Information Management and Technology for Forest Governance in Ghana

Prepared for
World Bank Group

Prepared by
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Table of Contents

Ghana Case Study on Information Management and
Technology for Forest Governance
Document version 8.0 – January 6, 2011

Final Report

Page 1 of 52

Acknowledgements

Acronyms and Abbreviations

AFLEG	Africa Forest Law Enforcement and Governance
AGI	Association of Ghana Industries
ASNAPP	Agribusiness in Sustainable Natural African Plant Products
BAC	Business Advisory Centre
BUSAC	Business Sector Advocacy Challenge Fund
CBUD	Centre for Biodiversity Utilisation and Development
CFMP	Community Forestry Management Project
CIDA	Canadian International Development Agency
CREMA	Community Resource Management Area
CRI	Crop Research Institute
DANIDA	Danish Ministry of Foreign Affairs
DFID UK	Department for International Development – United Kingdom
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organization of the United Nations
FC	Forestry Commission
FLEG	Forest Law Enforcement and Governance
FLEGT	Forest Law Enforcement, Governance and Trade
FORIG	Forestry Research Institute of Ghana
FRI	Food Research Institute
FS	Forest Services
FSD	Forest Services Division
GEPC	Ghana Export Promotion Council
GIS	Geographic Information Systems
GPRS	Ghana Poverty Reduction Strategy
GPS	Global Positioning System
GRATIS	Ghana Regional Appropriate Technology Industrial Service
ICT	Information and Communication Technology
IIED	International Institute for Environment and Development
ILO	International Labour Organization
ITTU	Intermediate Technology Transfer Units
IUFRO	International Union of Forest Research Organization
KNUST	Kwame Nkrumah University of Science and Technology
NBSSI	National Board for Small Scale Industry
NGO	Non-Governmental Organisation
NORAD	Norwegian Agency for Development Cooperation
NREG	Natural Resources and Environmental Governance
NTFP	Non-Timber Forest Product
NWFP	Non-Wood Forest Product (used interchangeably with NTFP)
OFR	Outside Forest Reserves
REDD	Reducing Emissions from Deforestation and Degradation
REP	Rural Enterprise Project
RFIDs	Radio Frequency Identification Devices

Ghana Case Study on Information Management and Technology for Forest Governance
Document version 8.0 – January 6, 2011

Final Report

Page 2 of 52

RGD   Registrar General's Department
RMSC   Resource Management Support Centre
SDC   Swiss Agency for Development and Cooperation
SFM   Sustainable Forest Management
SPSS   Statistical Package for Social Scientists
SRA   Social Responsibility Agreement
SME   Small and Medium Enterprise
SMFE   Small and Medium Forest Enterprise
TBI   Tropenbos International
TIDD   Timber Industry Development Division
TUC   Timber Utilisation Contract
UNDP   United Nations Development Programme
USAID   United States Agency for International Development
VLTP   Validation of Legal Timber Programme
VPA   Voluntary Partnership Agreement
WD   Wildlife Division
WFP   Wood Forest Product
WITC   Wood Industry Training Centre
WTS   Wood Tracking System

Introduction

Background

The World Bank's Forests Sourcebook published in 2008 presents guidance on information management in the forestry sector in Chapter 7. A more comprehensive treatment is provided in the IUFRO study edited by Lauri Hetemaki and Sten Nilsson, titled Information Technology and the Forest Sector.

The key findings from both reports are that information management in the sector is largely focused on assessing the status of forests and management of forests for timber resources. Geographic Information Systems (GIS), resource databases and remote sensing data are being used extensively to this end. The studies also indicate that as the focus increases on climate change mitigation approaches such as REDD, the need for the measurement and monitoring of forest cover and carbon sink functions will fuel developments in these technologies.

Governance is complex, covering global-local links, sector-sector links, and differing values, but it is increasingly recognized that governance problems underlie many forest problems. The attainment of sustainable forest management (SFM) depends critically upon matters far from the forest itself. It depends on the extent and quality of enabling policy and legal and institutional conditions on good forest governance. Together, these conditions influence how a society organizes itself to develop and manage forest wealth, to produce forest goods and services, and to consume them. It is increasingly clear that the underlying causes of bad forest management are invariably disabling policy and legal and institutional conditions, which can affect the entire market. Weak forestry institutions cannot enforce legislation. Weakened social norms mean that forest abuse is unpunished by other stakeholders. It is these weaknesses of governance that tend to underlie the dramatic problems at forest level – clearance of primary forests, afforestation that does not respect local peoples' rights and needs, forest management that extinguishes biodiversity, and so forth.

Information that is timely, accurate and relevant is a key pre-requisite to good governance as it enables individuals and governments to connect, enhance transparency and make decisions become clear and realized. Therefore, improved information management is a key to effective forest governance. However, the improvement of governance outcomes is also dependent on several factors, including political will and commitment at the highest level in government. It has been documented in several studies that the innovative use of information and communication technologies (ICT) can contribute to better information management and governance by increasing public participation, reducing corruption and increasing incomes for the poor. As well, there are some examples from the forest sector where ICTs are overcoming the traditional barriers of information generation and consumption.

Scope

The World Bank now seeks to analyze and document innovative, successful and/or unsuccessful cases of deployment of ICT in the forest sector in Ghana. As an example, one such system is the National Wood Tracking System (WTS) being piloted by the Forestry Commission of Ghana.

Ghana Case Study on Information Management and Technology for Forest Governance
Document version 8.0 – January 6, 2011

Final Report

Page 4 of 52

This was achieved by:

❑ Identifying practices and applications from other sectors (both natural resource based and not, such as health, education, financial services, etc.) that could be replicated in the forest sector in Ghana.

❑ Utilizing the established framework defined in paragraph 3 of the Terms of Reference above to study how ICTs are used in Ghana and what is the current state.

❑ Analyzing the system implementation using the template provided in Annex 1 of the Terms of Reference.

❑ Assessing the governance impact of the systems (outcome of the reform), utilizing the five pillars of forest governance referenced in Annex 2 of the Terms of Reference.

❑ Assessing how the systems are linked to the public sector revenue collection and reporting systems.

❑ Analyzing the underlying causes for success or failure of the systems.

❑ Identifying gaps in the application of ICT and study based on the established framework, experiences in other sectors and their ability to be replicated in the forest sector.

❑ Analyzing the lessons from the case study on the use of ICTs in improving forest law enforcement and governance which documents of best practices from the field of ICT use in forestry and other sectors and build a forward-looking agenda for developing information management tools for better forest governance outcomes.

The project's approach is based on the framework of forest governance already designed by the World Bank and presented in the World Bank Forest Law Enforcement and Governance (FLEG) publication, Roots for Good Forest Outcomes: An Analytical Framework for Governance Reforms. The approach identifies five elements of governance, which are essential to ensure good governance in the forest sector.

1. TRANSPARENCY, ACCOUNTABILITY AND PUBLIC PARTICIPATION
☐ Transparency in the Forest Sector
☐ Decentralization, Devolution and Public Participation in Forest Management
☐ Accountability of Forest Officials to Stakeholders
☐ Accountability Within the Forest Agencies

2. STABILITY OF FOREST INSTITUTIONS AND CONFLICT MANAGEMENT
☐ General Stability of Forest Institutions
☐ Management of Conflict over Forest Resources

3. QUALITY OF FOREST ADMINISTRATION
☐ Willingness to Address Forest Sector Issues
☐ Capacity and Effectiveness of Forest Agencies
☐ Corruption Control Within the Forest Sector

Ghana Case Study on Information Management and Technology for Forest Governance
Document version 8.0 – January 6, 2011

Final Report

Page 5 of 52

☐ Forest Monitoring and Evaluation (M&E)

4. COHERENCE OF FOREST LEGISLATION AND RULE OF LAW
☐ Quality of Domestic Forest Legislation
☐ Quality of Forest Law Enforcement
☐ Quality of Forest Adjudication
☐ Property Rights Recognized/Honored/Enforced

5. ECONOMIC EFFICIENCY, EQUITY AND INCENTIVES
☐ Maintenance of Ecosystem Integrity – Sustainable Forest Use
☐ Incentives for Sustainable Use and Penalties for Violations
☐ Forest Products Pricing
☐ Commercial Timber Trade and Forest Businesses
☐ Equitable Allocation of Forest Benefits
☐ Market Institutions
☐ Forest Revenues and Expenditures

This research will include the identification of case studies, existing literature and field work that assist in the assessment of ICT in each of the five main elements of forest governance listed above.

Method

In order to ensure a consistent and comprehensive literature review and fieldwork a **desk review and interview questionnaire** has been developed based on the proposed final report outline as well as the forest governance framework. The former was used to guide our literature review exercise while the latter was administered as part of our nationwide fieldwork. We present both questionnaires in this report.

Desk Review Questionnaire

Heading Section

Report Name	
Publication Date	
Author	
Identification Number	

Detail Section

	Related Element [1]	Related Category [2]	Description

1. Description
1.1.How related is this project to forest governance in

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[1] The related element is selected from the list of elements, including sub-bullets, of the five main elements of ICT governance.

[2] Each finding will be categorized by various aspects of ICT usage in governance such as technology, scalability or portability, cost, outcome, and so forth.

Ghana Case Study on Information Management and Technology for Forest Governance
Document version 8.0 – January 6, 2011

Final Report

Page 6 of 52

Ghana? Include general description, location and funding.

1.2. How is ICT used in this case study and what were the anticipated governance benefits of using ICT at the project design stage?

2. Information Management

2.1. What is the information chain that is enabled by ICT?

2.2. How is ICT intended to enable this information chain? Is it providing new information? Is it improving the quality of existing information? Is it improving the efficiency in public, private or other stakeholders? Is it making existing information more accessible?

2.3. Is the use of ICT changing the way information is now generated or used?

3. Users

3.1. What is the scale of the operation in this case study? How large is the area and how many people/locations/departments are involved?

3.2. Are there new uses or new users for this information?

3.3. Who are the different stakeholders in this case study and how inclusive is the model?

4. Technology

4.1. What were the initial barriers to implementing the technology and how were they overcome?

4.2. Was the technology developed for this particular use, replicated from other pilots or projects, or a commercial off-the-shelf (COTS) package?

4.3. How accessible is (are) the application(s)? Is (Are) the application(s) public domain or proprietary applications?

5. Outcome

5.1. Have there been any evaluations or mid-term reviews of the solution? If so, when were these conducted?

5.2. What were the findings of any assessments? What is the assessment of the level of achieving expected outcomes?

6. Extensibility

6.1. What was the cost of the solution and how was it funded?

6.2. How was scaling up or replication planned? What were the lessons learned in scaling up/replication?

Interview Questionnaire

Instructions

The Interview Questionnaire has been designed to solicit feedback and further data to strengthen the desk review report. The format of each question is:

Ghana Case Study on Information Management and Technology for Forest Governance Document version 8.0 – January 6, 2011   *Final Report*

Page 7 of 52

7. Theme
7.1. Question
7.1.1. Consideration
7.1.1.1. Consideration Notes

Each theme must be addressed for each. The first interview should be with the solution owner who can then support further interviews for each additional interview group such as users, operators, stakeholders, vendors and so forth. Where necessary, the desk review will be used to identify these user groups as well.

