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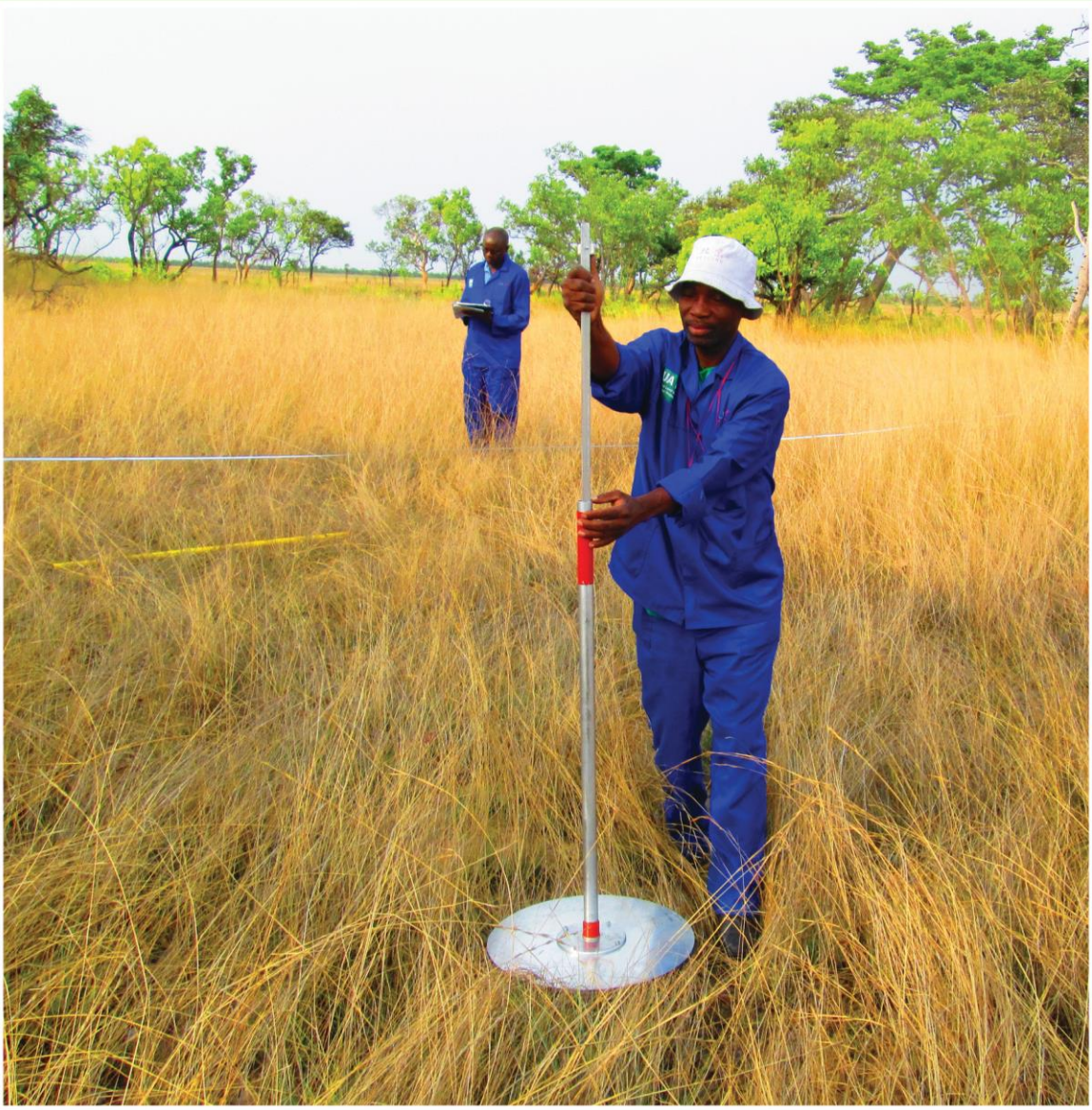
Biophysical Information Needs



Technical Report No. 4

Biophysical Information Needs

By C. Lungu & A. Siampale

Ministry of Lands, Natural Resources and Environmental Protection

FORESTRY DEPARTMENT

MINISTRY FOR FOREIGN AFFAIRS OF FINLAND

2016

Technical Reports in this series:

1. Classification of Forests in Zambia (Chidumayo)
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5. Informal Forest Economy (Lwaile & Gumbo)
6. ZFAP Preparatory Review (Matakala)

Biophysical Information Needs (BIN) Assessment Report

Technical Paper prepared for the Forestry Department, the Ministry of Lands, Natural Resources and Environmental Protection and the Food Agriculture Organization of the United Nations as a part of the Integrated Land Use Assessment Phase II

by

Christopher Lungu[1] and Abel M. Siampale[2]

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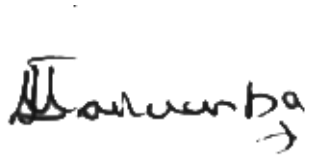
FOREWORD

The Forestry Sector in Zambia requires reliable, accurate and updated forestry information for strategic planning, policy and management decisions. However, forest information management in Zambia is still not up to standard due to insufficient institutional capacity for data management. The first Integrated Land Use Assessment (ILUA) which was undertaken between 2005 and 2008 generated forestry information that could only be used for national and international reporting. A follow up ILUA II was commissioned in 2010 and aims at improving the provision of adequate forestry data and its processing for National, Provincial and District level forest policy development as well as international reporting.

Considering that data users are wide and diverse, it follows therefore that data needs are different and of a varied range. Finding out the data needs is the initial point for planning forest inventory and in this regard, ILUA II initiated a Biophysical Information Needs Assessment in order to reveal stakeholders' and organizations' demands for forest data at several levels and scales.

This technical paper provides information needs for the forestry sector based on the needs assessment and recommends which data needs are necessary for ILUA II.



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ACRONYMS

BIN	Biophysical Information Needs
CBD	Convention on Biodiversity
CBNRM	Community Based Natural Resources management
CBO	Community Based Organizations
CBU	Copperbelt University
CCD	Convention on Climate and Desertification
CRP	Climate Resilience project
CSO	Civil Society Organizations
DDCC	District Development Coordinating Committee
DFO	District Forestry Officer
ENRMMP	Environment & Natural Resources Management and Mainstreaming Programme
ESP	Environmental Support Programme
ETF	European Tropical Foundation
FAO	Food and Agriculture Organization
FD	Forestry Department
FDHQs	Forestry Department Headquarters
FMU	Forestry Management Unit
FRA	Forest Resource Assessments
FRMP	Forestry Resource Management Programme
FSP	Forestry Support Programme
GIS	Geographic Information Systems
GMA	Game Management Areas
GN	Government Notices
IDP	Integrated Development Plan
ILUA	Integrated land Use Assessment
JICA	Japanese International Cooperation Agency
KAZA	Kavango-Zambezi
MACO	Ministry of Agriculture and Cooperatives (now Ministry of Agriculture and Livestock, MAL)
NFA	National Forestry Assessments

NGO	Non-Governmental Organizations
NHCC	National Heritage and Conservation Commission
NPE	National Policy on Environment
OWL	Other Wooded Land
PEO	Principal Extension Officer
PA	Protected Area
PFA	Protected Forestry Areas
PFAP	Provincial Forestry Action Plan
PPF	Peace Parks Foundation
REDD	Reduced Emission from Deforestation and Forest Degradation
REDD+	Reducing Emissions from Deforestation and Forest Degradation, Conservation, Enhancement of Carbon Stocks and Sustainable Forest Management
REMNPAS	Reclassification and Effective Management of the National Protected Area System
SADC	Southern Africa Development Community
SFM	Sustainable Forestry Management
SE	Sampling error
SI	Statutory Instrument
SNC	Second National Communication
TCP	Technical Cooperation programme
TFCA	Trans-frontier Conservation Area
UNFCCC	United Nations Framework Convention on Climate Change
UNFF	United Nations Forum on Forests
ZAFFICO	Zambia Forest and Forestry Industries Corporation
ZAWA	Zambia Wildlife Authority
ZEMA	Zambia Environmental Management Agency
ZFAP	Zambia Forestry Action Programme
ZFC	Zambia Forestry College

ABSTRACT

This study provides an overview of existing sources of forestry biophysical information listing a dozen inventories and surveys conducted in Zambia over the period 1932-1980. It is observed that this data has not been effectively made use of, shared, or communicated between stakeholders. The paper recommends ILUA II to expand data sharing activities and dissemination of information, while building human and resource capacity to ensure the applicability of such information in planning, forest management, measurement, reporting and evaluation (MRV), especially at district and sub-district levels. Memoranda of Understanding for how the government and other institutions may share forest-based information should be agreed upon.

