of Total	12.50%		18.80%	31.20%
		2012/2013	Count	2		3	5
			% within Year	40.00%		60.00%	100.00%
			% of Total	12.50%		18.80%	31.20%
		2011/2012	Count	3		3	6
			% within Year	50.00%		50.00%	100.00%
			% of Total	18.80%		18.80%	37.50%
	Total		Count	7		9	16
			% within Year	43.80%		56.20%	100.00%
			% of Total	43.80%		56.20%	100.00%
Income	Year	2013/2014	Count	7	3	8	18
			% within Year	38.90%	16.70%	44.40%	100.00%
			% of Total	14.30%	6.10%	16.30%	36.70%
		2012/2013	Count	7	3	7	17
			% within Year	41.20%	17.60%	41.20%	100.00%
			% of Total	14.30%	6.10%	14.30%	34.70%
		2011/2012	Count	4	3	7	14
			% within Year	28.60%	21.40%	50.00%	100.00%
			% of Total	8.20%	6.10%	14.30%	28.60%
	Total		Count	18	9	22	49
			% within Year	36.70%	18.40%	44.90%	100.00%
			% of Total	36.70%	18.40%	44.90%	100.00%
Housing	Year	2013/2014	Count	1			1
			% within Year	100.00%			100.00%
			% of Total	33.30%			33.30%
		2012/2013	Count	1			1
			% within Year	100.00%			100.00%
			% of Total	33.30%			33.30%
		2011/2012	Count	1			1
			% within Year	100.00%			100.00%
			% of Total	33.30%			33.30%
	Total		Count	3			3
			% within Year	100.00%			100.00%
			% of Total	100.00%			100.00%
Agricultural production	Year	2013/2014	Count	40	48	26	114
			% within Year	35.10%	42.10%	22.80%	100.00%
			% of Total	11.70%	14.10%	7.60%	33.40%
		2012/2013	Count	41	48	25	114
			% within Year	36.00%	42.10%	21.90%	100.00%
			% of Total	12.00%	14.10%	7.30%	33.40%
		2011/2012	Count	40	48	25	113
			% within Year	35.40%	42.50%	22.10%	100.00%
			% of Total	11.70%	14.10%	7.30%	33.10%
	Total		Count	121	144	76	341
			% within Year	35.50%	42.20%	22.30%	100.00%
			% of Total	35.50%	42.20%	22.30%	100.00%
Transportation	Year	2013/2014	Count	1			1
			% within Year	100.00%			100.00%
			% of Total	100.00%			100.00%
	Total		Count	1			1
			% within Year	100.00%			100.00%
			% of Total	100.00%			100.00%
Total	Year	2013/2014	Count	233	127	100	460
			% within Year	50.70%	27.60%	21.70%	100.00%
			% of Total	17.20%	9.40%	7.40%	33.90%
		2012/2013	Count	229	127	97	453
			% within Year	50.60%	28.00%	21.40%	100.00%
			% of Total	16.90%	9.40%	7.10%	33.40%
		2011/2012	Count	223	125	97	445
			% within Year	50.10%	28.10%	21.80%	100.00%
			% of Total	16.40%	9.20%	7.10%	32.80%
	Total		Count	685	379	294	1358
			% within Year	50.40%	27.90%	21.60%	100.00%
			% of Total	50.40%	27.90%	21.60%	100.00%

Table A.5: Rural and peri-urban household main use of forestry for the three years: 2012-2014