Where possible, interviewees should provide diagrams, graphs, specifications, pictures and other graphical or pictorial representation of responses and results.

Questionnaire Heading

Interviewee's First and Last Names or Group Name	
Interviewer's First and Last Names	
Interview Date	
Identification Number	

Questionnaire Details

Consideration
1. Description The description should provide a good overview of the ICT solution. The reader should be able to understand the why, what, where, when, how and who of the solution. The description should also link the ICT solution to the forest governance areas whether it is currently used in forest governance or not.

1.1. How related is this project to forest governance in Ghana? Include general description, location and funding.
    • Select one of the five forest governance components (see directly below). If this project is not directly used in forestry, discuss the areas of forest governance it could be applied to.
        o Transparency, accountability and public participation
        o Stability of forest institutions and conflict management
        o Quality of forest administration
        o Coherence of forest legislation and rule of law
        o Economic efficiency, equity and incentives
    • Discuss funding models around the following criteria:
        o Public versus private funding
        o Initial costs versus ongoing maintenance and operating costs

Ghana Case Study on Information Management and   *Final Report*
Technology for Forest Governance
Document version 8.0 – January 6, 2011

Page 8 of 52

o Comparison of budget versus actual – where there cost over runs or under runs?
     o What do users and customers pay for the project?
  • Location:
     o Where was project executed? Onshore, offshore?
     o Where is project used? Entire nation or localized? And if localized, where?

1.2. How is ICT used in this case study and what were the anticipated governance benefits of using ICT at the project design stage?
  • Describe the communication and information technology or technologies used
  • How do users access the system? Are they able to access (and afford) the ICT?
  • What is the purpose of the system? Is it to inform, change behavior, and track?
  • What was the precedence for this system?

2.   Information Management This section should provide an understanding of the information elements and flow involved in the forest governance (or potential forest governance) solution. Is this as expected or has it changed over the life of the product? And how has ICT been used to enable the interaction and processing of information elements and flow?

2.1. What is the information chain that is enabled by ICT?
  • Is this available in diagram or specifications format?
  • Who are the users or stakeholders at each stage of the chain?
  • How does this information chain relate to the governance components (whether it be a forest governance application or not)?

2.2. How is ICT intended to enable this information chain?
  • Is it providing new information?
  • Is it improving the quality of existing information?
  • Is it improving the efficiency in public, private or other stakeholders? If so, which ones?
  • Is it making existing information more accessible?

2.3. Is the use of ICT changing the way information is now generated or used?   • If so, describe the changes in terms of information chain, numbers or types of users involved and governance.
3.   Users This section should provide a detailed understanding of the users (end users, stakeholders, beneficiaries) and providers (operators, vendors) of the solution. It is important to define numbers, mix, intended versus unintended, inclusiveness or specificity of user base, and other considerations.

3.1. What is the scale of the operation in this case study?
  • How large is the area?
  • How many people/locations/departments are involved?
  • How many users are there?

3.2. Are there new uses or new users for this information?
3.3. Who are the different stakeholders in this case study and how inclusive is the model?
3.4. What benefit have the users obtained from the system?
3.5. Can users financially sustain the operating model for the project?   • Do users pay for the ongoing cost of the project? If so, how and how much do they pay?
4.   Technology In this section, the reader should understand what and how ICT was used in the solution. The

overview on ICT in Ghana should provide a basis for understanding the relevance, sustainability and implications of the ICT used in the forest governance solutions.
4.1. What were the initial barriers to implementing the technology and how were they overcome?
4.2. Was the technology developed for this particular use, replicated from other pilots or projects, or a commercial off-the-shelf (COTS) package?
4.3. How accessible is (are) the application(s)? Is (Are) the application(s) public domain or proprietary applications?
4.4. Please provide design specifications.
5. Outcome This section provides an understanding of the effects of the ICT solution on forest governance, the users, cost and the intended benefits.
5.1. Have there been any evaluations or mid-term reviews of the solution? • If so, when were these conducted? • Please provide documentation.

5.2. What were the findings of any assessments? What is the assessment of the level of achieving the expected outcomes?
• If there are no assessments, determine the following:
   o If in the early stages, how did the project plan to justify the benefits against the costs? If further along, how did they or do they justify the benefits against the costs?
   o Were the benefits realized?

6. Extensibility This section provides an assessment of how scalable and applicable is this ICT solution.
6.1. What was the cost of the solution and how was it funded?
6.2. How was scaling up or replication planned? • What were the lessons learned in scaling up/replication? • If replication is planned, has it been done with this application elsewhere or a similar application? And what were the lessons learned there?

These questionnaires were administered resulting in the data that was collected to make up this report. The later was completed by each team leader whiles the other team members or stakeholders responded in a face-to-face interview. The completed questionnaires are in Appendix 1.

Ghana Case Study on Information Management and Technology for Forest Governance Document version 8.0 – January 6, 2011

Final Report

Page 10 of 52

Summary

Information and Communications Technologies (ICTs) such as mobile phones, the internet, satellite phones, radio, WAP-enabled phones, handheld data devices, smart cards and global positioning systems (GPS) are being used to manage forest information as part of the wider governance framework.

Some of these applications are readily available in forest governance and in this report we look at some cases in Ghana. Our findings define how some of these applications match certain elements of the framework of forest governance defined earlier.

We present in a separate section a brief sample of how these technologies are being used in other industries in Africa to address governance for those industry sectors.

The World Bank's Forests Sourcebook also clearly discusses the areas where ICT can make a difference for each forest governance element. Based on our literature review we present a summary of this discussion, find below Table 1 which indicates the how ICT can be used to enable each forest governance element.

Table 1: How ICT can aid information management for good governance in forestry (2)

Elements of Governance	How ICT can help
Transparency, Accountability and Public Participation	• Track or trace products/raw materials from point of origin to consumption to meet fair trade, legal and/or sustainable harvest criteria of consumer countries. • Disseminate information on forestry transactions – auctions, allocations, tenders, etc. • Environment advocacy campaigns. • Consumer awareness on sustainable and safe seafood, forest produce, etc.
Stability of Forest Institutions and Conflict Management	• Monitor grazing pastures, wildlife movement, boundaries and poaching.
Quality of Forest Administration	• Map the forests for better management plans. • Monitor boundaries. • Updates and alerts on illegal activities and disasters. • Reducing poaching.
Coherence of Forest Legislation and Rule of Law	• Monitor spatial boundaries to ascertain legality.
Economic Efficiency, Equity and Incentives	• Enable payments or cash transfers to and from a widely dispersed population for products or services. • To make available to the public information on government. • Conduct e-auctions, e-procurement, advertise tenders on websites.

Ghana Case Study on Information Management and Technology for Forest Governance
Document version 8.0 – January 6, 2011

Final Report

Page 11 of 52

While examples exist across the world for the use of ICT to support each of the forest governance elements, we illustrate in the table below the specific projects in Ghana that exist to demonstrate the use of ICT in each of the forest governance elements.

We identified four (4) applications namely; 1. Ghana Wood Tracking System (WTS) - provides a timber legality assurance system, which is an important tool in reducing illegal logging, 2. Natural Resources and Environmental Governance Programme (NREG) is a multi-stakeholder system designed to sustain the implementation of a broader program of reforms to governance of natural resources and the environment, 3. Forestry Commission (FC) of Ghana website is intended to assist the forestry sector with improving its responsibility to the public by disseminating information and 4. Global Forest Information Service (GFIS) to generate and disseminate meta-data on the forestry sector.

Of the applications identified, GFIS is the only one that has done full cycle of implementation and is now in the second phase. Followed by the website of the FC, which is in its first phase and is about to give way to the second. The WTS and NREG are both in pilot stages hence outcomes are not clear and some of the elements of the pilot may change, as they are both in development. WTS is ahead of NREG in development.

GFIS stands out as an academic and intellectual effort that looks at the forestry sector while the FC website is a "public good" information sharing platform for civic engagement. These two compliment each other as means of public outreach and civic participation.

WTS and NREG are critical sector implementation programmes that need sustainability to ensure better governance of the sector. They compliment each other, as NREG would ensure the outcomes of WTS are met and without WTS, NREG would lack a major sector implementation mechanism. WTS is championed by FC and involves the Ministry of Lands and Natural Resources (MLNR) and other stakeholders whiles NREG is by the MLNR and involves the FC and other stakeholders. While this arrangement is important to reduce duplication, we recommend that the oversight responsibility of NREG over WTS and other sector programmes and projects are not compromised.

Table 2: Case studies that match elements of governance in Ghana

Elements of Governance	Case Studies
Transparency, Accountability and Public Participation	• Ghana National Wood Tracking System (WTS) • Global Forest Information Service (GFIS) Africa Project • Forestry Commission of Ghana Website
Stability of Forest Institutions and Conflict Management	• NREG Monitoring and Evaluation System • Ghana National Wood Tracking System (WTS)
Quality of Forest Administration	• NREG Monitoring and Evaluation System • Ghana National Wood Tracking System (WTS)
Coherence of Forest Legislation and	• Global Forest Information Service (GFIS) Africa

Ghana Case Study on Information Management and Technology for Forest Governance Document version 8.0 – January 6, 2011

Final Report

Page 12 of 52

Rule of Law	Project
Economic Efficiency, Equity and Incentives	• Forestry Commission of Ghana Website • Global Forest Information Service (GFIS) Africa Project

Even though from the above table, some of the case studies cut across the elements, information on the use of ICT in forest governance in Ghana is yet to develop to full potential. The Ghana National WTS could perhaps be further developed into a Forest Sector Information System (FSIS) which would deal with additional data such as inventories, harvesting licenses, concessions and concessionaires, management plans, exporters and local retailers, or other functions such as export and domestic sales, payment of taxes, land use planning, reforestation, and the management of personnel and equipment. Elements of these exist in spatial databases and hardcopy formats under the Resource Management Support Centre (RMSC) of the Forestry Commission in Kumasi; find below.

Table 3: FC Databases and their purpose

Databases	Purpose
Tree Information Form (TIF)	• Hardcopy paper used to collection tree information. • Tree information is then converted into a database.
Stock Survey (SS)	• Hardcopy paper used to take stock of trees in a lot or compartment. • This is being replaced by the WTS
Permanent Sample Plots (PSP)	• Softcopy information on the dynamics of the forest. • Used for long-term planning of forest resources.
Temporary Sample Plot (TSP)	• Soft copy census of all forest resources.
Financial Tracking System (ADOM)	• Internal soft copy for invoicing and receipts.
Timber Utilisation Contract (TUC	• Timber concessions holders who are either in the holders or loggers database or both.

The TIF and SS generate data that is put into ADOM and used to generate the invoice that the timber companies would have to pay on their concessions. The PSP and TSP data is used to generate the recovery rate of the forest, lots, compartments and species.

These databases are isolated and not connected for the purposes of control but are manipulated to generate correlation information when necessary. We advise that these databases are interconnected and the necessary controls put in place and together with the WTS system to form the FSIS proposed above.