A wide range of forestry biophysical information needs are identified at national, provincial, district and sub-district levels. Most actors want to know ***where*** the resources are located according to their management jurisdiction (units), ***what*** resources are available, the estimated ***quantity*** of the available resources, as well as ***how*** and ***who*** may be managing and using them.

Priority information needs for consideration under ILUA II are: biomass and carbon stock data; processes of resource change (e.g. wild fires, forest degradation, invasive species); updates of key management tools (e.g. vegetation classifications, national volume models and allometric equations for biomass including wood density); and the need to meet the day-to-day practical requirements of protecting and managing the national forest estate (e.g. status of PFAs; linking land use and geographical information to actual management units, such as the location of beacons and preparation boundary narratives).

The study observes that it will be difficult to meet all the information needs across the country. The paper recommends that the government, through the Forestry Department and ILUA II, considers the district as the main unit for the capture and dissemination of information to manage all forestry resources, including forest reserves. The study makes further recommendations regarding technical inputs towards forest information capture (e.g. plans, classifications, definitions and methodologies), and the establishment of permanent sample plots to strengthen MRV systems.

1.0 INTRODUCTION

1.1 Background to and scope of the BIN Assessment

In January 2002, the Government of the Republic of Zambia approached the FAO to request their assistance, via the Technical Cooperation Programme (TCP), with the carrying out of a National Forest Assessment (NFA). The Letter of Agreement between the Forestry Department of the FAO (*first party*) and the Ministry of Tourism, Environment and Natural Resources (*other party*) was signed in July 2003. This brought about the birth of the Integrated Land Use Assessment Project "TCP/ZAM/3007 (A)", which was endorsed by the FAO in January 2005 and signed by the Zambian Government on 1 March 2005. The first phase of ILUA was launched in August 2005.

The main purpose of ILUA I was to assess forestry and other natural resources, including land use practices; and to provide qualitative and quantitative information on the state, use, management and trends of these key resources. The first phase ran from 2005 to 2008. Following discussions held with stakeholders, the extension of ILUA was proposed to the Government of Finland in March 2009. Since the Environment and Natural Resources Management and Mainstreaming Programme (ENRMMP) had been launched to bring improved coordination and implementation capacity to the environment and natural resource management sector in Zambia, the proposed ILUA II project was designed to be implemented during 2010-2013 under this Programme, with Technical Assistance from the FAO.

The project's main outcome is: S*trengthened capacity in planning and implementation of Sustainable Forest Management (SFM) and Reduced Emission from Deforestation and Forest Degradation (REDD) through better information, capacity building, dissemination of information, and improved multi-sectoral dialogue*. The three main outputs of the project are identified as follows: 1) Effective means of dissemination and utilization of the information for multisectoral dialogue; 2) Improved methodological and human capacity in collecting and analyzing forest resource information for Sustainable Forest Management, REDD monitoring and carbon inventory and 3) Implementation of ILUA II - Mapping and Field Survey.

To start off ILUA II, a consultant was engaged to examine the information generated by ILUA Phase I and other sources, in order to specifically determine the Forestry Biophysical Information Needs for the Forestry Department and all its stakeholders at international, national, provincial, district and sub-district levels. This activity was to be undertaken by identifying and mapping existing stakeholders, potential biophysical information sources, and data collection mechanisms that may directly or indirectly support the Forestry Department's overall mandate.

The major tasks of this consultancy were to:

i. Undertake a Biophysical Forestry Information Needs Assessment.
ii. Review and analyze ILUA I and other relevant existing forestry data and data collection practices, including ILUA I reports, with the objective of defining the ILUA II information needs, as well as for REDD+ monitoring purposes.

iii. Identify and map existing and other potential biophysical information sources and data collection mechanisms in order to avoid the duplication of data collection through National Forestry Assessments (NFA).
iv. Identify the stakeholders in the forestry sector; map the different stakeholders' key information needs, including REDD+ requirements and requirements for provincial and district level forest management purposes; and identify the most important longer-term (periodically recurring) information needs shared by these stakeholders.
v. Identify and map forestry information needs at national, provincial and district levels and for international reporting processes relevant to the forestry sector.
vi. Present the list of variables, derived from the information needs, for validation for ILUA II.
vii. Adjust and finalize the list of variables after they have been validated by the stakeholders.

1.2 BIN Assessment Approach and Methodology

A combination of desk reviews and a field survey were the main methods used to collect relevant information and data:

i. Examining the mandate and needs of the key institution targeted by ILUA II, the Forestry Department (FD), and identifying FD stakeholders and their respective needs for biophysical information.
ii. Reviewing the available biophysical information which includes the following:
    - Past FD biophysical assessments
    - ILUA I data, information and reports
    - Any other potential biophysical assessments (past and ongoing)
    - Available data versus generated information
    - Dissemination levels of generated information (to all stakeholders)
iii. Conducting a field assessment for Biophysical Information Needs (BIN) in selected provinces and districts while guided by an Indicator Matrix with indicators categorized as:
    - readily available and generated biophysical information
    - presumed available but not circulated nor generated biophysical information
    - not captured/non-existent and non-generated biophysical information.

The Biophysical Information Needs to be identified will be assessed for their application (i.e. planning, decision-making, monitoring, reporting, verification and other uses) at international, national, provincial, district and sub-district levels.

2.0 FORESTRY BIOPHYSICAL INFORMATION REVIEW

2.1 Forestry Department's Mandate - Biophysical Information

The Forestry Department's mandate is to generate, manage and provide biophysical information to forest users and managers, and the public, for their various uses, at national, provincial, district and sub-district levels. Management of biophysical information is needed to support the Department's mission statement, namely to *ensure the sustainable flow of wood and non-wood forest products and*

services while at the same time ensuring the protection and maintenance of biodiversity for the benefit of present and future generations through the active participation of all stakeholders, and its overall objective, *to enhance the quantitative and qualitative contributions of the sub-sector towards the nation's socio-economic development in a sustainable manner*.

In order to meet this objective, the government, through the Forestry Department, is managing about 9% of Zambia's total land area as protected forest reserves, legally defined by statutory instruments (SIs) and gazette notices (GNs) as follows:

i. *National Forests* - These are forest reserves managed to meet national interests (i.e. the prevention of ecological disasters such as massive soil erosion, sedimentation and the drying up of rivers that may be caused by excessive water runoff; the provision of biodiversity and watershed protection; research and education; and general environmental protection). No felling of trees for commercial purposes may be allowed in national forests, except for the removal of overgrown trees with signs of die-back, or which are highly crooked and deformed, diseased and/or dead. National forests are functionally categorized as protection (conservation) forests managed for environmental stability.

ii. *Local Forests* - These areas are demarcated and set aside to be managed for both the present and future production of forestry goods and services in order to meet the daily social and economic development of the Zambian people. The provision of raw materials to the public, for both domestic and commercial use, in the form of round wood, fuel wood, charcoal, and non-wood products is facilitated under license. These forests are designed to be managed under the coupe system, where prescribed cultural (favourable activities done around trees) and silvicultural (favourable harvesting activities done on the trees) forest operations are applied under known working cycles. The working cycles normally will have defined the area extent, objectives, strategies, legal aspects, ecological prescriptions, monitoring indicators, and environmental mitigations. Local forests are functionally categorized as production (consumptive values) forests for the provision of both wood and non-wood forest products. However, in special circumstances (such as the presence of sensitive ecological land marks), they may be categorized as protection forests.