q12.3 Main use of forestry (trees and grass) in 2013/2014				Name of region			Total
				South	Central	North	
Domestic use	Year	2013/2014	Count	172	115	91	378
			% within Year	45.50%	30.40%	24.10%	100.00%
			% of Total	15.50%	10.30%	8.20%	34.00%
		2012/2013	Count	165	116	87	368
			% within Year	44.80%	31.50%	23.60%	100.00%
			% of Total	14.80%	10.40%	7.80%	33.10%
		2011/2012	Count	167	113	87	367
			% within Year	45.50%	30.80%	23.70%	100.00%
			% of Total	15.00%	10.20%	7.80%	33.00%
	Total		Count	504	344	265	1113
			% within Year	45.30%	30.90%	23.80%	100.00%
			% of Total	45.30%	30.90%	23.80%	100.00%
Food source	Year	2013/2014	Count	1	1	1	3
			% within Year	33.30%	33.30%	33.30%	100.00%
			% of Total	7.70%	7.70%	7.70%	23.10%
		2012/2013	Count	1	2	1	4
			% within Year	25.00%	50.00%	25.00%	100.00%
			% of Total	7.70%	15.40%	7.70%	30.80%
		2011/2012	Count	5	0	1	6
			% within Year	83.30%	0.00%	16.70%	100.00%
			% of Total	38.50%	0.00%	7.70%	46.20%
	Total		Count	7	3	3	13
			% within Year	53.80%	23.10%	23.10%	100.00%
			% of Total	53.80%	23.10%	23.10%	100.00%
Income	Year	2013/2014	Count	64	47	10	121
			% within Year	52.90%	38.80%	8.30%	100.00%
			% of Total	18.40%	13.50%	2.90%	34.80%
		2012/2013	Count	61	45	11	117
			% within Year	52.10%	38.50%	9.40%	100.00%
			% of Total	17.50%	12.90%	3.20%	33.60%
		2011/2012	Count	56	45	9	110
			% within Year	50.90%	40.90%	8.20%	100.00%
			% of Total	16.10%	12.90%	2.60%	31.60%
	Total		Count	181	137	30	348
			% within Year	52.00%	39.40%	8.60%	100.00%
			% of Total	52.00%	39.40%	8.60%	100.00%
Housing	Year	2013/2014	Count	108	61	37	206
			% within Year	52.40%	29.60%	18.00%	100.00%
			% of Total	17.40%	9.80%	6.00%	33.20%
		2012/2013	Count	109	62	38	209
			% within Year	52.20%	29.70%	18.20%	100.00%
			% of Total	17.60%	10.00%	6.10%	33.70%
		2011/2012	Count	107	61	37	205
			% within Year	52.20%	29.80%	18.00%	100.00%
			% of Total	17.30%	9.80%	6.00%	33.10%
	Total		Count	324	184	112	620
			% within Year	52.30%	29.70%	18.10%	100.00%
			% of Total	52.30%	29.70%	18.10%	100.00%
Agricultural production	Year	2013/2014	Count	1	2		3
			% within Year	33.30%	66.70%		100.00%
			% of Total	14.30%	28.60%		42.90%
		2012/2013	Count	1	1		2
			% within Year	50.00%	50.00%		100.00%
			% of Total	14.30%	14.30%		28.60%
		2011/2012	Count	1	1		2
			% within Year	50.00%	50.00%		100.00%
			% of Total	14.30%	14.30%		28.60%
	Total		Count	3	4		7
			% within Year	42.90%	57.10%		100.00%
			% of Total	42.90%	57.10%		100.00%
Total	Year	2013/2014	Count	346	226	139	711
			% within Year	48.70%	31.80%	19.50%	100.00%
			% of Total	16.50%	10.80%	6.60%	33.80%
		2012/2013	Count	337	226	137	700
			% within Year	48.10%	32.30%	19.60%	100.00%
			% of Total	16.00%	10.80%	6.50%	33.30%
		2011/2012	Count	336	220	134	690
			% within Year	48.70%	31.90%	19.40%	100.00%
			% of Total	16.00%	10.50%	6.40%	32.80%
	Total		Count	1019	672	410	2101
			% within Year	48.50%	32.00%	19.50%	100.00%
			% of Total	48.50%	32.00%	19.50%	100.00%

Table A.6(a): Sampled districts, traditional authority, villages and their characteristics