The FC stands out as the central institution for the applications identified. The FC has a Wide Area Network (WAN) spanning Accra, Kumasi and Takoradi and including intranet, website, e-mail and databases but these technologies are not being utilised effectively. While we could not assess the state of these technologies, we conclude that they are not being optimised because of

Ghana Case Study on Information Management and Technology for Forest Governance
Document version 8.0 – January 6, 2011

Final Report

Page 13 of 52

the lack of system and process re-engineering. The FC needs to re-engineer its entire system and processes to ensure that these tools are optimised and central to delivery.

Capacity building of the FC staff is our second observation. The ICT team at the FC seems to have major challenges due to the low appreciation of ICT and the lack of awareness, processes, and capacity within the institution. For example, there is no laid down process for generation to publishing of information and content on their website. An ongoing program that encompasses these elements alongside the implementation of the applications identified would ensure better uptake and impact.

Ghana Case Study on Information Management and Technology for Forest Governance Document version 8.0 – January 6, 2011

Final Report

Page 14 of 52

VEGETATION ZONES AND FOREST RESERVE MAP OF GHANA
(Hall & Swaine)

Ghana Case Study on Information Management and
Technology for Forest Governance
Document version 8.0 – January 6, 2011

Final Report

Page 15 of 52
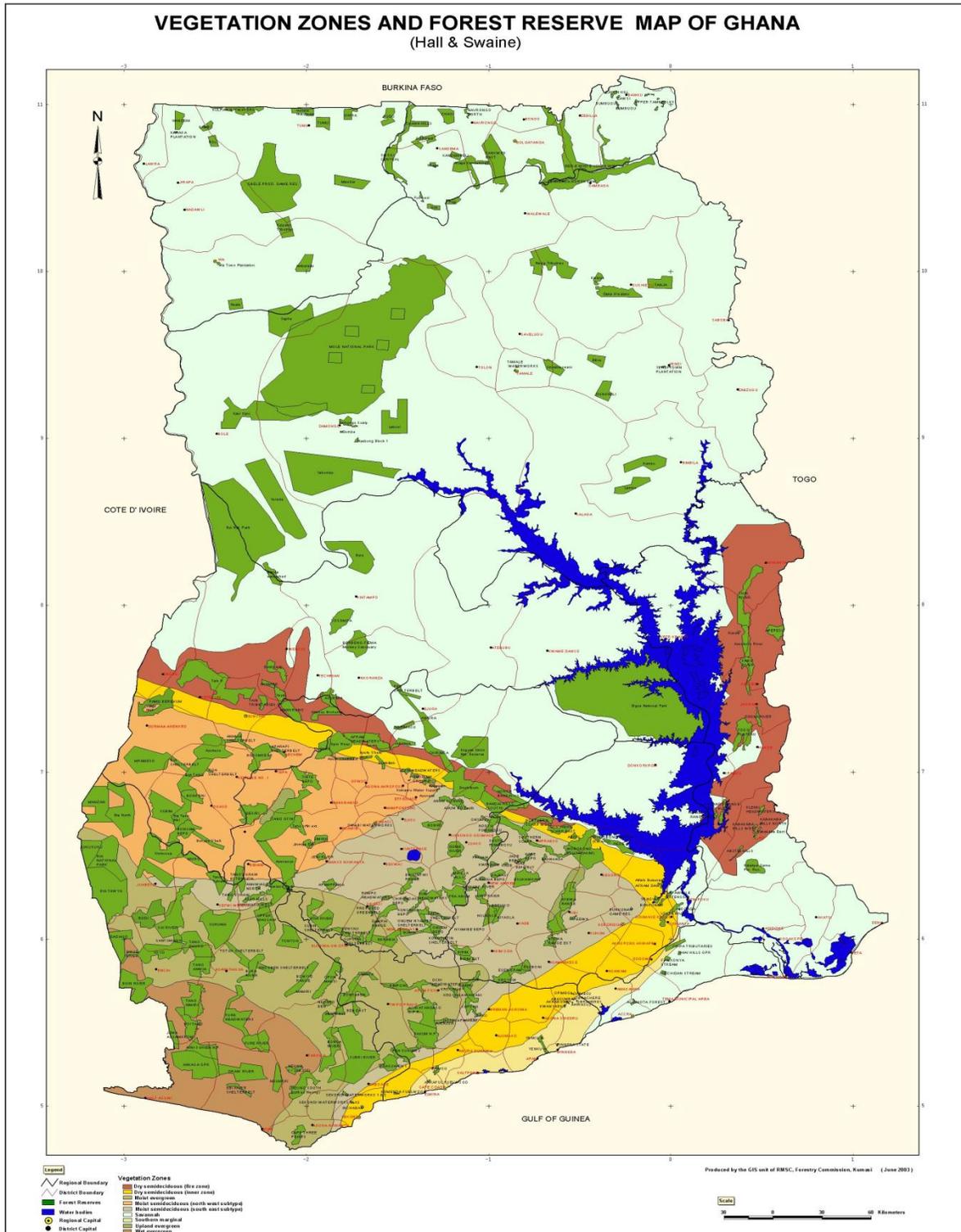
State of ICT Infrastructure Nationwide

The realization of the potential to use ICTs as a tool for sustainable development is driving the growth of Ghana's ICT infrastructure. Over the last decade, the ICT landscape has seen unprecedented growth due to a largely deregulated environment. This growth comes with it attendant growth of telecommunication and ICT infrastructure. This is useful to the extent that it can used to provide connectivity for the remote forest locations and to interconnect the isolated forest applications identified.

The existing ICT infrastructure spans the entire country with dominance in urban areas. Vodafone has the widest ICT/Telecom infrastructure covering all ten regions. They have International fibre connectivity via SAT-3 Submarine Optical Fibre Cable and an 800 km National Fibre Optic Backbone which is being extended to 4000km, connecting 23 sites nationwide.

No	Task	Delivery Date	Status
1	Complete and Activate 2 Rings with Protection	Jun-09	Accomplished, ensuring 99% Uptime
2	Construct Middle and Northern Rings	Jul-10	Commenced as Planned
3	Construct International Links	Dec-10	As Planned
4	Eastern Volta Redundancy Link	Aug-11	Under Consideration
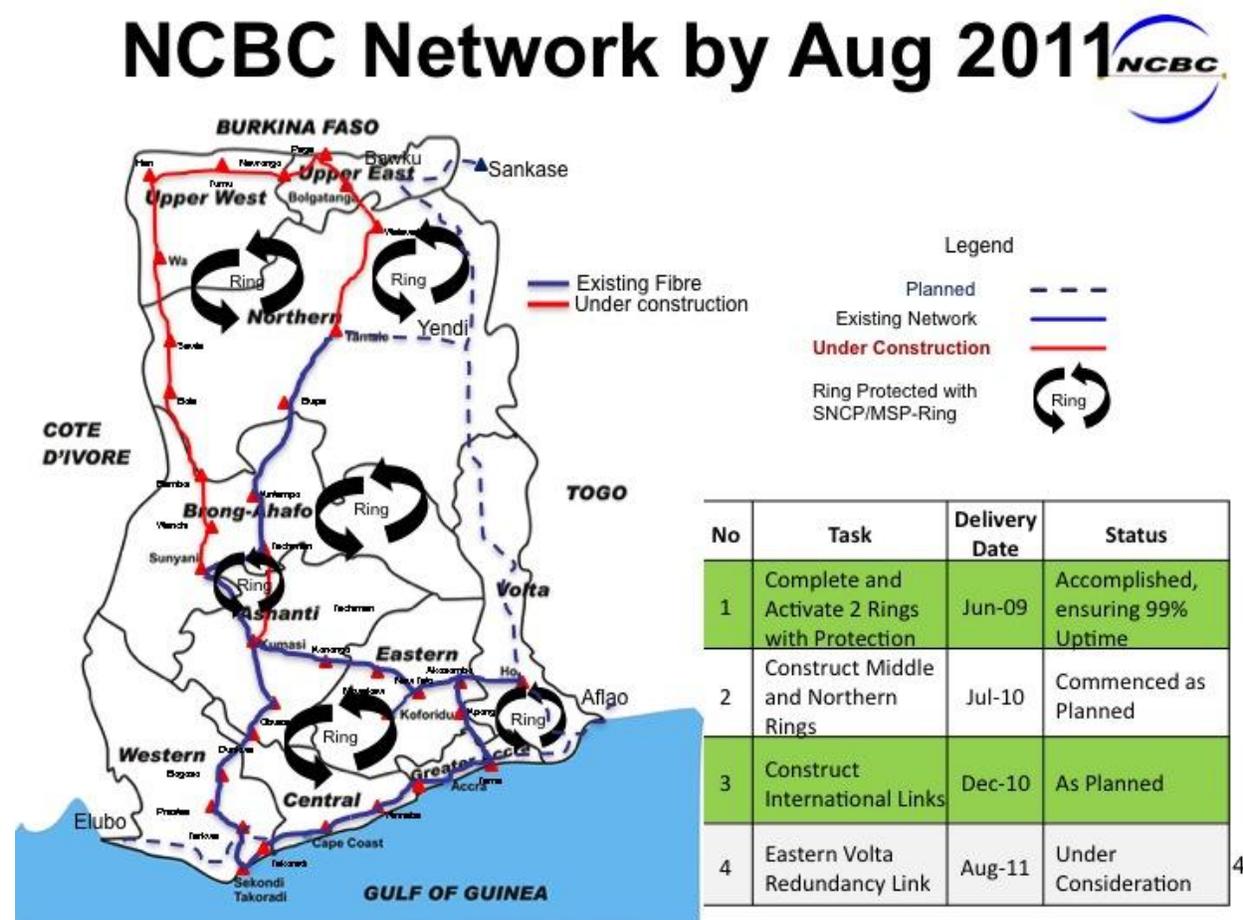
Most ICT firms in need of International connectivity through fibre buy bulk fibre capacity from Vodafone. Because of the deregulation of the sector, two more international gateway operators in Main One and GLO have been licensed to bring in International connectivity through fibre cables. Main One has already started operations selling capacity whiles GLO was billed to commission by the end of 2010. There are also four International gateways via satellite.

Ghana Case Study on Information Management and Technology for Forest Governance Document version 8.0 – January 6, 2011

Final Report

Page 16 of 52

Almost all of the telecommunications companies are building terrestrial fibre optic networks. Government was building the national fibre optic backbone that was mentioned earlier until it was included in the deal that led to the acquisition of the incumbent Ghana Telecom by Vodafone. MTN, tiGO and GLO are all building terrestrial fibre. There are two fixed line operators in Ghana; Vodafone and Zain (now Airtel). Fixed lines are prevalent in urban areas and most common in Accra and Kumasi.

The National Communications Authority (NCA) has licensed six (6) mobile telephony providers. Five of these providers; MTN, tiGO, Vodafone, Airtel and Glo mobile are GSM operators and the sixth one; Kasapa (which has recently been rebranded Expresso Telecom) is a CDMA operator. Glo Mobile is yet to start operations but have started erecting masts in readiness for their launch. All these telecommunications companies have extensive microwave infrastructure spanning all ten regions of the country. MTN is reportedly leading with over 50% of mast infrastructure in Ghana.