Beyond this mandate, the Forestry Department is obligated by law to regulate the extraction of forestry products from all forests across the country. They indirectly manage all tree resources, entrusted to the Republican President on behalf of the Zambian people, regardless of where they may be located. Therefore, foresters are professionals who are skilled in the art of promoting sustainable forestry management (SFM) in the country. They are trained to collect, process, analyze, generate, package and report up-to-date information on the forests, including the authentication of scientific research on tree species nomenclature and descriptions development of the national classification schemes for forests, and the monitoring and investigation of the performance of all the vegetation types in Zambia. The Forestry Department may take comprehensive stock of not only wood, but other forest resources also (e.g. roots, tubers, fruits, mushrooms, grasses, caterpillars, insects, bees, soils, water etc.); may control and manage forest fires; determine the forest degradation and deforestation levels; and generally report on the current status of all ecosystems or habitats.

2.2 Historical Forestry Biophysical Assessments and Information

2.2.1 Early Regional Forest Inventories

The first forest measurement and inventory in a miombo forest (i.e. a forest dominated by *Brachystegia, Julbernardia and Isoberlinia* species) was based on sample plots near Ndola, in the Copperbelt region, which were established between 1932 and 1936. This effort was focused particularly on meeting the requirements of the mining industry, which was growing into the economic backbone of the country. The Copperbelt mines needed to identify and quantify the available timber resources that could be used for refinery poles and structural timber. The subsequent need for further information then led to the first regional forest inventory, which was carried out on the Copperbelt between 1942 and 1944. A small-scale regional forest inventory in Western Province was completed from 1949 to 1951, and targeted the location and assessment of the availability of sawn timber for concession harvesting, with a special interest in Zambezi teak (*Baikiaea plurijuga* or *Mukusi*). Since the time of David Livingstone (1857), Zambezi teak had been widely regarded as the most valuable timber resource in the area. Durable and termite resistant, it was particularly used to manufacture railway sleepers for much of the Southern Africa network (*Löyttyniemi, 1988*).

2.2.2 District Forest Inventories

During the period from 1952 to 1967, the undertaking of forest inventories became more systematic. It was extended from the Copperbelt and Zambezi teak areas to other parts of the country. Simultaneously, there was also a shift in policy to decentralize the colonial administration, which also affected forest management. The district became the unit of forest administration, and forest inventories became a district-level responsibility. Forest inventory information was gathered into District Forest Management Books (Forest Department, 1965), which were later archived at the Forestry Department offices in Ndola and Lusaka. The detailed forest inventory information found in the books contains baseline data for almost all later forest resource assessments in Zambia. District inventories ceased in 1967.

2.2.3 National Wood Energy Cover and Woody Biomass Inventories

The first rigorous assessment of the total woody biomass volume in Zambia was done in the mid-1980s as part of the National Wood Energy Consumption and Resource Survey (Chakanga and de Backer, 1986). Using the District Forest Management Books as baseline data and 1965 as a reference year, the survey established a total national forest area figure of 61.2 million hectares, as well as an associated total woody biomass. The study estimated that the range of forested and wooded area was between 41.2 and 55.2 million hectares, while the corresponding estimate for the total woody biomass volume (the growing stock) ranged from 3,000 to 4,100 million m^3.

2.2.4 Southern Africa Development Community (SADC) Wood Energy Study

The second assessment of Zambia's woody biomass resource was completed by the European Tropical Foundation (ETF), based in Holland, as part of a Southern Africa Development Community (SADC) wood energy study (Erkkilä, 1989; ETF, 1987). The assessment was based on remote sensing techniques using small-scale satellite imagery analysis and covered the whole SADC region. No reference was made to District Forest Management Book data. The study concluded that the Zambian share of the SADC woody biomass resource was 2,600 million dry tonnes. With an average

basic woody density of 714kg/m^3 for Southern Africa indigenous forest trees, the dry woody tonnes correspond to 3,640 million m^3 of wood volume. The independent ETC estimate thus fell within the woody biomass growing stock range of the 1986 de Backer study.

2.2.5 Zambia Forestry Action Programme Forestry Biophysical Information

The third assessment of Zambia's forest resources base was done in conjunction with the Zambia Forestry Action Programme (ZFAP, 1998), which used the District Forest Management Books as a reference point. In addition, other available information from the past 30 years, as well as computer simulations, were used to produce a thorough province by province analysis of Zambia's forest areas and growing and woody biomass stock for ZFAP (Alajärvi, 1996). Alajärvi concluded that the total area of forests and woodland was 59.5 million hectares. The total growing woody biomass stock estimate was 4,202 million m^3 out of the 59.5 million hectares; forested areas were measured to cover 43.6 million hectares, with scattered woodland covering a further 15.9 million hectares. The estimate for growing woody biomass stock in forested areas was 4,122 million m^3, with a further 80 million m^3 in the scattered woodland.

2.2.6 The Provincial Forestry Action Programme (PFAP) Assessment

PFAP's interest was at the provincial level and in selected forest reserves, with the objective of developing and supporting the implementation of provincial forestry action plans, particularly pilot collaborative forest management plans in selected local forests. The overall objective of the programme was the "improved livelihood and status of forests in Zambia". The programme's aim was to establish sustainable collaborative forest management practices in seven pilot forest areas for the purpose of experience sharing and subsequent scaling up, if successful.

2.2.7 The Environmental Support Programme (ESP) Assessment

The Environmental Support Programme had five areas of environmental concern, namely; deforestation, wildlife depletion, land degradation, water pollution and sanitation, and air pollution. Chibombo District was identified as one of the areas adversely affected by deforestation, hence its requirement for urgent intervention measures to redress the situation. A forest inventory was conducted in the District from 24 January to 7 February 2001, the objective of which was to quantify the forest resource base in the district for the purpose of enhancing revenue generation.

2.2.8 The Forestry Support Programme (FSP) Assessment

The Forestry Support Programme aimed at facilitating the establishment of an autonomous self-financing forestry management organisation, a 'Forest Commission', in Zambia. Under this project, a forest resource assessment was implemented between 2002 and 2004. The methodology used up-to-date satellite imagery to define the limits of forest cover, and to identify classes of high-, medium- and low-density forest cover. These classes were then used as the strata in a stratified random sampling system in each province. The FSP inventory determined that the forested area had decreased to 33.5 million hectares. However, care needs to be taken when data generated at provincial and local levels is extrapolated to a national scale.

2.2.9 The Forest Resource Management Programme (FRMP) Assessment

The FRMP's interest was at the provincial level and in selected forest reserves, with the objective of developing effective pilot collaborative forest management programmes and sustainable non-wood forest product industries. These inventories widened the interest from gazetted forest reserves to

include customary land without protected area status, known as open areas, and protected wildlife areas on customary land, known as Game Management Areas (GMA).

Table 1 *Record of the Historical Forestry Biophysical Assessments*

Forestry Biophysical Assessment	Time Period
1) Sample plots established near Ndola to determine the productivity of Miombo woodlands (*Brachystegia, Julbernardia and Isoberlinia spp*.).	1932 - 1936
2) The first extensive forest inventory identifying and estimating timber volume availability for Copperbelt Province mines.	1942 - 1944
3) Small-scale forest inventory identifying and estimating the timber volume for Western Province concession harvesting (esp. *Baikiaea plurijuga*).	1949 - 1951
4) Large-scale inventory for District Forest Management Books covering all districts in the country.	1952 - 1967
5) Timber and woodland survey of East Luangwa, PFA No. 170.	1972
6) First estimate of Zambia's woody biomass resource: wood consumption and supply survey at national level.	1984 - 1986
7) Second estimate of Zambia's woody biomass resource: SADC wood energy study based on small-scale satellite imagery.	1987
8) Forest resources management study for Zambezi teak forests in south-western Zambia in co-operation with the Japan International Cooperation Agency (JICA).	1994 - 1996
9) Forest inventory for Mulungushi West forest reserve, in Central Province and for Mwewa forest reserve, in Luapula Province under the Provincial Forest Action Programme (PFAP).	1996
10) Forest inventories in Copperbelt, Luapula and Southern Provinces under PFAP, Phase I.	1996 - 1998
11) SADC estimate of Zambia's forest area: 29.4 million hectares.	1997
12) Forest inventories in Copperbelt, Luapula and Southern Provinces under PFAP, Phase II.	1999 - 2001
13) FAO 2000 estimate for Zambia's forest area: 31.2 million hectares.	2000
14) Local forest inventories in the Central Province under the Environmental Support Programme (ESP).	2001
15) Forest inventories in all nine provinces: Central, Copperbelt, Eastern, Luapula, Lusaka, Northern, North-Western, Southern and Western Provinces under the Forestry Support Programme (FSP).	2002 - 2004
16) Forest Resources management Project's forest resource assessments in Luapula and North-Western Provinces. Pilot forest reserves in open forest areas and some wildlife protected areas (GMA) were assessed.	2004