District	Traditional Authority	Name of Village	Location of Village	Classification of Village
Phalombe	Chiwalo	Namchapa	Rural	Impact
		Katulozwe	Rural	Impact
	Nazombe	Lomoliwa	Rural	Causal
		Mangulenje	Rural	Causal
Zomba	Mwambo	Namatapa	Rural	Impact
		Nsabwe	Rural	Impact
		Nyeriwa	Rural	Impact
	Mlumbe	Mtiya	Urban	Causal & Impact
Mangochi	Jalasi	Malekano	Rural	Causal
		Chiganga	Rural	Causal
	Mponda	Chomba	Urban	Causal & Impact
		Kalonga	Urban	Causal & Impact
Salima	Pemba	Kabumbu 1	Rural	Impact
		Majiga	Rural	Impact
	Ndindi	Jasiteni	Rural	Causal
		Matewere	Rural	Causal
Nkhata-Bay	Mkumbira	Mkumbira	Urban	Causal & Impact
		Mng'ona 2	Urban	Causal & Impact
	Mankhambira	Mndora	Rural	Causal
		Ching'anya	Rural	Impact
Blantyre	Kuthembwe	Gomani	Rural	Impact
		Twaya	Rural	Impact
	Kuntaja	Chimkango	Rural	Impact
		Magombo-Nyadi	Urban	Causal
Balaka	Kalembo	Mkweta	Rural	Impact
		Mkanda	Rural	Impact
	Chanthunya	Tsite	Rural	Causal
		Yonamu	Rural	Causal
Ntcheu	Phambala	Matchereza	Rural	Causal & Impact
		Matale	Rural	Causal & Impact
	Mpando	Chipusire	Rural	Causal
		Daudi	Rural	Causal
Dedza	Kachera	Kachule	Rural	Impact
		Kafotokoza	Rural	Impact
	Kamenyagwaza	Chitedze	Urban	Causal & Impact
		Katsekaminga	Urban	Causal & Impact
Karonga	Mwirang'ombe	Kalimunda	Rural	Causal & Impact
		Dopa	Rural	Impact
	Kyungu	Mwangolera-Mwamkamala	Urban	Causal
		Mwalewa	Urban	Causal

Table A.6(b): Summary information on household sampling for primary data collection

Data Category	Item	Number	Description
Geographical allocation of sampled households	Districts	10	This was out of the given 17 disaster-prone districts.
	Traditional Authorities (TAs)	20	In each district, 2 TAs with highest ENR interventions were sampled .
	Villages	40	In each TA, 2 villages with most noticeable ENR interventions were sampled.
Total household sample size	Households	801	In each village, using a systematic random sampling technique, 20 households were sampled for household interviews. In one village in Blantyre, 21 households were sampled instead of 20.
Gender of sampled households	Male-headed households	636 (79.4%)	The 636 male-headed households were randomly sampled out of the available village household lists. It was not purposive sampling.
	Female-headed household	165 (20.6%)	The 165 female-headed households were randomly sampled from the available village household lists. It was not purposive sampling.
Location of sampled households	Households in rural villages	603 (75.3%)	Randomly sampled based on the sampling methodology
	Households in peri-urban villages	198(24.7%)	Randomly sampled based on the sampling methodology
Type of village activities in relation to ENRs	Households in predominantly ENR *impact*	321 (40.1%)	Randomly sampled based on the sampling methodology
	Households in predominantly ENR *causal*	282 (35.2%)	Randomly sampled based on the sampling methodology
	Households in ENR *causal and impact villages*	198 (24.7%)	Randomly sampled based on the sampling methodology
Participation in ENR activities	Households participating in ENR activities	470 (58.6%)	Randomly sampled based on the sampling methodology. Household participation in ENR activities is dependent upon availability of such interventions in the village.
	Households not participating in ENR activities	331 (41.4%)	Randomly sampled based on the sampling methodology. This includes households that do not participate in the ENR activities by choice and those that do not because ENR programmes are not available in the village and they do not make any efforts to initiate them.

ANNEX 3: Stakeholder contact details

Table A.7(a): List of people contacted during the primary data collection field work

DISTRICT	DESIGNATION
Phalombe	DPD
	Assistant AEDC – MPINDA EPA
	AEDC – NKHULAMBE EPA
Zomba	DPD
	AEDC – LIKANGALA EPA
	WARD COUNCILLOR
Mangochi	DPD
	AEDO
	WARD COUNCILLOR
Salima	DPD
	AEDC
	AEDO CHIPOKA EPA
	AEDO KATERERA EPA
Nkhata-Bay	DPD
	EDO
	AEDC
Blantyre	DPD
	District Environment Officer
	Environment Officer (Kunthembwe EPA)
Balaka	District Environment Officer
	AEDO – Ulongwe EPA
	AEDO – Phalula EPA
	DPD – Balaka District
Ntcheu	AEDO – Manjawira EPA
	Lead Farmer – (Daudi Village, T/A Mpando)
	DPD – Ntcheu District
Dedza	AEDC – Bembeke EPA
	AEDC – Lobi EPA
	AEDO – Dedza
	DPD – Dedza District
Karonga	Forestry Officer
	District Forestry Officer

Table A.7(b): List of decision makers contacted during the secondary data collection & consultations