MTN, Vodafone, Zain and tiGO offer wireless broadband services through 3G modems and expresso through CDMA modems.

There are about 35 operational Internet Service Providers (ISP). These ISPs mainly operate in urban areas but occasionally provide VSAT services in remote areas. Together they have installed some 130 VSATs nationwide.

There are several cyber cafés and ICT Centres in the country, notable are the Vodafone cafés located in every regional capital of Ghana. Government and the UNDP have also partnered to set up Community Information Center (CIC) in every district, which provides ICT services for the districts. These CICs are equipped with computers, photocopiers, printers, internet and other services. There are also 128 FM Broadcasting stations and 12 Television stations (6 are free on air).

The industry regulator, National Communications Authority (NCA) has initiated the process to license WiMax Frequencies in the 2.500 to 2.690GHz spectrum for Broadband Wireless Access (BWA) services. The license price is set at a minimum threshold of $5 million and the beauty contest would result in the issuance of five (5) licenses of;

- Three (3) slots of 30MHz blocks nationwide for operators using technologies that require unpaired spectrum for a 10-year period.

- Two (2) slots of 2x15 MHz blocks nationwide for operators using technologies that require paired spectrum for a 10-year period.

- There shall be an extra-paired 2x5MHz and an extra contiguous unpaired 15 MHz available to winners of the spectrum blocks above through negotiations with the Authority.

Ghana Case Study on Information Management and Technology for Forest Governance Document version 8.0 – January 6, 2011   *Final Report*

Page 17 of 52

Case Studies

National Wood Tracking System (WTS)

Description: The Ghana National Wood Tracking System, developed by Helveta Ltd., the provider of supply chain intelligence software CI World™, provides a timber legality assurance system which is an important tool in reducing illegal logging – a key initiative under the European Union (EU) – Ghana Voluntary Partnership Agreement (VPA).
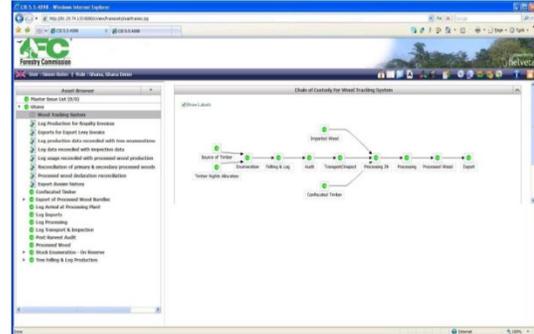
As the Log and Wood Tracking Pilot Project for On-Reserve Forest Areas is principally a project aimed at establishing a chain of custody from the standing tree to various points of sale for export, it is about tracking the flow of legal timber.

The Ghana National Wood Tracking System will allow the chain of custody of wood from across the country, allowing Ghana to demonstrate compliance and control across their timber supply chains and secure access to premium markets in the EU and US, thereby enabling the private industry to source legally assured timber and avoid procuring unlawful material in response to both legislation and consumer demand.

Timber stocks are broken down into compartments as units of measurement. Compartments make a coupe for logging by stock and they follow a schedule from growth to harvesting. Before harvesting, a survey is conducted to capture information on species, diameter, location, etc.

Pilot project is in three compartments in the Suhuma Forest Reserve, Sefwi Wiawso District, Western Region, and one compartment in the Asenanyo River Forest Reserve, Nkawie District, Ashanti Region. The companies involved are BLLC, Kumi & Co., John Bitar Company and Samartex. If the pilot is deemed successful, the project will be scaled up nationally.

The system is primarily doing stock enumeration for matured timber about to be harvested. Before visiting the sites the project leaders caution that given this is a work in progress, data that we would come across won't be "accurate" as they are still working on elements of the system.

Process: The three compartments in the Suhuma and one in the Asenanyo reserves were visited during which we spoke to the field rangers, supervisors and timber companies. The system was being implemented collectively with the buy-in of all the relevant stakeholders who alluded to the ability of the system to minimise illegal logging, a major problem in the industry.

The WTS system was popularly known as VPA to many of the actors. In the places visited, we identified trees that are numbered (engraved on the tree) and next to the numbering is a white tag, which has a barcode with its corresponding numbers as per the pictures below:

Ghana Case Study on Information Management and Technology for Forest Governance
Document version 8.0 – January 6, 2011

Final Report

Page 18 of 52

A Motorola MC65 equipped with GPS, GSM, scanner, camera and data input is handed out to the enumerators who venture into the reserve with the field rangers and supervisors. The stock enumeration involves numbering and tagging the yet-to-be harvested timber with a bar code near the base of the tree. When harvested the timber would also have a replica number and bar code to track it through the process to export. Information collected includes:

- Allocation of reserves, compartments and lots
- Consortium holding
- Consortium harvesting schedule and by who
- Plant species and how harvest is done
- Where to mill
- Due diligence on taxes
- GPS position of trees

The Resource Management Support Center (RMSC) is the technical wing of the FC responsible for standards, manuals of operation and monitoring of implementation. It is focused on Timber and Non-Timber Forest Products or Produce (NTFP). It is primarily responsible for information collection on the sector and runs a repository of databases. It works with the Forest Service Division (FSD), Wildlife Division (WD) and the Timber Industry Development Division (TIDD). TIDD is a specialized division since timber is a large part of forest resources, and they track the entire process, the chain of custody, or log tracking.

The RMSC databases are not linked or interconnected for control purposes but work together through manipulation, namely:

1. Timber Information Form (TIF) – manually captured but converted into the database.
2. Stock Survey (SS) – manually captured but converted into the database, this is being replaced by the WTS.
3. Temporary Sample Plot (TSP) – gives a census of the forest resources.
4. Permanent Sample Plots (PSP) – gives dynamics of the forest and is used to generate the recovery rate of the forest, lots, species, etc.
5. Timber Utilization Contract (TUC) holders are the concessionaires (Timber companies) and we put them in two databases: holders and loggers.

ADOM is a financial tracking system internally for invoicing and receipts. It generates:

- Timber Utilization Concession (TUC) annual rent (concession rent for 40 years of life contract).

Ghana Case Study on Information Management and Technology for Forest Governance Document version 8.0 – January 6, 2011

Final Report

Page 19 of 52

- Stock Survey Fees (SSF) when tree is ready to be harvested per area ($350).
- Stumpage Fee (SF) after tree felling based on species and volume (unit price per cubic meter by species).

Once a stock is ready to be harvested, ADOM has a formula used to generate the yield, which is harvested. The lot or compartment is then closed for the year in order for it to start the regeneration cycle. ADOM does not talk to any of the above databases. ADOM is not networked, so it works as a stand-alone system in the various regions where there are reserves. So, a concession holder may owe in region A and region B would not know through ADOM except if they communicate through other means. We recommend networking of the ADOM system.

Samartex Ltd. and Kumi & Co. Ltd., the two timber companies we spoke to have largely the same manual processes in taking the timber through their factories, with slight variation.

Samartex has manual order forms, which are used to generate demand notice (5 products) based on which harvesting is done. After harvesting, the timber logs come to the mill accompanied by a hard copy waybill (dispatch note). They then have a spreadsheet, to be graduated into an access database, which captures:
- Log yard input
- Production input
- Production output
- Product buyer (export)

They have a general ledger for accounting and inventory. A Gilat VSAT is in place for Internet and e-mail (locally hosted), which they use to reach out to their clients internationally. Their website is hosted outside Ghana. They have about seventy (70) computers in a networked environment running Sun systems on Windows. They plan to upgrade their ICT infrastructure to match the full-scale implementation of the WTS.

Kumi & Co.'s system is entirely manual, but they are in the process of automating to coincide with the full implementation of the WTS, which they eagerly welcome. They are part of the pilot.
1. They have a log-receiving book, which is used to capture the species, tree, log number, volume and certificate from TIDD when the timber comes to the factory.
2. The Timber Inspection Division ensures that the processed product meets the buyer's request, which is logged with them prior. It then issues another certificate for it to exit to the port.
3. An export permit is issued at the port based on the certificate and processes followed.
4. CEPS then does inspection, etc., before the products leave for its destination.

Both companies are looking to automate their processes, in order to correspond with the full-scale implementation of the WTS. Samartex, for example, hired an experienced IT manager for this purpose, whom we met. As a result, they are better computerised than Kumi & Co. Ltd.

Conclusion: During the visit;
1. We realized that most stakeholders knew about VPA, which is the holder of the WTS.

Ghana Case Study on Information Management and Technology for Forest Governance Document version 8.0 – January 6, 2011   *Final Report*

Page 20 of 52

2. They indicated that the VPA would help with better management of the timber resources.
3. We took pictures and videos of the forest reserve and wood species with the tags and numbers.
4. We could not interact with the enumerators because most of them were not available since they are not currently enumerating.
5. Our conclusion is that all stakeholders are co-operating for the full-scale implementation of the WTS.

Information Management: Timber Rights Administration Unit (TRAU) for contract/contacts management, Forest Service Division (FSD) and Resource Management Support Center (RMSC) for stock survey, yield selection and harvesting, Timber Industry Development Division (TIDD) for transport, processing and export.

Users are known throughout the process, thereby ensuring a greater level of accountability. Also, data capture is more accurate because human error is reduced through the use of data parameters.

The timber flows monitored and verified are standing trees in the lots or compartments in the forest reserves, they are yet to proceed to logging and processing, import to processing, and local sales or export - with possible changes of status for the products in between (e.g. ownership, location, properties (e.g. species, re-measurement, new grading, length trimmed), new log(s) cross-cut from existing log, new bundles replacing old bundles following new sorting). The WTS will enable the tracking of individual logs and consignments of processed products. It will include product labelling, physical inspections and documentary checks electronically. The use of ICT in this case allows a more comprehensive review of all wood movements than paper-based systems alone can provide, which is the current method.

Users: The pilot is over approximately five hundred (500) hectares. Made up of four (4) companies, four (4) compartments, four (4) mills, and five (5) forestry departments and divisions, about one hundred (100) people. Users registered with a username and passwords are approximately thirty (30).

The model addresses the traceability of wood in on-reserve areas destined for export. It excludes wood coming from off-reserve areas, imports, underwater extraction and plantations. These categories are reserved for the national rollout plan. More accurate mapping capabilities, quicker access to reports, more accurate data capture and almost real-time understanding of mill recovery rates.

The stakeholder group for the Ghana National WTS is far reaching and includes:
- Ministry of Lands and Natural Resources and Forestry Commission staff.
- Other government ministries and departments including: Customs and Excise Prevention Service (CEPS), Ministry of Finance and Economic Planning, Free Zones Board (Ministry of Trade and Industry), Ministry of Food and Agriculture, Ministry of Environment, Ministry of Local Government and Rural Development, Ghana Standards Board, the Environmental Protection Agency, and (when fuel wood and charcoal are included) the Ministry of Energy.
- Parliamentary Select Committee on Lands and Forestry.