Forestry Biophysical Assessment	Time Period
17) Integrated Land Use Assessment (ILUA) covering the whole country with support from the FAO and the Government of Finland.	2005 – 2008 2009 – on-going

Source: *Adapted from Mukosha and Siampale, 2008*

2.2.10 ILUA I Forestry Biophysical Information

The first phase of the Integrated Land-Use Assessment (ILUA I) compiled a wide array of statistical and spatial data on the land use situation in Zambia, which was acquired through field surveys conducted across the country from tract and plot measurements, as well as observations and local interviews. The purpose was to assess forestry and other related resources and land use practices, in order to provide up-to-date qualitative and quantitative information on the state, use, management and trends of forest and forestry related resources. The assessment covered a large range of biophysical and socio-economic variables, and thus provides a broad view of forest resources and related land uses for the country as a whole. Some of the major key findings of the biophysical information generated by ILUA I are as follows:

i. Forest cover, according to the ILUA I field inventories, is estimated at approximately 49.9 million hectares, or 66% of the total land cover of Zambia.
ii. The total growing stock (volume) across all land uses for Zambia is estimated at 2.9 billion m^3, with the majority of this volume, 2.1 billion m^3, held in semi-evergreen miombo (*Brachystegia – Julbernardia – Isoberlinia*) dominated forests.
iii. The total national biomass (i.e. above and below ground) is estimated at 5.6 billion metric tonnes (MT), with an additional 434 million tonnes of dead wood biomass, for a total biomass estimate of 6 billion tonnes. Of this biomass, there are approximately 2.8 billion tonnes of carbon stored in the forests. The potential for increased carbon sequestration from the terrestrial forests in Zambia is generally high due to the high total growing stock of the forests and the potential for reducing emission from forests, as approximately 32% of the forest is considered either moderately or heavily disturbed. Over 65% of the forests are secondary regeneration with active growth potential.
iv. The mean volume of the forests is relatively low, ranging from 40m^3/ha in deciduous *Baikiaea* forests and mopane (*Colophospermum mopane*) woodland to 67m^3/ha in evergreen mavunda (Cryptosepalum) forests. Natural forests with tree cover greater than 70% can be regarded as rather intact forestland, where some selective harvesting of valuable species may have occurred. In these forests, the total volume is about 80m^3/ha, whereas in degraded forests with tree cover between 10% and 40%, the volume is reduced to around 40m^3/ha.
v. Degradation of the forests can be analyzed from the record of disturbance levels in the forests. In Zambia, 61% of the forest and other wooded land (OWL) area is disturbed in one way or another by human activity. However, only some 5% is considered to be heavily disturbed and the rest, 56%, slightly or moderately disturbed. Areas without disturbances accounted for 39% of the forests. According to ILUA I, Zambian forests and woodlands have good potential for regeneration.

vi. Most of the land in Zambia (61%) is practically managed by customary authorities. Of the total forestland, about 31 million hectares (63%) are located on customary land and only 12 million hectares are located on state land (24%). Privately owned forests with legal land titles account for 5 million hectares.

The forestry biophysical information produced by ILUA I has been used mostly at a national level for the following:

i. national planning (i.e. Sixth National Development Plan);
ii. national decision making (i.e. preparation of the 2010 draft Forestry Policy);
iii. national reporting to international dialogues and conventions (i.e. CBD, CCD, UNFF, FRA and UNFCCC);
iv. national monitoring (i.e. comparative analysis for the trends on land use and land cover change overtime);
v. national verification exercises; and
vi. reference material to other interventions (i.e. REDD+, SNC, CRP-MACO).

There are, on record, 17 successful forestry biophysical assessments that have been conducted by the Forestry Department since 1932 (Table 1). Of all these assessments, only that of 1952 to 1967 was district-based and helped in formulating and developing district level forest management plans. Others were the 1996, 2001, and 2004 assessments for PFAP, ESP and FRMP, which captured and generated biophysical information that was applicable for use at forest reserve level. This means that only one of the four forestry biophysical assessments provided an opportunity to serve district biophysical information needs, while the remaining three assessments were useful at forest level, providing indicative data for use at national and provincial levels. The sampling error (SE) for such results increases when applied to relatively smaller areas, such as at district and sub-district levels, thereby reducing its accuracy and reliability. Therefore, this scenario presents us with the need to consider generating forestry biophysical information for the district and sub-district levels.

2.3 Other Potential Sources of Forestry Biophysical Information

There are isolated, but quite consistent and site-specific, forestry biophysical assessments where very useful biophysical forestry information has been generated. A number of other institutions have been sponsoring and conducting forest inventories in other parts of the country and the government may not have taken a keen enough interest in sharing and utilizing their biophysical information. These institutions are maintaining both the raw data and the processed forestry information, which could be used for planning, decision making, reporting, and monitoring. Below are some of the potential sources that have been identified:

i. The Zambia Forest and Forestry Industries Corporation (ZAFFICO) periodically conducts forestry inventories of the exotic forest plantations on the Copperbelt. ZAFFICO manages just over 50,000 hectares of forest plantations under updated forest management plans. They normally engage inventory specialists (foresters) who conduct forest inventories in all their plantations for the purpose of generating biophysical information on the growing stock used

to update forest plantation management plans. They also generate map information products for the same plantations.

ii. *The Copperbelt University (CBU), under the school of natural resources and Zambia Forestry College (ZFC), have been conducting pilot forest inventories in several forest reserves every year since 1947 and 2001 respectively. To date, most of the forest reserves in the Copperbelt and central provinces have been inventoried and have site-specific forest management plans, produced by students in collaboration with their teachers, which the Forestry Department can use to manage these forest reserves sustainably. Even though such forest inventories are done for academic purposes, the forest inventory data and biophysical information generated is very useful.*

iii. *The Zambia Wildlife Authority (ZAWA) conducts assessments of fauna and flora, including fire management for the plains, swamps and wetlands and associated map products, which are compiled in the General Management Plans for the national parks, and the Land Use Plans for surrounding Game Management Areas (GMAs). ZAWA is a potential source of related forestry biophysical information i.e. species distribution for animal, birds and plants in all their PAs which includes 21 national parks, 36 GMAs, 2 wildlife sanctuaries, and 1 bird sanctuary covering approximately 236,376km^2 and representing about 31.4% of the country's total area of 752,614km^2. The land for national parks accounts for about 8.5% (approximately 63,634km^2) and GMAs account for about 22.9% (approximately 172,704km^2). Other areas which are also under the custody of ZAWA are the bird and wildlife sanctuaries which account for 0.001% (4.5km^2) and 0.004% (33km^2) respectively.*

iv. *The Peace Parks Foundation's (PPF) climate change programme has the vision to create sustainable income streams for African conservation through the sale of ecosystem services. To this end, it facilitated the collection of baseline forestry data for carbon accounting on the Zambian component of the Kavongo-Zambezi (KAZA), which includes the West Zambezi GMA, Sioma Ngwezi National Park, Kafue National Park and surrounding GMAs, and the forest reserves and open areas between Kafue and the West Zambezi GMA as stipulated in their Integrated Development Plan (IDP). They collected forestry data for above and belowground biomass, dead wood biomass, litter (including grass) biomass, and soil biomass to generate biophysical information for carbon stocks. The forestry biophysical information generated can ultimately be used to verify the status and change in carbon stocks, and can also be used to populate carbon sequestration models and ground truthing remote sensing models.*

v. *The Reclassification of the Effective Management of National Protected Area System (REMNPAS) project conducted a carbon pre-feasibility study for the West Lunga National Park and surrounding GMAs. The forestry biophysical information generated will support planning a detailed carbon accounting inventory for the 600,000ha project area, which also includes some protected forest reserves in North-Western Province.*

A formal arrangement, e.g. a Memorandum of Understanding (MoU), can be entered into with some (if not all) of these institutions in order to facilitate the sharing of the field data collected from these forest inventories. Further technical cooperation can be arranged, including the sharing of costs and

specialization in forest inventory planning, execution, data processing, analysis and interpretation, in order to improve on data and information quality and reliability. There is no doubt that the forestry biophysical information available from these interventions can be used by the Forestry Department for sustainable forest management.