Department/Ministry	Position	Name of officer
Energy Affairs Department	Deputy Director – Policy and Planning	Mr. Lewis Mhango
Department of Irrigation	Deputy Director	Mr. C Jana
Ministry of Agriculture, Irrigation & Water Development	Director – Planning and Policy	Mr. A. Namaona
Ministry of Health	Director – Planning & Policy Development	Dr. D. Kabambe
Ministry of Local Government and Rural Development	Director – Planning	Dr. F. Zhuwao
Department of Fisheries	Director, Deputy Directors, Chief Fisheries Officer	Mr. Alexander Bulirani, Dr. S. Donda, Dr. F Njaya
Department of Tourism	Director	Ms. P.M. Liabuba
		Dr. E. Gomani
Department of Environmental Affairs	Chief Environment Officer	Mr. B. Yasin
Forestry Department	Assistant Director	Mr. K.Z.S. Chirambo
		Ms. Tangu Tumeo
Economic Planning Division	Director	Mr. Yona Kamphale
Treasury: Budget Division	Deputy Director	Mr. R. Perekamoyo
African Development Bank	Agric. & Natural Resources Officer	Mr. Vinda Kisyombe

ANNEX 4: Data collection tools used during the study

Overcoming Poverty in Malawi through Sustainable Pathways: Identifying Policy Options to Accelerate Poverty Reduction by Quantifying Poverty and Environment Nexus

by PricewaterhouseCoopers (PwC) in collaboration with Agriculture and Natural Resources Management Consortium (ANARMAC)

Household Questionnaire

The Malawi Government through the Ministry of Finance, Economic Planning and Development with the technical and financial support from the United Nations Development Programme (UNDP) and United Nations Environmental Programme (UNEP) is conducting a study to establish policy options for poverty reduction through sustainable utilization of the environment and natural resources. The study is being conducted through national consultative processes of selected key national and district policy stakeholders as well as rural communities in 10 districts across the country. We are researchers from PwC and ANARMAC to undertake this study on behalf of the Malawi Government and development partners interested in supporting national efforts on the environment and poverty reduction.

1. Profile & Identification

Name of District	
Name of Village	
Name of Extension Planning Area (EPA)	
Traditional Authority	
Name of Research Assistant	
Date of interviews	
Name of data entry clerk	
Date of data entry	
Date of interviews	

2. Household Demographics

Name of respondent_____
Status of the respondent in the household_____

Year	Civil status of h/head	Sex of h/head	Age		Years of education		Household size				Children		
			h/head	Spouse	h/head	Spouse	≤ 14 yrs	14-64 yrs	≥ 65yrs	Total	Male	Female	Total
2013/14													
2012/13													
2011/12													
2010/11													

Key for civil status: 1= married; 2= divorced; 3= widowed; 4= cohabiting; 5= on separation; 6= single, never married before.

3. Household Agricultural Production

Household Crop Production Activities

3.1 Does your household participated in crop production activities in the past 4 years? Yes___ No_____

3.2 If yes, what has been the historical household crop production activities for the past 4 years?

Crop name	Year	Area planted (ha)	Production (kgs)	Yield (kg/ha)	Fertilizer use		Seed use		Labour				Farm implements		Credit amt (MK)
					Qty (kgs)	Total Costs (MK)	Qty (kgs)	Total Costs (MK)	Family	Hired	Total	Cost of labour hire (MK)	No.	Costs (MK)	
1.	2013/14														
	2012/13														
	2011/12														
	2010/11														
2.	2013/14														
	2012/13														
	2011/12														
	2010/11														
	2013/14														
3.	2013/14														
	2012/13														
	2011/12														
3.	2013/14														
	2012/13														
	2011/12														
	2010/11														
4.	2013/14														
	2012/13														
	2011/12														
	2010/11														
5.	2013/14														
	2012/13														
	2011/12														
	2010/11														
6.	2013/14														
	2012/13														
	2011/12														

Crop name	Year	Area planted (ha)	Production (kgs)	Yield (kg/ha)	Fertilizer use		Seed use		Labour				Farm implements		Credit amt (MK)
					Qty (kgs)	Total Costs (MK)	Qty (kgs)	Total Costs (MK)	Family	Hired	Total	Cost of labour hire (MK)	No.	Costs (MK)	
	2010/11														