Ghana Case Study on Information Management and Technology for Forest Governance Document version 8.0 – January 6, 2011　　　　*Final Report*

Page 21 of 52

- Customs authorities in importing countries.
- The Office of the Administrator of Stool Lands (OASL), which ensures that the stools and landowners are fairly treated in the disbursement of stumpage fees?
- Timber Rights Evaluation Committees for OFR logging.
- Private forestry and timber companies in Ghana.
- An independent observer.

For these stakeholders, the introduction of the Ghana National WTS is going to prove to be a marked improvement in the quality, availability, transparency and timeliness of wood tracking data. This would enhance the revenue generation of the Forestry Commission.

Technology: Using barcode-scanning, hand-held computers (HHCs or PDAs) in remote forest areas, in conjunction with plastic bar-coded tree and log tags, to capture measurements like species, diameter, length, and geospatial location. It also captures the date, time and name of the user who entered the data. With Internet connectivity, uploading field data is done to a secure mainframe computer. Database software technology is used to interpret and organize data into tailor-made reports and maps of forest areas.

Users are assigned a user name and password to enter the system. Access to data entry forms and reports is user-role specific.

WTS is based on an existing system from Helveta Ltd. called CI World™. Overall, WTS consists of four main components:
1. The identification and tagging of individual products or consignments using bar-coded labels or RFIDs (Radio Frequency Identification Devices).
2. The incorporation of these tag numbers onto the statutory forms used for declarations, inspections and other relevant records and reports.
3. The use of electronic technology for data collection and transmission.
4. The development of a database to receive, analyze and report all wood production and movements.

All components, as well as the supply chain software called CI World™, are readily available on the open market and are being employed by other African countries such as Liberia, Cameroon and the Democratic Republic of Congo.

Although various modules were configured in time, it has taken longer than expected for the FC to test the system by conducting the pilot. Logistical issues and internal information gathering struggles have hindered the project. Resolution of issues has been the result of protracted engagement with the FC both from afar (United Kingdom) and through the introduction of forestry specialists who are permanently on the ground in Ghana.

Outcome: The system is currently being implemented, so data on the outcome is not currently available.

Extensibility: The system will be a national system and as it is currently being implemented, future data on extensibility is not currently available.

Ghana Case Study on Information Management and Technology for Forest Governance
Document version 8.0 – January 6, 2011

Final Report

Page 22 of 52

NREG Monitoring and Evaluation System

Description: The Natural Resources and Environmental Governance (NREG) is a multi-stakeholder programme designed to sustain the implementation of a broader program of reforms to governance of natural resources and the environment. The program is also to bring innovation to the government program by focusing on a set of policies and reforms in the inter-related sectors of forestry and wildlife, as well as mining and environmental protection. The NREG Matrix in Appendix 2 provides more details.

The NREG Monitoring and Evaluation (M&E) System is a sector-wide project with a focus on building a comprehensive M&E system for collective use, part of which is to develop a database for storage of environmental and natural resource data. The project is in two phases: the inception stage is focused on development of the M&E system and the implementation phase would include procurement of servers, software and development of a database for the system.

The programme is supported by funding from Agence Française de Développment (AFD), Department for International Development (DfID) of the United Kingdom, the European Commission (EC), the Royal Netherlands Government (RNG) and the International Development Association of the World Bank (IDA - WB). A Monitoring and Evaluation (M&E) system including an M&E database component will be implemented to track the outcomes of the various policies and reforms put in place, which are intended to:
• Improve management of government revenues and finances in forestry and mining sectors.
• Reduce illegal logging.
• Reduce social conflict in forestry and mining communities.
• Integrate environmental considerations into policy formulation and implementation across government, including risks associated with climate change.

Process: The program's ecosystem actors have collectively developed a forest sector program and policy matrix with five (5) key policy objectives, which match some of the elements of forest governance for this study.

Table 4: NREG program / policy objectives and elements of governance

Elements of Governance	NREG Program / Policy Objectives
Transparency, Accountability and Public Participation	• Strengthen Monitoring and Evaluation / Information Communication Technology Systems
Stability of Forest Institutions and Conflict Management	• Institutional Strengthening and Governance
Quality of Forest Administration	• Secure Natural Ecosystem for the Benefit of all Segments of Society
Coherence of Forest Legislation and Rule of Law	
Economic Efficiency, Equity and Incentives	• Sustainably Finance and Promote Investment in the Forestry Sector • Promote equitable resource access rights and benefits for all

segments of society

Coherence of Forest Legislation and Rule of Law is the only governance element not addressed in the NREG matrix and our investigations reveal that in Ghana, there is some level of coherence in forest legislation and the rule of law. The challenge is with its enforcement and implementation. These programs and projects are meant to ensure compliance.

The matrix, which has a year on target from 2009 to 2011 and expected outcomes beyond 2012, seems to have missed the targets for 2009 and is making adjustments for 2010. Our estimation is that some of the targets for 2009 and 2010 would only be realized in 2011. There is need for doubling of effort and resources in the project implementation.

The project is situated principally between the Ministry of Lands and Natural Resources (MLNR) and the Forestry Commission (FC) who are the lead implementers. Both institutions have some servers and software procured and a data source matrix is about to be developed to track and pull all the data in the system. This is a precursor to the NREG system.

The FC has an Intranet, which is supposed to be used for internal communication, but it is not being utilized due to a lack of awareness, training and interest. Data is in soft and hard copy, and scattered. The second phase is the collection of all the data into the database and integration into their Intranet to ensure smooth operation. This would require a lot of effort and institutional reform, which is the purpose of the program. Different institutions in the NREG program would follow the same architecture and the databases would be networked to talk to each other at the institutional and regional level.

Conclusion: We observe that the matrix is comprehensive enough to capture the case studies under this exercise and provides the M&E framework for expected outcomes. Though the implementation is two years behind schedule, the critical target areas can be met with the doubling of efforts and allocation of needed resources in 2011 and beyond.

Information Management: The M&E database will allow a wealth of data to be collected, collated, shared and analyzed in an easily accessible and usable format compared to paper or spreadsheet-based solutions.

Users: The stakeholders involved in this project are Ministry of Lands and Natural Resources (MLNR), Ministry of Environment, Science and Technology (MEST), the Forestry Commission (FC), Ministry of Communications (MoC), and the Environmental Protection Agency (EPA).

Technology: The M&E database component is yet to be built, so there is insufficient data to assess the technology.

Outcome: The M&E database component is yet to be built, so there is insufficient data to assess the outcome.

Extensibility: The M&E database component is yet to be built, so there is insufficient data to assess the extensibility.

Ghana Case Study on Information Management and
Technology for Forest Governance
Document version 8.0 – January 6, 2011

Final Report

Page 24 of 52

Forestry Commission of Ghana Website

Description: The Forestry Commission of Ghana website is intended to assist the forestry sector with improving its responsibility to the public by disseminating information. It has an Intranet for internal use to generate, process and store information while the website publishes what is for public consumption. The Intranet site is on their Wide Area Network (WAN), which currently connects Accra, Kumasi and Takoradi. The system is supported by MySQL database for information and data storage.
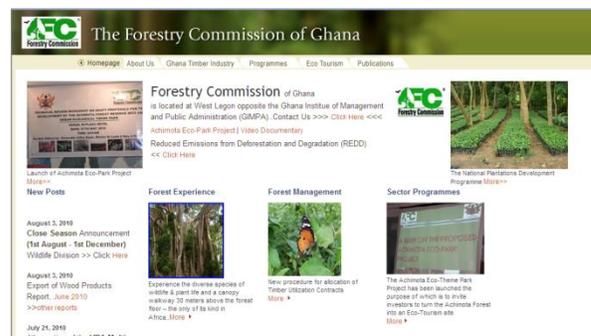
It was initially developed with a combination of government and donor funds but the FC has challenges with the recurring cost, meaning some of the elements of the system are not in optimal form.

There are also a lack of internal processes, which include a serious challenge in getting content from the staff because the website is not seen as an integral part of the FC system. Also, there are no structures for collecting and aggregating data. This means the website is not frequently updated and public information dissemination is hampered.

Process: There is no established internal information flow system for generating, aggregating, processing, storing and publishing information and data. The website management team suffers greatly. Even though the staff and senior management are not forthcoming with information and data for the website, they insist the website must be updated.

Conclusion: The FC leadership and team sees the value of an updated website and has some critical tools like WAN, Intranet, e-mail and databases; some of which were procured independently with donor support. However, the FC has failed to re-engineer their internal processes to ensure that these tools are deployed and optimized. We recommend a process re-engineering program for the entire FC.

Information Management: The website enables information that would otherwise be difficult to obtain to be made more readily available to the public, provided Internet access is available. The website provides information on forest management, forest sector programs, the Forestry Commission itself, publications, and more.

Users: The key stakeholder for the Forestry Commission of Ghana website is the general public. Though the number of Ghanaians with access to the Internet is relatively low and concentrated in the cities, with an increase in Internet connectivity across the country particularly through the fast-growing mobile networks, it can be expected that the user base will continue to grow in numbers.

Technology: The website is static and built from Macromedia Dreamweaver in 2001. Though the FC has an e-mail system, WAN, Intranet and databases they are not interconnected to the

Ghana Case Study on Information Management and Technology for Forest Governance
Document version 8.0 – January 6, 2011

Final Report

Page 25 of 52

website for the flow of content to the public. A new website is being developed now by their service provider which would have a good Content Management System (CMS).

Outcome: Though the website has been in existence since 2001, it has never been reviewed. Though it is static, it has given the government organizations, NGOs, the general public, the international community and Internet users some information about the FC and how to engage with them.

Extensibility: Given that the website is available on the Internet, this application is accessible by any user/stakeholder, at any time, provided they have Internet access. The use of the website is also extendable, provided the content and/or necessary plug-ins are available.

Global Forest Information Service (GFIS) Africa Project

Description: As scientific knowledge generated through research is a key to sound forest policy formulation and sustainable forest management (SFM), the availability of this research information and knowledge is vital to good forest governance. To this end, the International Union of Forest Research Organizations (IUFRO), which is a major player in forestry research activities, introduced in 2000 the Global Forest Information Service (GFIS) to generate and disseminate meta-data. In Ghana, the Forestry Research Institute of Ghana (FORIG) of the Centre for Scientific and Industrial Research (CSIR) was engaged in the project. While the project ended in 2004, GFIS continued beyond 2004 with the stakeholders obtaining Internet subscriptions. It aims to support and strengthen forestry research in order to contribute to the conservation and sustainable management and utilization of forest resources in sub-Saharan Africa.