2.5 Dissemination Status of Forestry Biophysical Information

This study reveals that there is a great deal of forestry biophysical information that has been generated by the Forestry Department through its various projects, as well as by other institutions since 1932. The Forestry Department Headquarters (FDHQ) maintains both the spatial and attributes forestry biophysical datasets and information products under a computerized data management system serviced by the Forestry Management Unit (FMU). However, the dissemination of such information within and outside the Forestry Department has not been impressive. The information is rarely passed down to the districts where it is needed most. Some of the reasons given for such inadequacies in disseminating this information to the districts and sub-districts are the low capacity and inadequate systems (i.e. lack of computerized filing systems) to store and manage the electronic data and information in circulation. Most forestry offices at district levels are using manual filing systems (cabinets) with no computers, internet or telephone facilities. This poor situation prevails country-wide. At the provincial level, the situation was compounded further by the 1995 restructuring of the FD, namely the abolishment of the Forestry Management Division which had provincial forestry planning and management units responsible for information management in the respective provinces. This is all the more reason why capacity building and the establishment of sound systems and procedures (i.e. provision of facilities that will enhance information generation and management) at provincial and district levels will be necessary at this stage.

Under ILUA II, some goodwill has been shown to commence the dissemination of information using the data sharing guidelines which have recently been published by the Forestry Department. Nevertheless, the practice may still need the provision of adequate support facilities at district levels (e.g. computers, internet, telephone, other data storage and printing equipment) to ensure the effective and efficient sharing of information at all levels. For instance, provincial staff have been offered training in GIS by the UN-REDD project, and it is anticipated that the trained officers will develop a personal interest in pursuing the need to collect and generate information that the district can use in forestry protection and management.

3.0 FORESTRY BIOPHYSICAL INFORMATION NEEDS

3.1 Stakeholders Interested in Forestry Biophysical Information

The list of stakeholders interested in forestry biophysical information may not be conclusive and may be almost limitless. The field responses have shown that forestry biophysical information is very useful for the effective protection and management of the environment, and for economic and social development. A careful grouping of key stakeholders by sector was done in order to capture an optimal number of users and to avoid missing some of the less engaged, or not engaged but interested, stakeholders. Further, there is also a list of stakeholders with identified specific/immediate forestry biophysical information needs or expectations from ILUA II and UN-REDD (Annex 3).

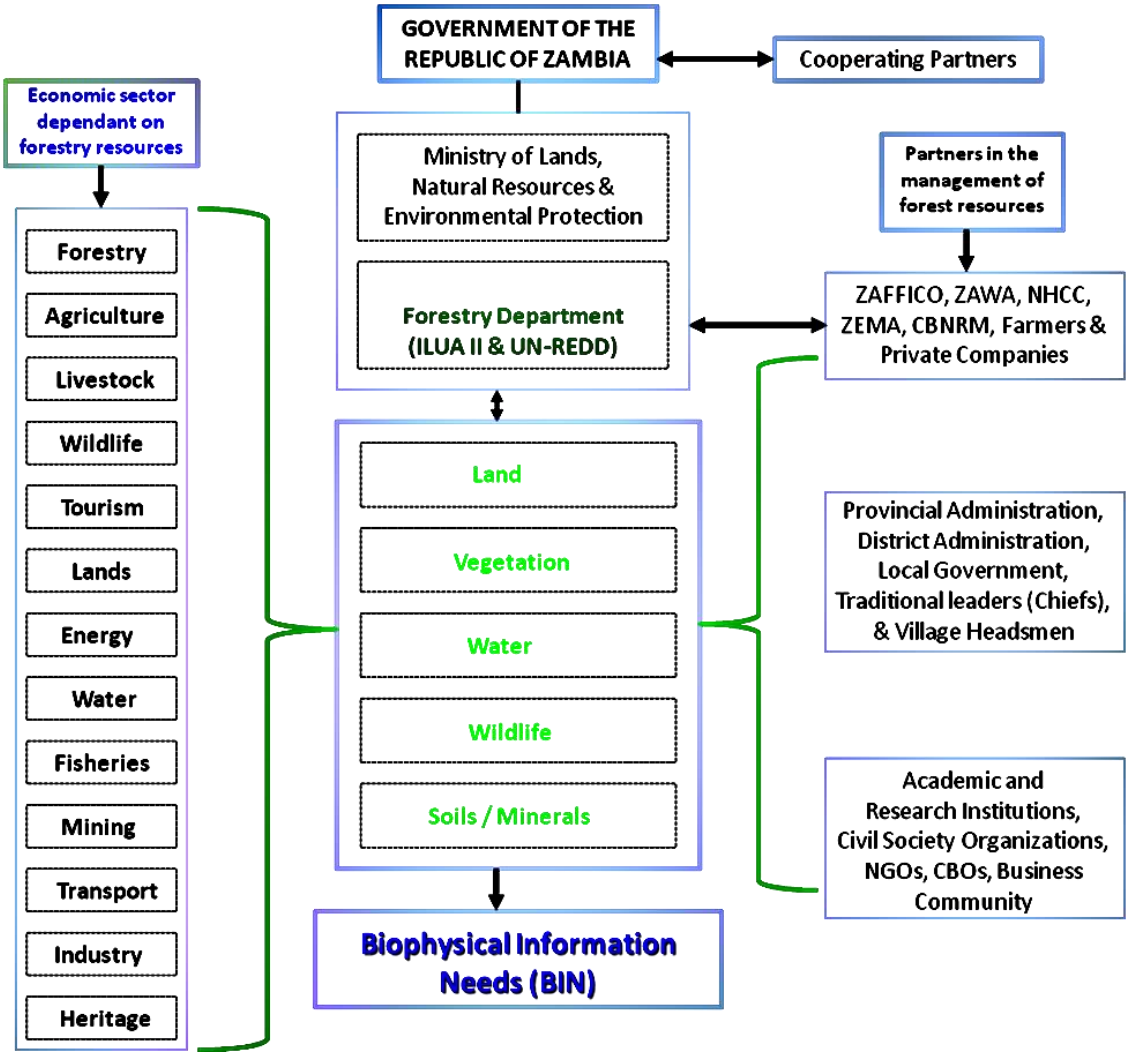

Figure 1 *BIN Stakeholders Diagram for ILUA II (Adapted from GRZ 2005).*

Note for the diagram*: There are several stakeholders, both within and outside the government, acting either as institutions; groups; or individuals, who benefit directly or indirectly from the*

provision of forestry biophysical information generated from past, current and on-going biophysical assessments. This is because developmental programmes largely depend on the use of natural resources (i.e. land, vegetation, water, wildlife, and soils/minerals) for socio-economic growth. Therefore, the generation and provision of biophysical information that guides the sustainable utilization of these major natural resources enhances the development of key economic sectors in any given society. Such information assists these sectors with policy formulation; provides realistic guidance on the monitoring, use and management of these resources; and reports confidently on changes in the resource base.

However, there are stakeholders who mostly use and depend on forestry biophysical information for their daily operations (Annex 3). They will very often either walk into or call the Forest Department offices in order to request the latest biophysical information.

3.2 Forestry Biophysical Information Needs

The need for forestry biophysical information varies at different levels (i.e. national, international, provincial, district and sub-district levels), and so the scale of detail and applicability/use also varies accordingly. The information needs relate strongly to geographical locations and areas, the current resource base and its status, and management practices and uses. For instance, most actors want to know ***where*** the resources are located according to their management jurisdiction (units) and ***what*** resources are available, to estimate the ***quantity*** of the available resources, and to know ***how*** and ***who*** may be managing and using them. Below is a table providing a checklist of forestry biophysical information that has been rated as a priority and important for consideration under ILUA II.