Livestock Production Activities

3.3 Does your household keep any livestock in the past 4 years? Yes_____ No_____

3.4 If yes, what has been the historical household livestock production activities for the past 4 years?

Type of livestock	Year	Stock Number	Management practice	If grazing is management practice		Disease & Pest Outbreaks			Credit amt (MK)
				Land area (ha)	Type of land	Name of disease	Source of disease	Cost of treatment (MK)	
1.	2013/14								
	2012/13								
	2011/12								
	2010/11								
2.	2013/14								
	2012/13								
	2011/12								
	2010/11								
3.	2013/14								
	2012/13								
	2011/12								
	2010/11								
4.	2013/14								
	2012/13								
	2011/12								
	2010/11								
5.	2013/14								
	2012/13								
	2011/12								
	2010/11								

4. Household Agricultural Incomes

4.1 Has your household participated in crop and livestock marketing in the past 4 years? Yes______ No_________

4.2 If yes, please state the amount sold, selling prices, distance to the markets and incomes realized.

Year	Crops						Livestock						Total income crops & livestock (MK)
	Crop name	Amt harvested (kgs)	Amt sold (kgs)	Av selling price (MK/ kg)	Distance to market	Total income realized (MK)	Name	Total no. of animals	No. sold	Av. selling price	Distance to market	Total income realized (MK)	
2013/14													
2012/13													
2011/12													
2010/11													
2013/14													
2012/13													
2011/12													
2010/11													
2013/14													
2012/13													
2011/12													
2010/11													
2013/14													
2012/13													
2011/12													
2010/11													
2013/14													
2012/13													
2011/12													

Year	Crops						Livestock						Total income crops & livestock (MK)
	Crop name	Amt harvested (kgs)	Amt sold (kgs)	Av selling price (MK/ kg)	Distance to market	Total income realized (MK)	Name	Total no. of animals	No. sold	Av. selling price	Distance to market	Total income realized (MK)	
2010/11													
2013/14													
2012/13													
2011/12													
2010/11													

5. Household Non- Farm Livelihoods and Incomes Sources

5.1 Has your household been participating in non-farm livelihood activities in the past 4 years? Yes_____ No_____

5.2 If yes, what are those activities and incomes realized?

Year	Activity	Income & costs (MK)			Lead person in the h/hold	Source name (e.g., other peoples farms, forest area, lake)	Distance to the source (km)
		Total gross incomes realized	Prodtn costs (e.g., labour, inputs, etc.)	Net incomes			
2013/14	*Ganyu* (casual) labour						
	Fishing and fish trading						
	Arts & crafts						
	Land rentals						
	Forest products (e.g., honey, mushroom)						

Year	Activity	Income & costs (MK)			Lead person in the h/hold	Source name (e.g., other peoples farms, forest area, lake)	Distance to the source (km)
		Total gross incomes realized	Prodtn costs (e.g., labour, inputs, etc.)	Net incomes			
	Fuelwood						
	Charcoal						
	Small-scale businesses						
	Remittances & gifts from relations						
	NGO/institutional hand-outs						
	Others (specify)						
	Total						
2012/13	*Ganyu* (casual) labour						
	Fishing and fish trading						
	Arts & crafts						
	Land rentals						
	Forest products (e.g., honey, mushroom)						
	Fuelwood						
	Charcoal						
	Small-scale businesses						
	Remittances & gifts from relations						

Year	Activity	Income & costs (MK)			Lead person in the h/hold	Source name (e.g., other peoples farms, forest area, lake)	Distance to the source (km)
		Total gross incomes realized	Prodtn costs (e.g., labour, inputs, etc.)	Net incomes			
	NGO/institutional hand-outs						
	Others (specify)						
	Total						
2010/11	*Ganyu* (casual) labour						
	Fishing and fish trading						
	Arts & crafts						
	Land rentals						
	Forest products (e.g., honey, mushroom)						
	Fuelwood						
	Charcoal						
	Small-scale businesses						
	Remittances & gifts from relations						
	NGO/institutional hand-outs						
	Others (specify)						
	Total						

6.1 Has your household purchased different items/commodities in the past 4 years? Yes____ No_____

6.2 If yes, what items and amounts spent?

Year	Expenditure Item	Total amt spent (MK)	Months of major expenditures	Who was major decision maker?	Major beneficiary of the expenditure	Remarks
2013/14	Staple food crops					
	Natural/wildlife products					
	Clothes & shoes					
	Schools fees & related items					
	Medication					
	House construction materials					
	Fuelwood & charcoal					
	Social activities (funerals, weddings)					
	Remittances & gifts					
	Total					
2012/13	Staple food crops					