Ghana Case Study on Information Management and *Final Report*
Technology for Forest Governance
Document version 8.0 – January 6, 2011

Page 26 of 52
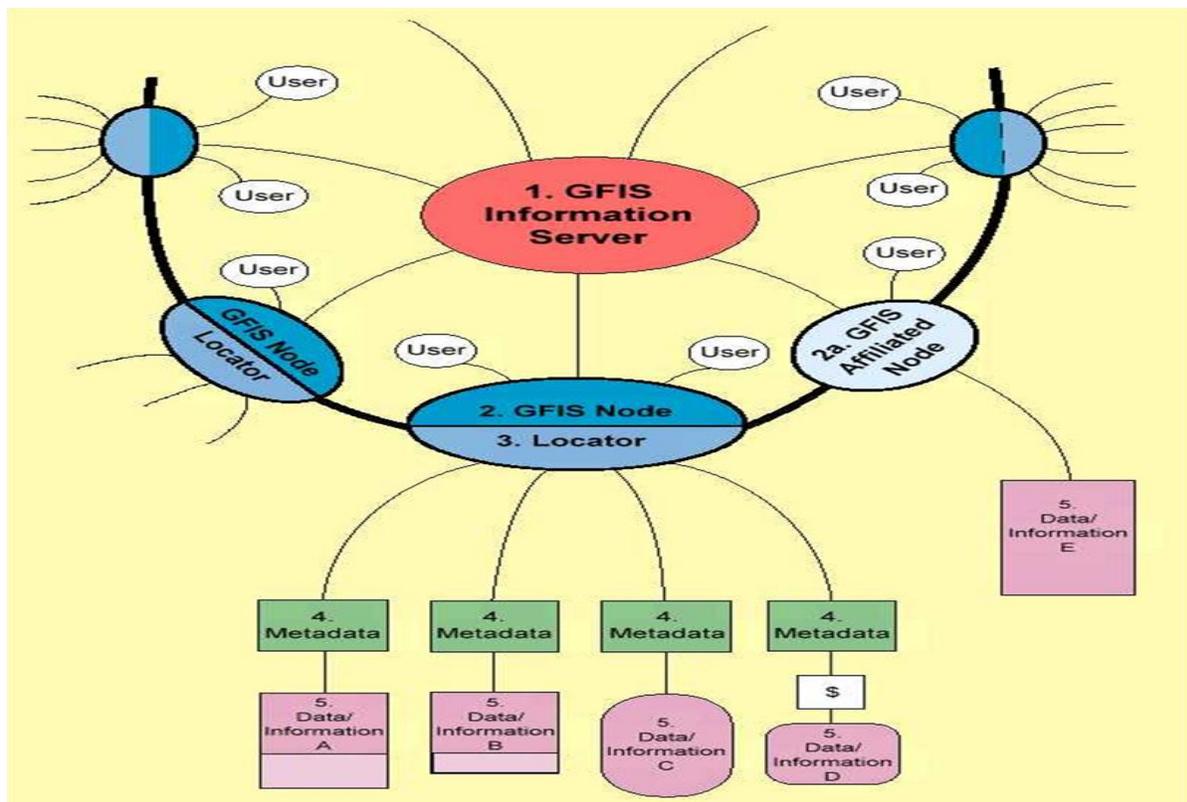
The second phase under GFIS Global, which is in place now, provides the entire information set for public consumption.

Process: The five (5) countries in GFIS Africa collect information and send it to Ghana, which was the lead, and then it is sent through the system to FORNESSA who published it for public consumption. The same process exists for GFIS Global, with a governance system as outlined below:
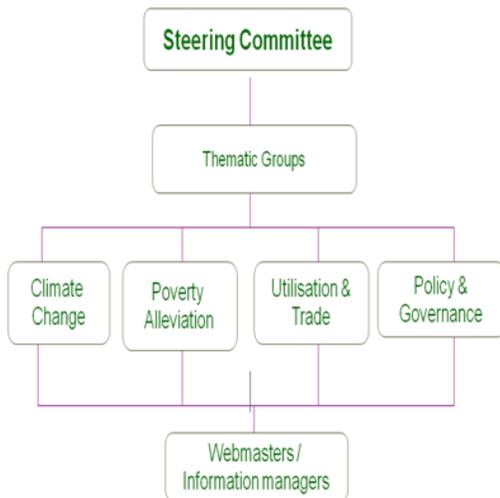

Steering committee: Steering committee provides policy direction and overlooks project implementation.
Thematic group leaders: Liaises with information managers or webmasters to identify prioritized topics related to the thematic groups.
Webmasters/Information managers: Uploads information on the FORNIS website and then sees to the functionality of the website. This then becomes available to all users.

Conclusion: GFIS Global seems to be a successful successor to GFIS Africa and has added more countries, now there are seven (7) institutions from six (6) counties with more to be added soon. The project is heavily donor-dependent, which provides challenges for future sustainability.

Ghana Case Study on Information Management and Technology for Forest Governance Document version 8.0 – January 6, 2011

Final Report

Page 27 of 52
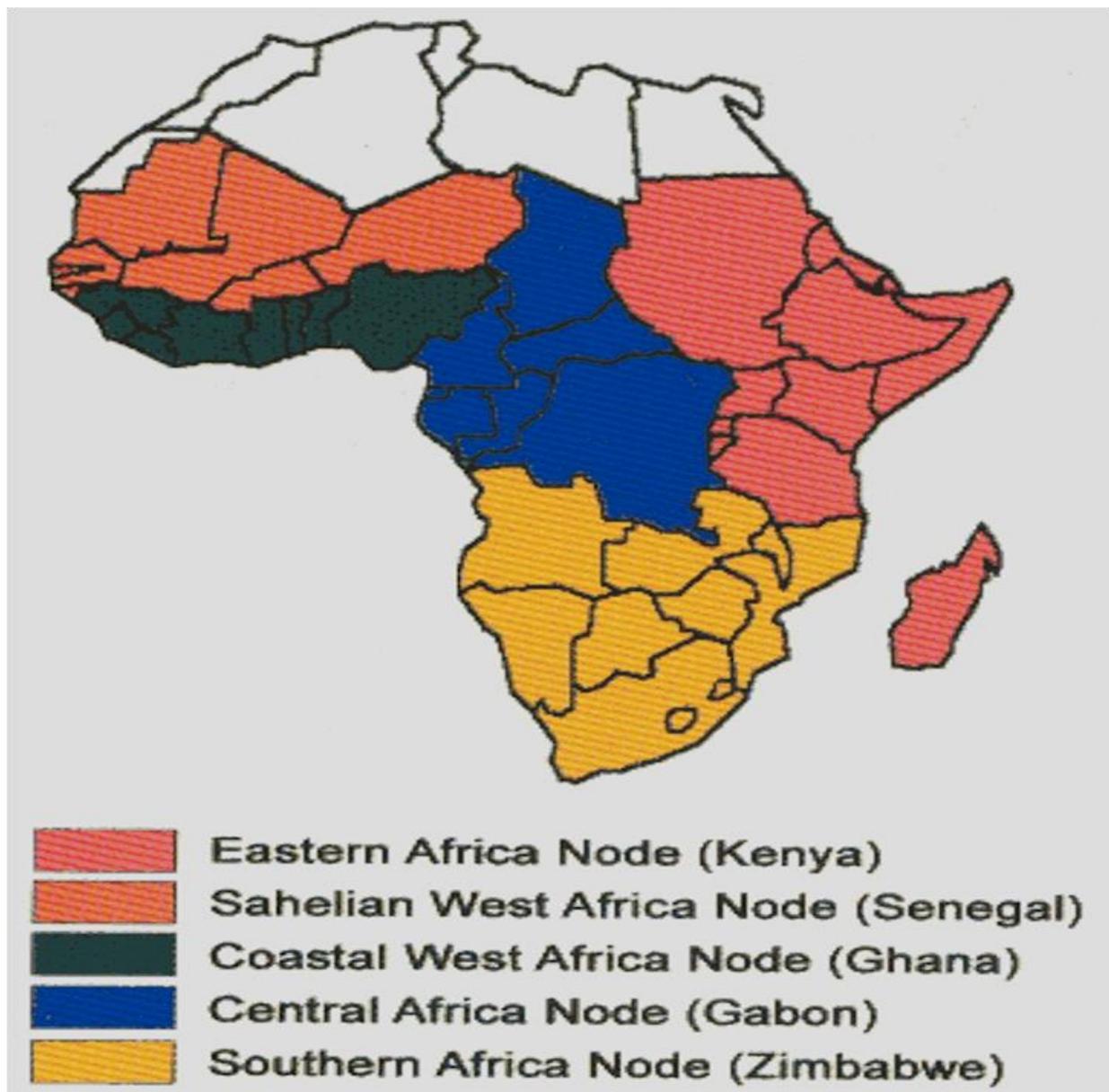
Information Management: The GFIS Africa project, which was implemented by FORNESSA, included five GFIS nodes in Senegal, **Ghana**, Kenya, Zimbabwe and Gabon and was sponsored by the European Commission. The gateway is at www.gfis.net and the portal at www.fornis.net. These five nodes, now referred to as service centres, were the Institut Senegalais de Recherches Agricoles (ISRA), the Forestry Research Institute of Ghana (FORIG), the Kenya Forestry Research Institute (EFRI), the Forest Research Centre of Zimbabwe (FRC-Z) and the Association pour le Développement de l'Information Environnementale (ADIE), and were strategically located in different climatic and ecological zones. These centres were given the responsibility to mobilize information from countries within their zones, making this information available to all countries on the electronic media network and thereby ensuring all countries have more easily accessible scientific research data with which to enable decision-making on forest governance policy and regulation matters.

Ghana Case Study on Information Management and Technology for Forest Governance Document version 8.0 – January 6, 2011   *Final Report*

Page 28 of 52

Users: The primary users were research scientists across Africa including students, trainers, researchers, NGOs and others involved in land management. There was also a team of forest and information managers, researchers and scientists, policymakers, webmasters and data-entry personnel required to maintain the GFIS system.

Technology: GFIS is a database of information accessible from any Internet search engine with keyword searches. All five service centres were equipped with the necessary hardware and software to maintain the electronic media output that was GFIS Africa. For the exchange and integration of information from different countries to be effective, the use of standards such as Dublin core, XML and other meta-data standards was required. GFIS Global is a web-based Internet system built on the Drupal CMS and is fairly new, implemented in July 2010.

Outcome: The outcome of GFIS Africa has been a positive one. GFIS has created awareness about the importance of information and its effect on research results. Many researchers across Africa have used the GFIS database at one time or another to access information for numerous purposes including literature reviews, proposal writing, publishing scientific articles, and more.

One of the greatest challenges for the project was the creation of international partnerships among African countries with multicultural and multilingual characteristics. It was expected that the GFIS database would eventually be multilingual, not only meeting the needs of different language groups but also having the capacity to be converted from one language to another. The system has resulted in:
– Better forest management
– Increased communication among researchers from different regions
– Greater dependence on science for policy decisions
– Increased public awareness
– More and stronger partnerships

– Lack of high quality scanner; materials have to be sent to the US for scanning, prolonging turn-around time
– Poor Internet facilities in Africa frustrates commitment
– Limited Internet bandwidth makes it difficult to upload large documents
– Need to find ways of sustaining the process if donor support ends

Extensibility: After the initial project, it was expected that the service centres would extend services to other countries and institutions, linking them to the network. However following the end of the project, there have been multiple challenges that threaten its long-term viability. These include: inadequate network infrastructure (high Internet connection fees and weak links), general infrastructure problems (unreliable power), inadequate financial support, especially after the end of the project period, poor information retrieval skills among users, and inadequate linkages with partner organizations. It is also clear that in this case, the people infrastructure required to staff the service centres, obtain and maintain the research information, and network across their zones, is perhaps more an extensibility challenge the Internet technologies.