Table 2 *List of Forestry BIN for ILUA II including UN-REDD.*

Information needed	Details / Descriptions	Format / Packaging
1. Growing stock	Tree species diameter distributions; number of stems and volume distribution (timber, poles, medicinal, fuel wood, fruits, others); and tree species regeneration – district-based information needed	Compiled in district forestry management plans (DFMPs) - where formulation of forest resource -based management plans are not feasible
2. Biomass and carbon stock	Above ground, below ground, deadwood, litter (leaves, twigs, debris, needles) and grass, soil biomass and carbon stocks	Compiled into technical reports and maps showing the biomass and carbon stock – national and provincial levels
3. Land cover pattern	Area and/or percentage of forest cover; disturbance levels (degradation); land cover change overtime (deforestation); other land cover units/classes	Compiled into maps showing all the land cover change, their area extent – national and provincial levels

Information needed	Details / Descriptions	Format / Packaging
4. Land use pattern	Natural conservation and protected area land use categories; agriculture land use; settlements; power; transport and communication	Compiled into maps showing all the land use classes, and their area extent – provincial and district levels
5. Updated national vegetation (types)	Extent (cover) of the vegetation types in relation to land under non-forest cover; species composition and their current status - endemic, endangered, threatened or rare species	Compiled into maps showing all the land use classes, and their area extent – national and provincial level

About 95% of the respondents interviewed at different levels (national, provincial, district and sub-district) strongly emphasized the need to have such forestry biophysical information provided **according to their management jurisdictions (units),** while 5% of the respondents indicated that some site-specific information related to their areas of operation would still suffice for their current needs. The respondents also emphasized that comprehensive detail on forestry biophysical information for **protected areas (PAs),** leading to the formulation and development of management plans, is by far the most sought-after type of information. The detailed information needed may require sampling all the protected areas in order to generate site-specific information that can facilitate the formulation of such plans.

Meanwhile, 98% of the stakeholders interviewed strongly felt that the forestry biophysical information products compiled into **maps** are the most preferred types of information. Some of the requested information products at all levels include the following:

i. Updated statistics on the growing stock, biomass and carbon stocks
ii. Updated (1965) District Forestry Management Books
iii. Forest cover maps – showing forest and non-forests areas
iv. Deforestation maps – showing deforested areas over time
v. Land cover maps – showing forest cover, grasslands, cultivated areas, built-up, outcrop, and water bodies
vi. Land use maps – showing all land use classes (forestry, agriculture, settlements, mining, communication facilities
vii. Updated (1976) vegetation maps – showing types and extent of vegetation cover
viii. Biomass maps – showing biomass distribution over all land uses
ix. Carbon emission maps – showing areas emitting CO2 from different land uses

3.3 Biophysical Information Needs Analysis

There is no record, from any of the past assessments, including ILUA I, of any forestry biophysical information that could be considered as not necessary (obsolete) for collection in any subsequent

forestry assessments. Past forestry assessments actually collected data that generated the same type of forestry biophysical information, but at different scales, for different objectives, and at different times of the assessment. To date, forestry biophysical information needs do not differ from one level to the other, but they differ in scale, amount, or detail of the required information. In fact, what has been observed is actually an increase in data variables and information needs overtime, due to new interests that have arisen, especially in the area of climate variability and change. However, in order to realize the above biophysical information needs, the Forestry Department—through the ILUA II and UN-REDD projects—may be required to prepare the following technical inputs:

i. A stratified national assessment plan/design which can be adapted at all levels (national, provincial, district, and sub-district)
ii. A national land use and land cover classification scheme (on-going)
iii. Country specific allometric equations (i.e. volume and biomass models)
iv. A technical national definition/description of what the minimum dimension of a tree to be measured at 1.3m over-bark during forest inventories should be (i.e. = or < 5cm dbh)
v. A technical national definition/description of what percentage of tree cover should be used in Zambia as a standard for a forest (i.e. 10% tree cover over 0.5ha)
vi. A soil survey methodology just like the forest inventory that will provide biomass and carbon stock biophysical information. This is an important carbon pool closely linked to vegetation assessment.

4.0 LATEST INFORMATION VARIABLES TO BE CONSIDERED FOR ILUA II

It is commonly understood that, with regards to forestry biophysical information, the key variables match the actual units of interest normally designed for collection as raw field data (i.e. diameter, tree heights, species names, form, health status, use, vegetation type, soil types). Annex 5 provides a comprehensive list of dimensions, data types, variables and types of biophysical information. However, the list below provides information variables that have generated a great deal of interest at national, provincial, district and sub-district levels:

i. Biomass and carbon stock accounting in litter (leaves, twigs, needles, debris), grass, and in soils. Generated and compiled carbon emission maps.
ii. Wildfire occurrence, land areas prone to fire and the fuel loads that burn annually across all classes of land use, including burned agriculture crop residue.
iii. Forest degradation levels and deforestation (extent of encroachment) rates inside protected forest areas. Identification of alternative forested areas with the potential for placement under protection.
iv. Reclassification of protected forest areas to include emerging issues of carbon and also to define such areas as to whether or not they are Intact, Threatened, Encroached, Depleted or Transformed (down or upgraded in plantations).
v. Identification and classification of vegetation types and plant species that may be Endemic, Endangered, Threatened, Vulnerable or Rare (refer to IUCN classification).

vi. Identification (geographical location) and listing of all beacons, updating the boundary narratives and determining area round each protected forest area.
vii. Detailed soil surveys to account for land form, soil types, soil texture, soil drain, soil depth and soil pH under forest research to promote expansion of forest plantations especially rubber and other plant species.
viii. Collection of wood data (through destructive sampling) to develop national volume models and allometric equations for biomass including wood density.
ix. Mapping of invasive and alien species colonizing unique ecosystems in protected forest areas.

5.0 CONCLUSIONS

All the districts and provinces visited expressed the desire for information that could help them **formulate forestry management plans** for each and every protected forest reserve. However, they confirmed that they may not be in a position to formulate such plans due to the degree of detail and amount of forestry biophysical information they may require for each forest reserve. Districts and provinces are more concerned with implementation than with planning.

While it would be interesting to capture and generate forestry biophysical information for each of the 480+ protected forest reserves for the purpose of formulating forest management plans country wide, the task exceeds the current capacity of the Forestry Department (FD). However, since 1947, when the FD first became a department, the forest reserves were adequately managed under general District Forestry Management Books. Updating and preparing such district level management plans may be more realistic considering all the financial and administrative constraints. The Forestry Management Unit (FMU) anticipates that updating these books is feasible at a national level. This implies that ILUA II may facilitate the updating of 42 old district forest management plans as well as the formulation of new ones for the new districts, in order to capture the information needed to manage all the forestry resources in each district, including the forest reserves.

Technically, this will only be feasible if the growing stock biophysical information, and the socio-economic information, is designed to be captured according to forest density/conditions (*high density forest – 80%+ canopy cover, medium density forest – 50 to 79% canopy cover; low density forest – 20 to 49% canopy cover; and open density forest – 10 to 19% canopy cover*), regardless of whether or not the forest cover/content and all its resources are in a protected forest area, owned on private land, or on traditional (customary) land. This would account for all the resources therein, including vegetation, land, water, wildlife, and soils information.

Finally, it is strongly recommended that permanent sample plots (PSP) be adopted and managed by district forestry offices countrywide for continued monitoring and reporting. The three basic, but very important forest mensuration tools (namely a GPS, Diameter Tape, and Suunto hypsometers), should be provided for each district. The provision of all such tools may not need to be facilitated by the ILUA II and UN-REDD projects, but can be sourced from the Forestry Department's usual government funding. This will certainly enhance the levels of inventory skills and knowledge of district staff, which at the moment are very weak in a number of the districts. It is also recommended that some cost and benefit sharing opportunities can be realized – if strong collaborations with other potential sources of forestry biophysical information (FBI) are established. The Forestry Department may be able to avoid the need to sample some areas i.e. forest plantations under ZAFFICO, where sufficient assessments may already have been conducted. The FD should endeavour to share its capacity and expertise with such institutions.