Year	Expenditure Item	Total amt spent (MK)	Months of major expenditures	Who was major decision maker?	Major beneficiary of the expenditure	Remarks
	Natural/wildlife products					
	Clothes & shoes					
	Schools fees & related items					
	Medication					
	House construction materials					
	Fuelwood & charcoal					
	Social activities (funerals, weddings)					
	Remittances & gifts					
	Total					
2011/12	Staple food crops					
	Natural/wildlife products					
	Clothes & shoes					
	Schools fees & related items					

Year	Expenditure Item	Total amt spent (MK)	Months of major expenditures	Who was major decision maker?	Major beneficiary of the expenditure	Remarks
	Medication					
	House construction materials					
	Fuelwood & charcoal					
	Social activities (funerals, weddings)					
	Remittances & gifts					
	Total					
2010/11	Staple food crops					
	Natural/wildlife products					
	Clothes & shoes					
	Schools fees & related items					
	Medication					
	House construction materials					
	Fuelwood & charcoal					

Year	Expenditure Item	Total amt spent (MK)	Months of major expenditures	Who was major decision maker?	Major beneficiary of the expenditure	Remarks
	Medication					
	House construction materials					
	Fuelwood & charcoal					
	Social activities (funerals, weddings)					
	Remittances & gifts					
	Total					
2010/11	Staple food crops					
	Natural/wildlife products					
	Clothes & shoes					
	Schools fees & related items					
	Medication					
	House construction materials					
	Fuelwood & charcoal					

Year	Expenditure Item	Total amt spent (MK)	Months of major expenditures	Who was major decision maker?	Major beneficiary of the expenditure	Remarks
	Social activities (funerals, weddings)					
	Remittances & gifts					
	Total					

7. Household Health Condition

7.1 Has your household ever had disease incidences in the past 4 years? Yes_____No_____

7.2 If yes, what have been extent of disease infections, effects and underlying causes?

Disease	Year	Months of outbreak	No. of hhold members affected	Age of infected hhold members	Mortality (no of deaths in the family)	Age of deceased	Underlying disease cause
1.	2013/14						
	2012/13						
	2011/12						
	2010/11						
2.	2013/14						
	2012/13						
	2011/12						

Disease	Year	Months of outbreak	No. of hhold members affected	Age of infected hhold members	Mortality (no of deaths in the family)	Age of deceased	Underlying disease cause
	2010/11						
3.	2013/14						
	2012/13						
	2011/12						
	2010/11						
	2010/11						

Key: underlying disease causes: 1= poor hygiene/sanitation; 2= consumption of diseased livestock; 3= sharing water sources with livestock due to water scarcity; 4= drinking water contamination due to floods; 5= others (specify)

8. Household Natural Resource Access & Management

Land

8.1 What productive activities have you been doing on your land in the past 4 years?

Year	Total land owned (ha)			Land used for crop prodtn (ha)	Soil types on the crop prodtn land	Land utilized for livestock prodtn	Soil types on livestock prodtn land	Amt of land rented out (ha)	Amt of land rented in (ha)
	Arable	*Dimba*	Total						
2013/14									
2012/13									

Year	Total land owned (ha)			Land used for crop prodtn (ha)	Soil types on the crop prodtn land	Land utilized for livestock prodtn	Soil types on livestock prodtn land	Amt of land rented out (ha)	Amt of land rented in (ha)
	Arable	*Dimba*	Total						
2011/12									
2010/11									

Key for Malawi soil types: 1=clay or sandy clay (usually red, dark reddish or deep red) found in plateaux areas; 2=alluvial soils (greyish brow) found in Lakeshore & Chilwa Plain areas; 3=gray water-logged soils (found in *dambos* or *dimbas*); 4=shallow stony soils (found in hilly areas); 5=dark brown fertile soils (usually found in Shire Valley area)

Other Natural Resources

8.2 Has your household been utilizing natural resources products in the past 4 years? Yes____ No_____

8.3 If yes, what natural resources and what are they used for, and does the household participate in environmental management programmes?