Applications of ICT for Governance in Africa

The forestry industry is one of several sectors considering and applying ICT to the challenges of governance. Indeed, Ministries of Communications and Information Technology, which are the governing ministries over information and communication technologies, are coordinating several initiatives to promote and guide the use of ICT in government and governance. In particular, because of the rapid growth and penetration of mobile capability throughout the continent, there is a tremendous opportunity to leverage this technology for governance solutions. We present below a sampling of mobile applications currently used within Ghana and/or across Africa, in closely related sectors, such as agriculture, and beyond.

ESOKO

Launched in 2004, Esoko is a new approach in sharing, viewing and managing market information at www.esoko.com. It uses SMS and the web to generate, store and broadcast market information on commodities and the prices to subscribers who pay a fee, which is the equivalent of an SMS message. More than 800,000 prices from hundreds of markets are quoted, with a focus on sub-Saharan Africa. Users sign up to receive weekly SMS alerts on commodities and they can also upload offers to buy and sell products.

There are some other Market Information Systems, like SMS Sokini in Kenya which provides agricultural information through SMS for a fee, WOUGNET on Uganda's Busoga Rural Open Source Development Initiative website and Manobi'sXamMarse, which means "know your market" in Wolof, from Senegal.

Mobile Money

MPESA - Launched in 2007 by Kenya's mobile giant Safaricom, MPESA (pesa means money in Swahili) is a way to transfer money via the mobile phone. The mobile phone in Africa is playing a significant role in the growth of the banking and finance sector.

About half of Safaricom's estimated 13.4 million customers use MPESA. According to the company's last financial information, a total of $1.8 billion has been transferred since the service launched, representing about 5 percent of GDP. Most Kenyans now use their phones to send and receive money, manage their bank account, check and pay their utility bills, bypassing long waits in queues and making it easier to support family and friends. In the last two years, the use of formal financial services from non-bank institutions in Kenya has increased from 7.5 percent to 17.9 percent, mostly due to MPESA.

Artel (formerly Zain) and MTN, two major mobile carriers in Africa, also have their mobile money system, namely Zap and MTN Money, which they are rolling out across the continent and taking money transfers beyond borders.

A related mobile-banking platform from South Africa is called WIZZIT targets the 13 million to 16 million people who do not have bank accounts or use any accounts. The platform is a fully functional bank account, against which you can set up debit orders and have your salary deposited electronically from any bank. Through relationships with the South African Post Office and ABSA Bank, WIZZIT has about 4,600 outlets.

Ghana Case Study on Information Management and Technology for Forest Governance Document version 8.0 – January 6, 2011

Final Report

Page 30 of 52

Mobile Web

USHAHIDI - A Swahili word for "testimony", Ushahidi is a platform that uses a Google Maps mash-up to map crisis information using text messages sent by users at www.ushahidi.com. It was developed in Kenya during the crisis following the 2008 elections used to report incidences of violence.

The Ushahidi platform has been used to monitor elections in India, Mexico, Lebanon and Afghanistan. Apart from Kenya, it has being used to track unrest in the Democratic Republic of Congo and Haiti. In Zambia it's used to track medicine stock shortages and in the Philippines to track mobile phone companies.

It is designed as a free and open source mapping and content management system primarily for the mobile phone, which allows users to send critical crisis information and receive mobile updates. It also has a web interface for visualization. Since its establishment, there have been 2,881 mobile and 2,580 web downloads of the application.

African Elections Portal (AEP)

A related innovation is the African Elections Portal at www.africanelections.org, which uses SMS, the web and new media tools to provide timely and relevant election-related information and knowledge while monitoring specific and important aspects of governance.

AEP, which was launched in 2008 with a cue from the post election violence in Kenya, uses new and social media tools to develop capacity to monitor the governance process, prior, during and after an election. The project leverages free, fair and unbiased media and the crucial role they play in elections. The platform has been used to cover elections in Ghana, Mauritania, Malawi, Mozambique, Namibia, Botswana, Togo, Guinea and Cote d'Ivoire.

The project is helping strengthen transparency in elections and deepen democracy and the rule of law on the continent through the provision of timely and accurate information.

Mobile Authentication

mPedigree - In January 2008, mPedigree (www.mpedigree.org) pioneered a platform that was successfully tested in a pilot in Ghana and was at the time widely reported as the first system anywhere in the world by means of which consumers and patients, across a national territory, can instantly verify the source of a purchased pharmaceutical for free, right at the point of purchase, using standard mobile phones.

MPedigree now aims to enrol manufacturers worried about losing market share to counterfeiters. It provides them with special codes through access to a secure, automated, Internet-to-line mechanism, which assigns the embossment on each pack of drug of a unique alphanumeric code. When a consumer purchases the product, they scratch off a panel to reveal the code which they then SMS to a universal four-digit number. This number, called a short code, is leased by telecom operators who allow the queries to be directed to mPedigree, who then respond immediately with verification.

Ghana Case Study on Information Management and Technology for Forest Governance Document version 8.0 – January 6, 2011

Final Report

Page 31 of 52

During a four-month pilot project in Ghana in 2007 using a locally-manufactured painkiller called Efpac, four mobile operators assigned codes that worked nationwide, allowing 3,000 patients in Accra and Kumasi to authenticate their drug purchase in five seconds or less with a free SMS either from their phone or a third party's, often the pharmacist who dispensed the drug. The drug manufacturer paid the cost of the SMS.

In the next phase of this project, some of these applications can be reviewed and re-engineered to meet some of the governance elements not address effectively by the four applications studied.

Ghana Case Study on Information Management and Technology for Forest Governance Document version 8.0 – January 6, 2011

Final Report

Page 32 of 52

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8. Hidden forestry revealed: Characteristics, constraints and opportunities for small and medium forest enterprises in Ghana, by Paul Osei-Tutu, Kwabena Nketiah, Boateng Kyereh, Mercy Owusu-Ansah, and Joseph Faniyan in 2010
9. Chatham House illegal logging indicators country report card by Chatham House (www.illegal-logging.info/indicators) in 2010
10. Ghana – European Community FLEGT Voluntary Partnership Agreement Briefing Note European Commission and Ghana officials to inform public about the VPA. November 2009
11. Illegal logging in Ghana – BRIEFS DEVELOPMENT no.5 Christian P. Hansen, PhD fellow (cph@life.ku.dk) and Thorsten Treue, associate professor (ttr@life.ku.dk)
12. Danish Centre for Forest, Landscape and Planning, University of Copenhagen in December 2008
13. Assessing potential impacts in Ghana of a VPA by James Mayers, IIED
14. Recommendations for controlling illegal chainsaw milling in Ghana
15. The VPA and Log Tracking-Industry's Concerns
16. An Overview on Certification by Wendy Baer, Executive Vice President International Wood Products Association (IWPA) on Oct. 21, 2002
17. Communiqué: Civil Society Meeting on Forest Governance 30 July – 3 Aug. 2007 by Institute of Local Government Studies Ogbojo, Accra on Aug. 3, 2007
18. Cross-Border Flows of Timber and Wood Products in West Africa Hugh Blackett & Dr. Eric Gardette, HTSPE Ltd. on Oct. 20, 2008
19. Forest Governance in Ghana - An NGO perspective. Produced for FERN by Forest Watch Ghana in March 2006
20. Chain Saw Logging and Milling in Ghana Background Study Report
21. Country Case Study 1: Ghana's experience in timber verification system design by Neil Bird, Timothée Fometé and Gene Birikorang in May 2006
22. Scoping study: Independent Forest Monitoring (IFM) in Ghana by David Young
23. Independent Forest Monitoring by Global Witness in November 2005
24. Joint Statement on a Voluntary Partnership Agreement (VPA) on Forest Law Enforcement, Governance and Trade (FLEGT) between Ghana and the European Community
25. Ghana Forestry Commission's 'Validation of Legal Timber' Programme (VLTP). Proposed Wood Tracking System: System Requirements Analysis, Validation of Legal Timber Programme (VLTP) by Chris Beeko - cabeeko@yahoo.com and SGS Project team members: Marc Parren (Dr) - marcparren@hq.fcghana.com, Antoine de La Rochefordière -

Ghana Case Study on Information Management and Technology for Forest Governance Document version 8.0 – January 6, 2011

Final Report

Page 33 of 52

For World Bank

antoine.delarochefordiere@sgs.com, John Barne - john@barne.freeserve.co.uk and Blaise Reymondin - blaise.reymondin@sgs.com in May 2007

26. The World Bank. (2009). *Roots for Good Forest Outcomes: An Analytical Framework for Governance Reforms*. Washington D.C.: The World Bank
27. IUCN: A Desk Study of Existing Forest Sector Initiatives in Ghana by Chris Beeko in August 2009
28. Ministry of Lands and Forestry ICT Policy Statement obtained from Ministry of Lands and Forestry website
29. NATURAL RESOURCES & ENVIRONMENTAL GOVERNANCE PROGRAMME (NREG) ANNUAL REPORT 2009 obtained from Forestry Commission website

Appendix 1: Completed Questionnaires

Ghana Case Study on Information Management and Technology for Forest Governance
Document version 8.0 – January 6, 2011

Final Report

Page 34 of 52

Questionnaire Heading

Interviewee's First and Last Names or Group Name	Brian Cohen, Forestry Specialist, Helveta Ltd.
Interviewer's First and Last Names	
Interview Date	14 October 2010
Identification Number	

Questionnaire Details

Consideration

7. Description

The description should provide a good overview of the ICT solution. The reader should be able to understand following the description the why, what, where, when, how and who of the solution. The description should also link the ICT solution to the forest governance areas whether it is current used in forest governance or not.

7.1. How related is this project to forest governance in Ghana? Include general description, location and funding.

- Select one of the five forest governance components (see directly below). If this project is not directly used in forestry discuss the areas of forest governance it could be applied to.

  As the Log and Wood Tracking Pilot Project for On-Reserve Forest Areas is principally a project aimed at establishing a chain of custody from the standing tree to various points of sale for export, it is about tracing the flow of legal timber and therefore most aligned to the first component.

  o Transparency, Accountability and Public Participation
  o Stability of Forest Institutions and Conflict Management
  o Quality of Forest Administration
  o Coherence of Forest Legislation and Rule of Law
  o Economic Efficiency, Equity and Incentives

- Discuss funding model around the following criteria:
  o Public versus private funding
  o Initial costs versus Ongoing maintenance/operating costs
  o Comparison of budget versus actual – where there cost over runs or under runs?
  o What do users/customers pay for the project?