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ANNEXES

Annex 1 *Biophysical Information Needs Assessment Plan (April 15 – 24, 2012)*

FIELD VISITS CONDUCTED AGAINST THE PROPOSAL - Mainly two out of the seven tasks for the consultancy required a field visit to a few selected districts and some provinces. These are tasks No. 1 and 5, which state that the Consultant shall conduct a "Biophysical Forestry Information Needs Assessment" and will "identify and map forestry information needs at national, provincial and district level and for international reporting relevant to the forestry sector" respectively. Following the review of past biophysical and forestry related assessments, which confirmed that there is a considerable record of biophysical information needs compiled by other studies specifically from Luapula, Northwestern, Copperbelt and Central Provinces under the auspices of the Provincial Forestry Action Program (PFAP), Environmental Support Program (ESP), Forest Resource Management Programme (FRMP), and Forest Support Program (FSP), about six other Provinces were initially selected for the field visit in order to consolidated what was available from elsewhere. However, this was not feasible due to the limited time of 12 days allocated for a field visit under this consultancy. Therefore, only two out of the 10 current provinces were visited as follows:

Study Sites Table

Id	Provinces	Districts
1	Southern	PEO's Office – Southern; and DFOs in Kazungula, Choma and Siavonga
2	Western	PEO's Office – Western; and DFOs in Mongu, Senanga and Sesheke

Itinerary - A total of six districts and two respective Provincial Administrative offices were visited. Interviews were held with District Forestry Officers (DFO) and staff from other environmental related sectors, especially for members from the environment and natural resources sub-committee of the District Development and Coordinating Committee (DDCC). These meetings were arranged with help from the Provincial and District Forestry Offices. The field visit 11 man-days as shown in the table below:

Table for the Schedule of the Field Work

Date	Activity
15 April 2012	Travelled to Mongu via Kaoma.
16 April 2012	Paid a courtesy call at the PEO's office and had a meeting with the DFO staff members at the Forestry Department offices in Mongu. Travelled to Senanga District.
17 April 2012	Had a group meeting with the DFO and some members of the DDCC's sub-committee at the Forestry Department offices in Senanga. Travelled

Date	Activity
	to Mongu.
18 April 2012	Travelled to Kazungula via Sichili – Sesheke.
19 April 2012	Had a group meeting with the DFO and some members of the DDCC's sub-committee at the Forestry Department offices for Kazungula/Livingstone. Travelled to Choma.
20 April 2012	Paid a courtesy call at the PEO's office and had a group meeting with the DFO staff members at the Forestry Department offices for Choma.
21 April 2012	Travelled to Siavonga.
22 April 2012	Started compiling the field report.
23 April 2012	Had a group meeting with the DFO and some members of the DDCC's sub-committee at the Fisheries Department offices in Siavonga.
24 April 2012	Continued compiling the field report.
25 April 2012	Travelled back to Lusaka and END OF FIELD ASSESSMENT.

The Field Visit Entourage

(1) National Consultant (Forestry Information Specialist) – Chris Lungu

(2) PMU (ILUA II) Technical Officer – Abel M. Siampale

PMU (ILUA II) Driver – Donard Mwaba

Annex 2 *Questionnaire for Biophysical Information Needs Assessment*

1.0 DETAILS OF THE KEY INFORMANT/S

Name/s: ……;

Authority (Title): ……;

Station: ……;

Date of the interview: ……;

Other informants (attach a list and indicate name of the group):

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2.0 KNOWLEDGE BASE ON BIOPHYSICAL INFORMATION

2.1 What do you understand by Biophysical Information?:

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2.2 What Biophysical Information do you have? (list)

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2.2 How old is the Biophysical Information listed above?:

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3.0 BIOPHYSICAL INFORMATION NEEDS

3.1 What biophysical information do you critically need? (list)

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3.2 At which levels (i.e. national, Provincial, District / Sub-district) do you need this biophysical information? (list)

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3.3 What are the specific uses of the Biophysical Information listed above? **(table to summarize)**

PURPOSE / USE (Tick where applicable)							
Info (ID)	**Planning**	**Decision Making**	**Moni-toring**	**Report-ing**	**Verifi-cation**	**Other use**	**Remarks**
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.							
13.							
14.							

PURPOSE / USE (Tick where applicable)							
Info (ID)	**Planning**	**Decision Making**	**Moni-toring**	**Report-ing**	**Verifi-cation**	**Other use**	**Remarks**
15.							
16.							
17.							
18.							
19.							
20.							
21.							
22.							
23.							
24.							
25.							
26.							
27.							
28.							
29.							

4.0 POSSIBLE SOURCES OF BIOPHYSICAL INFORMATION IN THE AREA

4.1 Indicate any other possible sources of biophysical information in the region (i.e. list Institutions and types of biophysical information available).

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4.2 In what format is such biophysical information available? (describe)

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4.3 Has such biophysical information been published?

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Annex 3 *List of Stakeholders and their Biophysical Information Needs*

Level	Stakeholder	Information needed	Purpose
International	FAO – FRA	Growing, biomass and carbon stock and emissions, land use and land cover change information	Measurement, reporting and verification
	UNFCCC	Carbon stock and emissions, land use and land cover change information	Reporting
	UN-REDD	Growing, biomass and carbon stock and emissions, land use and land cover change information	Measurement, reporting and verification
National	Directorate of Forestry (i.e. Forestry Management, Research, and Extension)	Growing, biomass and carbon stock and emissions, land use and land cover change information, wildfire occurrences, vegetation types distribution, soils information, wildlife information	Planning, decision making, measurement, reporting and verification
	Government Ministries and Departments (i.e. MACO, CSO, LANDS, SURVEY, NRSC)	Land use and land cover information including deforestation and degradation information	Planning, decision making and reporting
	Civil Society Organizations	Land use and land cover information including deforestation and degradation information	Decision making and reporting
	Private Sector	Land use and land cover information including deforestation and degradation information	Decision making
Provincial	PDCC	Land use and land cover change information (i.e. forest degradation and deforestation information)	Decision making, monitoring and reporting
	Provincial Forestry Staff	Growing, biomass and carbon stock and emissions, land use and land cover Change information	Planning, decision making, Monitoring, and reporting

Level	Stakeholder	Information needed	Purpose
	Regional Planners	Land use and land cover Change information (i.e. forest degradation and deforestation information)	Planning, monitoring, and reporting
District and sub-district	DDCC	Growing, biomass and carbon stock and emissions, land use and land cover change information	Decision making, PFA protection and management, monitoring and reporting
	District Forestry Staff	Growing stock information (species distribution, health status, form, use including non-wood forest products)	Planning, PFA protection and management, measurement, reporting and verification
	Forest Concessionaires	Growing stock (timber species distribution)	Decision making, PFA protection and management
	Charcoal Manufacturers	Growing stock (fuel wood resource availability)	Decision making, PFA protection and management
	Local Community Members	Growing stock (including non-wood forest products distribution)	Decision making, forest protection and management, and reporting

Annex 4 *Dimension, Data Types, Variables and Biophysical Information Needs*

Dimension	Data type	Variables (Quality/Diversity)	Indicator / Information
Forest products and services (WFP & NWFP)	Tree species	Spp, Stems, Health-status	Species Distribution & Composition
	Tree crown cover	Crown diameter	Forest condition
	Timber species	Spp, Height & Diameter	Growing, Biomass, & Carbon Stock
	Poles	Spp, Height & Diameter	Growing, Biomass, & Carbon Stock
	Seedlings/saplings	Spp & Stems	Regeneration potential & GBC Stocks
	Fuel wood	Spp & Stems	Growing, Biomass, & Carbon Stock
	Medicinal products	Spp & Stems	Type, Growing, Biomass, & Carbon Stock
	Dead wood (Logs)	Length & T/B Diameter	Biomass & Carbon Stock
	Stumps	Height & Diameter	Biomass & Carbon Stock
	Twigs / litter	Grams, kg, tonnes	Biomass & Carbon Stock
	Grasses	Grams, kg, tonnes	Type, Biomass & Carbon Stock
	Fruits	Occurrence (High, moderate, low, nil)	Type, Frequency & Distribution
	Tubers	Occurrence (High, moderate, low, nil)	Type, Frequency & Distribution
	Mushrooms	Occurrence (High, moderate, low, nil)	Type, Frequency & Distribution
	Caterpillars	Occurrence (High, moderate, low, nil)	Type, Frequency & Distribution
	Honey	Occurrence (High, moderate, low, nil)	Frequency & Distribution
	Wildlife	Spp & Occurrence (High, moderate, low, nil)	Type, Frequency & Distribution
	Fisheries	Spp & Occurrence (High, moderate, low, nil)	Type, Frequency & Distribution
	Bamboo & Rattan	Spp & Stems	Type, Growing, Biomass, & Carbon Stock