Resource	Year	Distance to the source	Used for?	Who decides use in the household?	Who is the major beneficiary in the h/hold?	Is there an NGOs/ organization promoting environ. management activities in the village or nearby villages?	Does the h/hold participate in any environ. or resource management programmes? Yes or no.
Rivers & lakes	2013/14						
	2012/13						
	2011/12						
	2010/11						

Resource	Year	Distance to the source	Used for?	Who decides use in the household?	Who is the major beneficiary in the h/hold?	Is there an NGOs/ organization promoting environ. management activities in the village or nearby villages?	Does the h/hold participate in any environ. or resource management programmes? Yes or no.
Forestry (trees & grass)	2013/14						
	2012/13						
	2011/12						
	2010/11						
Forestry products (e.g., honey, mushrooms)	2013/14						
	2012/13						
	2011/12						
	2010/11						
Wildlife	2013/14						
	2012/13						
	2011/12						
	2010/11						

Resource	Year	Distance to the source	Used for?	Who decides use in the household?	Who is the major beneficiary in the h/hold?	Is there an NGOs/ organization promoting environ. management activities in the village or nearby villages?	Does the h/hold participate in any environ. or resource management programmes? Yes or no.
Freshwater fish	2013/14						
	2012/13						
	2011/12						
	2010/11						
Others (specify)	2013/14						
	2012/13						
	2011/12						
	2010/11						

Any other remarks?

_____

_____

Thank you very much for participating in the study by providing useful information!!!

A Study on

Overcoming Poverty in Malawi through Sustainable Pathways: Identifying Policy Options to Accelerate Poverty Reduction by Quantifying Poverty and Environment Nexus

by PricewaterhouseCoopers (PwC) in collaboration with Agriculture and Natural Resources Management Consortium (ANARMAC)

Checklist for Community Stakeholder Focus Group Consultations

The Malawi Government through the Ministry of Finance, Economic Planning and Development with the technical and financial support from the United Nations Development Programme (UNDP) and United Nations Environmental Programme (UNEP) is conducting a study to establish policy options for poverty reduction through sustainable utilization of the environment and natural resources. The study is expected to provide reliable empirical evidence on the role of various environment and natural resource subsectors in Malawi in the attainment of national and household poverty reduction objectives. The study is being conducted through national consultative processes rural communities in 10 districts across the country. We are researchers from PwC and ANARMAC to undertake this study on behalf of the Malawi Government and development partners interested in supporting national efforts on the environment and poverty reduction.

1. Profile

Name of Village/CBNRM group	
Traditional Authority	
Name of district	
Name of CBNRM group & contact details	

Distance from the Village to the Boma	
Name of Enumerator(s)	
Date of interviews	
Data entry clerks	
Date of data entry	

2. Livelihoods, Income Sources and Expenditures

2.1 Small holder household crop production activities in the area for the past 3 years

Crop/ Year	2013/14						2012/13						2011/12					
	Prodtn Levels		Quantity sold & Price			Disaster incidence	Prodtn Levels		Qty sold & Price			Disaster incidence	Production Levels		Quantity sold & Price			Disaster incidence
	Max (kg)	Min (kg)	Max (kg) (& % sold)	Min (kg) (& % sold)	Av sales price		Max (kg)	Min (kg)	Max (kg) (& % sold)	Min (kg) (& % sold)	Av sales price		Max (kg)	Min (kg)	Max (kg) (& % sold)	Min (kg) (& % sold)	Av sales price	
Maize																		
Beans																		
Soy beans																		
Rice																		
Ground nuts																		

Pigeon peas																		
Fruits & vegetables (specify)																		

Key: Disaster incidences include: 1=droughts/ prolonged dry spells; 2=floods; 3=pests and diseases; 4=hailstorm; 5=others (specify)

Any remarks:

_____

_____

2.2 Major household income/livelihood activities in the area for the past 3 years

Livelihood activity	**Income earnings in 2013/14 season**		**Income earnings in 2012/13 season**		**Income earnings in 2011/12 season**		**Remarks/observations**
	Minimum (MK)	**Maximum (MK)**	**Minimum (MK)**	**Maximum (MK)**	**Minimum (MK)**	**Maximum (MK)**	
Production of cash crops							
Production of food crops							
Ganyu labour							
Fish Farming							
Livestock production (e.g., cattle)							
Arts and crafts							

Livelihood activity	**Income earnings in 2013/14 season**		**Income earnings in 2012/13 season**		**Income earnings in 2011/12 season**		**Remarks/observations**
	Minimum (MK)	**Maximum (MK)**	**Minimum (MK)**	**Maximum (MK)**	**Minimum (MK)**	**Maximum (MK)**	
Land rentals							
Harvests of natural forest products							
Baking activities							
Brewing local beers							
Operating a grocery/business							
Others (specify)							