Dimension	Data type	Variables (Quality/Diversity)	Indicator / Information
	Papyrus & Reeds	Spp, grams, kg, tonnes	Growing, Biomass, & Carbon Stock
	Crop residue	Grams, kg, tonnes	Biomass & Carbon Stock
	Resource access	Metres & Kilometres	Distances to resource areas
	Others	•	Type, Frequency & Distribution
Land use and forest types	Agriculture land	Acres, ha or km^2	Area Distribution and % of other land
	Urban land	Acres, ha or km^2	Area Distribution and % of other land
	Rural settlements	Acres, ha or km^2	Area Distribution and % of other land
	Mining land	Acres, ha or km^2	Area Distribution and % of other land
	Infrastructure	Acres, ha or km^2	Area Distribution and % of other land
	Other land use	•	
	Natural forests	Acres, ha or km^2	Area Distribution and % of other land
	Other wood land	Acres, ha or km^2	Area Distribution and % of other land
	Other land	Acres, ha or km^2	Area Distribution and % of other land
	Plantations	Acres, ha or km^2	Area Distribution and % of other land
	Grasslands	Acres, ha or km^2	Area Distribution and % of other land
	Water bodies	Acres, ha or km^2	Area Distribution and % of other land
	Other land	•	

Dimension	Data type	Variables (Quality/Diversity)	Indicator / Information
General Land Management Systems	Forest reserves	Acres, ha or km^2	Area Distribution and % of other land
	National parks	Acres, ha or km^2	Area Distribution and % of other land
	Game Management Areas (GMAs)	Acres, ha or km^2	Area Distribution and % of other land
	Sanctuaries	Acres, ha or km^2	Area Distribution and % of other land
	Conservation areas	Acres, ha or km^2	Area Distribution and % of other land
	Heritage sites	Acres, ha or km^2	Area Distribution and % of other land
	Water catchments	Acres, ha or km^2	Area Distribution and % of other land
	Wetlands	Acres, ha or km^2	Area Distribution and % of other land
	Other land	•	
	Encroachment	Acres, ha or km^2	Area Distribution and % of other land
	Ownership	Acres, ha or km^2	Area Distribution and % of other land
	Concessions	Number, acres, Ha or km^2	Area Distribution and % of other land
	Other mgt	•	
1. Environ-	Exposition	Degrees	Directions

Dimension	Data type	Variables (Quality/Diversity)	Indicator / Information
	Slope	% of slope	Elevation
	Relief	•	Elevation
	Fire	Occurrence (High, moderate, low, nil)	Frequency and Distribution
	Drought	Occurrence (High, moderate, low, nil)	Frequency & Disturbance levels
	Flooding	Occurrence (High, moderate, low, nil)	Frequency & Disturbance levels
	Inundation	Occurrence (High, moderate, low, nil)	Frequency & Disturbance levels
	Pests	Occurrence (High, moderate, low, nil)	Frequency & Disturbance levels
	Erosion	Occurrence (High, moderate, low, nil)	Frequency & Disturbance levels
	Landslide	Occurrence (High, moderate, low, nil)	Frequency & Disturbance levels
	Overgrazing	Occurrence (High, moderate, low, nil)	Frequency & Disturbance levels
	Wind throws	Occurrence (High, moderate, low, nil)	Frequency & Disturbance levels
	Silviculture mgt	Type of treatment	Management cycles
	Cultural mgt	Type of treatment	Management cycles
	Other	•	
5. Air	Wind speed	M/h or km/h	Fire danger rating information
	Temperature	Degrees Celsius	Fire danger rating information
	Rainfall	mm	Rain performance & distribution
	Air quality	•	Amount of pollutant by type per year
	Air movement	•	Number of storms per year

Technical editing by Gun Mickels-Kokwe
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About Integrated Land Use Assessment (ILUA) Phase II

In 2005, the Government of the Republic of Zambia, through the former Ministry of Tourism, Environment and Natural Resources (now Ministry of Lands, Natural Resources and Environmental Protection; MLNRP) and in an effort to reduce poverty, promote economic growth, fill existing human capacity gaps and fulfil its international commitments, requested technical and financial assistance from the Food and Agricultural Organization of the United Nations (FAO) to design and implement an Integrated Land Use Assessment (ILUA). The aim of the project was to establish a permanent forest and tree monitoring system and to obtain baseline national-level data on forest and other related land use resources. This was in order to address the urgent need for knowledge on the state and trends of Zambian forestry resources, given the lack of existing national level surveys and the need to strengthen institutional and financial capacity. In this way, the ILUA served as a pilot to provide data on the national status of land cover, management and use. The ILUA results were seen as vital to supporting national policy processes and planning, but because ILUA was intended as a national-level inventory, the results had limited utility for informing provincial and district level land use planning and decision making due to limited available funds and therefore applied low sampling intensity.

Therefore, based on discussions held with project stakeholders, the continuation of ILUA through an extension was proposed, in March 2009, to the Government of Finland for financing. Since the Environment and Natural Resources Management and Mainstreaming Programme (ENRMMP) has been launched to bring improved coordination and implementation capacity to the environment and natural resource management sector in Zambia, the project is designed to be implemented during 2011-2014 under this programme, with technical assistance from the FAO.

While ILUA I generated baseline data, ILUA II, to be carried out from 2011 to 2016, aimed to enhance the use and development of data and information systems for forest resource monitoring and Sustainable Forest Management, particularly for provincial level land use planning as well as for selected districts. ILUA II aims to provide information on trends in forest change through refined methodologies, re-assessed field plots and a four-fold intensification of sampling density in order to report at the sub-national level. It also aims to cover socio-economic related information needs via the Forest Livelihoods and Economic Survey in order to better understand the drivers of deforestation and to inform policy interventions which support Sustainable Forest Management. Establishing a monitoring system that captures livelihood needs beyond the forests is critical to designing well-targeted and innovative policy solutions that can support and promote sustainable natural resource management. The principal objectives of the ILUA II project are to strengthen forest and land use inventories at the national and sub-national level, and to support the implementation of Sustainable Forest Management and initiatives to Reduce Emissions from Deforestation and forest Degradation (REDD) through better information, capacity building, dissemination of information, and improved multi-sectoral dialogue.

The main stakeholders of the project are: MLNREP and different departments and institutions with which it collaborates, Ministry of Finance and National Planning, Ministry of Agriculture and Livestock, Central Statistical Office, National Remote Sensing Centre (Ministry of Science and Industrial Research), University of Zambia, Copperbelt University, Centre for International Forestry Research, National Institute for Scientific Research, Zambian Agricultural Research Institute, other national and international education and research institutes, smallholder farmers, NGOs and civil society, UN-REDD and other projects, the FAO and other cooperation partners.

The intended beneficiaries of the project can be summarized as follows: policy and decision makers at all levels, forest industries with an interest in timber and non-timber forest products from forest areas, the international community and international organizations requiring reliable information on the natural environment, NGOs, academia and grassroots organizations with interests in forest resource management, environmental protection, timber trade and extension.

In line with the overall policy of the Government of the Republic of Zambia, the impacts of this project are that benefits of Sustainable Forest Management are increased and mainstreamed in the national economy and policies, thereby supporting sustainable development of environment and rural livelihoods and meeting the Millennium Development Goals in a changing climate.

The project's main outcome is ***"strengthened capacity in planning and implementation of Sustainable Forest Management and REDD through better information capacity building, dissemination of information and improved multi-sectoral dialogue"***. The three main outputs of the project are:

Output 1: Effective means of dissemination and utilization of the information for multi-sector dialogue

Output 2: Improved methodological and human capacity in collecting and analyzing forest resource information for Sustainable Forest Management, REDD monitoring and carbon inventory.

Output 3: Implementation of ILUA II Mapping and Field Survey

ILUA II
Integrated Land Use Assessment Project

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