Further remarks/observations on challenges or new crops/technologies being introduced in the village, etc._____

_____

2.3 Major household livestock production and marketing activities in the area for the past 3 years

Type of livestock	**Production (No.) & Marketing in 2013/14 season**				**Production (No.) & Marketing in 2012/13 season**				**Production (No.) & Marketing 2011/12 season**				**Remarks/observations on land area**
	Min per hhold	Max per hhold	Rearing practice	Av selling prices	Min per hhold	Max per hhold	Rearing practices	Av selling price	Min per hhold	Max per hhold	Rearing practices	Av selling price	
Chicken													
Cattle													

Further remarks/observations on challenges or new crops/technologies being introduced in the village, etc._____
_____

2.3 Major household livestock production and marketing activities in the area for the past 3 years

Type of livestock	Production (No.) & Marketing in 2013/14 season				Production (No.) & Marketing in 2012/13 season				Production (No.) & Marketing 2011/12 season				Remarks/observations on land area
	Min per hhold	Max per hhold	Rearing practice	Av selling prices	Min per hhold	Max per hhold	Rearing practices	Av selling price	Min per hhold	Max per hhold	Rearing practices	Av selling price	
Chicken													
Cattle													
Goats													
Pigs													
Sheep													
Rabbits													
Guinea fowls													
Others (specify)													

Has the village been facing increasing land constraints for rearing livestock? If so, how is the challenge being dealt with?

_____
_____

Further remarks/observations on challenges (e.g., livestock diseases, other disasters, new developments, etc.):_____
_____

3. Health Conditions and Services

3.1 Village/area disease outbreaks, effects and underlying causes in the past 3 years

Disease	2013/14				2012/13				2011/12			
	Months of outbreak	No. affected	Mortality	Underlying cause	Months of outbreak	No. affected	Mortality	Underlying cause	Months of outbreak	No. affected	Mortality	Underlying cause

Key: Underlying disease causes: 1=poor hygiene/sanitation; 2=consumption of diseased livestock; 3=sharing water sources with livestock due to water scarcity; 4=drinking water contamination due to floods; 5=others (specify)

3.2 What were genders and ages of the persons affected and dying from the disease outbreaks in the village for the past 3 years?

_____
_____

3.3 Access to health services

How far is the health centre from the village/community?_____

What diseases are treated/not treated at the nearest health centre?

_____

How far is the nearest reliable hospital from the village/community?_____

Do households use natural herbs for treatment of disease infections?

_____

_____

If yes, how does the depletion of the forests and environment impact on the households' access to herbal medicines?

_____

_____

If yes, how does the depletion of the forests and environment impact on the households' access to herbal medicines?

_____

_____

4. Community-Based Natural Resource Capital Base and Management Activities

4.1 Village/community natural resource endowment, management practices and benefits being realized

Natural resource	Specific management practices	How many are participating (i.e., proportion of the village population)?	Who initiated the process?	When did the management practices start?	Expected benefits	Actual average annual benefits realized so far		Specific challenges being encountered
						Av. income (per hhold)	Other social benefits	
Land and soils								
Water (rivers, streams & lakes)								
Forestry								
Freshwater fish								
Wildlife								
Others (specify)								

4.2 Benefits from other natural resources outside the village, but the village community members do have access, for the past 3 years:

Natural Resource	**Distance to the resource (km)**	**2013/14**		**2012/13**		**2011/12**	
		Average income earnings	**Other benefits**	**Average income earnings**	**Other benefits**	**Average income earnings**	**Other benefits**
	Distance to the resource (km)	**Average income earnings**	**Other benefits**	**Average income earnings**	**Other benefits**	**Average income earnings**	**Other benefits**
Land and soils							
Water (rivers, streams & lakes)							
Forestry							
Freshwater ßfish							
Wildlife							
Others (specify)							

Any other information, i.e., on benefits, challenges and how the community deals with them, etc.:

_____

Thank you very much for taking your time to provide this useful information!!!

The Poverty-Environment Initiative (PEI) Malawi of the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP supports country-led efforts to mainstream poverty-environment linkages into national development planning and budgeting.

PEI provides financial and technical assistance to government partners to set up institutional and capacity-strengthening programs and carry out activities to address the particular poverty-environment context.

PEI is funded by the governments of Norway, Spain, Sweden, the United Kingdom, and the European Union and with core funding of UNDP and UNEP.