- Location:
  o Where was project executed? Onshore, offshore?
    Onshore.
  o Where is project used? Entire nation or localized? And if localized, where?
    Pilot project in three compartments in the Suhuma Forest Reserve, Sefwi Wiawso District, Western Region, and one compartment in the Asenanyo River Forest Reserve, Nkawie District, Ashanti Region. The companies

Ghana Case Study on Information Management and Technology for Forest Governance
Document version 8.0 – January 6, 2011

Final Report

Page 35 of 52

	involved are BLLC, Kumi & Co., John Bitar Company and Samartex. If the pilot is deemed successful, the project will be scaled up nationally.
7.2.	How are ICTs used in this case study and what were the anticipated governance benefits of using ICTs at the project design stage?
	• Describe the communication and information technology or technologies used
	Using barcode-scanning hand-held computers (HHCs or PDAs) in remote forest areas, in conjunction with plastic barcoded tree and log tags, to capture measurements like species, diameter, length, and geospatial location, as well as the date, time and name of the user who entered the data. With internet connectivity, uploading field data to a secure mainframe computer. Using database software technology to interpret and organize data into tailor-made reports and maps of forest areas.
	• How do users access the system? Are they able to access (and afford) the ICTs?
	Users are assigned a user name and passcode to enter the system. Access to data entry forms and reports is user role-specific.
	• What is the purpose of the system? Is it to inform, change behavior, track?
	To track logs and wood products. To support invoicing and payment processes.
	• What was the precedence for this system?
	Paper-based log-tracking with limited information security assurances.
8.	Information Management This section should provide an understanding of the information elements and flow involved in the forest governance (or potential forest governance) solution. Is this as expected or has it changed over the life of the product? And how have ICTs been used to enable the interaction and processing of information elements and flow?
8.1.	What is the information chain that is enabled by ICT?
	• Is this available in diagram or specifications format?
	• Who are the users or stakeholders at each stage of the chain?
	TRAU (Timber Rights Administration Unit) for contract/contacts management, FSD (Forest Service Division) and RMSC (Resource Management Support Center) for stock survey, yield selection and harvesting, TIDD (Timber Industry Development Division) for transport, processing and export.
	• How does this information chain relate to the governance components (whether it be a forest governance application or not)?
	Users are known throughout the process, thereby ensuring a greater level of accountability. Also, data capture is more accurate because human error is reduced through the use of data parameters.
8.2.	How is ICT intended to enable this information chain?
	• Is it providing new information?
	A more reliable chain of custody, tracking timber from the port back to the stump.
	• Is it improving the quality of existing information?
	Yes. See above. Data parameters are used to reduce human error. Also, data is easier to read.
	• Is it improving the efficiency in public, private or other stakeholders? If so, which ones?
	• Is it making existing information more accessible?
	Depends on the user roles assigned and the access the user roles are given. Up to the GFC.

Ghana Case Study on Information Management and Technology for Forest Governance
Document version 8.0 – January 6, 2011

Final Report

Page 36 of 52

8.3. Is the use of ICTs changing the way information is now generated or used? 　• If so, describe the changes in terms of information chain, numbers or types of users involved, and governance.
9.　Users This section should provide a detailed understanding of the users (end users, stakeholders, beneficiaries) and providers (operators, vendors) of the solution. It is important to define numbers, mix, intended versus unintended, inclusiveness or specificity of user base, and other considerations.
9.1. What is the scale of the operation in this case study? 　• How large is the area? 　**Approximately 500 ha.** 　• How many people/locations/departments are involved? 　**4 companies, 4 compartments, 4 mills, 5 forestry departments/divisions, about 100 people.** 　• How many users are there? 　**Users registered with a user name and passcode = approximately 30.**
9.2. Are there new uses or new users for this information?
9.3. Who are the different stakeholders in this case study and how inclusive is the model? 　**The model addresses the traceability of wood in on-reserve areas destined for export. It excludes wood coming from off-reserve areas, imports, underwater extraction, plantations. These categories are reserved for the national roll-out plan.**
9.4. What benefit have the users obtained from the system? 　**More accurate mapping capabilities, quicker access to reports, more accurate data capture, almost real-time understanding of mill recovery rates.**
9.5. Can users financially sustain the operating model for the project? 　• Do users pay for the ongoing cost of the project? If so, how and how much do they pay?
10. Technology In this section, the reader should understand what and how ICTs were used in the solution. The overview on ICT in Ghana should provide a basis for understanding the relevance, sustainability and implications of the ICTs used in the forest governance solutions.
10.1. What were the initial barriers to implementing the technology and how were they overcome? 　**Although various modules were configured in time, it has taken longer than expected for the GFC to test the system by conducting the pilot. Logistical issues and internal information gathering struggles have served to hinder the project. Resolution of issues has been the result of protracted engagement with the GFC both from afar (UK) and through the introduction of forestry specialists who are permanently on the ground in Ghana.**
10.2. Was the technology developed for this particular use, replicated from other pilots or projects, or a commercial off-the-shelf (COTS) package? 　**Developed for this particular use, but informed by similar projects in Liberia, Cameroon and the DRC.**
10.3. How accessible is (are) the application(s)? Is (Are) the application(s) public domain or proprietary applications?
10.4. Please provide design specifications.
11. Outcome

This section provides an understanding of the effects of the ICT solution on forest governance, the users, cost and really, the intended benefits.
11.1. Have there been any evaluations or mid-term reviews of the solution? • If so, when were these conducted? • Please provide documentation.

11.2. What were the findings of any assessments? What is the assessment of the level of achieving expected outcomes?
 • If there are no assessments, determine the following:
  o If in the early stages, how did the project plan to justify the benefits against the costs? If further along, how did they or do they justify the benefits against the costs?
  o Were the benefits realized?

12. Extensibility This section provides an assessment of how scalable and applicable is this ICT solution.
12.1. What was the cost of the solution and how was it funded?
12.2. How was scaling up or replication planned? • What were the lessons learned in scaling up/replication? • If replication is planned, has it been done with this application elsewhere or a similar application? And what were the lessons learned there?

Ghana Case Study on Information Management and Technology for Forest Governance Document version 8.0 – January 6, 2011

Final Report

Page 38 of 52

Interview Questionnaire

Instructions

The Interview Questionnaire has been designed to solicit feedback and further data to strengthen the desk review report. The format of each question is:

1.   Theme
1.1. Question
• Consideration
○ Consideration Notes

Each theme must be addressed for each. The first interview should be with the solution owner who can then support further interviews for each additional interview group such as users, operators, stakeholders, vendors and so forth. Where necessary the desk review will be used to identify these user groups as well.

Where possible, interviewees should provide diagrams, graphs, specifications, pictures and other graphical or pictorial representation of responses and results.

Questionnaire Heading

Interviewee's First and Last Names or Group Name	JOE APPIAH – GYIAPONG
Interviewer's First and Last Names	
Interview Date	25TH OCTOBER 2010
Identification Number	

Questionnaire Details

Consideration
1.   Description
The description should provide a good overview of the ICT solution. The reader should be able to understand following the description the why, what, where, when, how and who of the solution. The description should also link the ICT solution to the forest governance areas whether it is current used in forest governance or not.
1.1. How related is this project to forest governance in Ghana? Include general description, location and funding.
• Select one of the five forest governance components (see directly below). If this project is not directly used in forestry discuss the areas of forest governance it could be applied to.
✓ Transparency, Accountability and Public Participation
○ Stability of Forest Institutions and Conflict Management
○ Quality of Forest Administration
○ Coherence of Forest Legislation and Rule of Law
○ Economic Efficiency, Equity and Incentives
• Discuss funding model around the following criteria:
○ Public versus private funding
○ Initial costs versus Ongoing maintenance/operating costs
✓ Comparison of budget versus actual – where there cost over runs or under runs?
○ What do users/customers pay for the project?

ICT in Forest Governance Field Study Questionnaire –
prepared by Internet Research
Document version 1.0 – October 3, 2010

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Page 4 of 6

- Location:
  - o Where was project executed? Onshore, offshore? *N/A*
  - o Where is project used? Entire nation or localized? And if localized, where?

1.2. How are ICTs used in this case study and what were the anticipated governance benefits of using ICTs at the project design stage?
- Describe the communication and information technology or technologies used
- How do users access the system? Are they able to access (and afford) the ICTs? *Through Personal Computer*
- What is the purpose of the system? Is it to inform, change behavior, track? *Inform & change behavior*
- What was the precedence for this system? *Not Clear*

2. Information Management

This section should provide an understanding of the information elements and flow involved in the forest governance (or potential forest governance) solution. Is this as expected or has it changed over the life of the product? And how have ICTs been used to enable the interaction and processing of information elements and flow?

2.1. What is the information chain that is enabled by ICT? *From units to ICT dept*
- Is this available in diagram or specifications format? *N/A*
- Who are the users or stakeholders at each stage of the chain? *Staff*
- How does this information chain relate to the governance components (whether it be a forest governance application or not)? *N/A*

2.2. How is ICT intended to enable this information chain?
- Is it providing new information? *Not necessarily*
- Is it improving the quality of existing information? *Yes*
- Is it improving the efficiency in public, private or other stakeholders? If so, which ones? *Ideally*
- Is it making existing information more accessible? *Yes.*

2.3. Is the use of ICTs changing the way information is now generated or used? *Not always*
- If so, describe the changes in terms of information chain, numbers or types of users involved, and governance.

3. Users

This section should provide a detailed understanding of the users (end users, stakeholders, beneficiaries) and providers (operators, vendors) of the solution. It is important to define numbers, mix, intended versus unintended, inclusiveness or specificity of user base, and other considerations.

3.1. What is the scale of the operation in this case study? *Head office of FC*
- How large is the area?
- How many people/locations/departments are involved? *300 people*
- How many users are there? *500*

3.2. Are there new uses or new users for this information? *As and when needed new ones are added*

3.3. Who are the different stakeholders in this case study and how inclusive is the model? *N/A*

3.4. What benefit have the users obtained from the system? *No study conducted*

3.5. Can users financially sustain the operating model for the project?
- Do users pay for the ongoing cost of the project? If so, how and how much do they pay? *No payment*

4. Technology

In this section, the reader should understand what and how ICTs were used in the solution. The overview on ICT in Ghana should provide a basis for understanding the relevance, sustainability and implications of the ICTs used in the forest governance solutions.

4.1. What were the initial barriers to implementing the technology and how were they overcome? *Acceptance but through training.*

4.2. Was the technology developed for this particular use, replicated from other pilots or projects, or a commercial off-the-shelf (COTS) package? *N/A*

4.3. How accessible is (are) the application(s)? Is (Are) the application(s) public domain or proprietary applications? *N/A*

4.4. Please provide design specifications. *N/A*

5. Outcome

This section provides an understanding of the effects of the ICT solution on forest governance, the users, cost and really, the intended benefits.

5.1. Have there been any evaluations or mid-term reviews of the solution? *No*
- If so, when were these conducted?
- Please provide documentation.

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Document version 1.0 — October 3, 2010

Confidential

Page 5 of 6

*Ghana Case Study on Information Management and
Technology for Forest Governance*
Document version 8.0 – January 6, 2011

Final Report

Page 40 of 52

For World Bank

5.2. What were the findings of any assessments? What is the assessment of the level of achieving expected outcomes? *No Assessment Conducted*
• If there are no assessments, determine the following:
o If in the early stages, how did the project plan to justify the benefits against the costs? If further along, how did they or do they justify the benefits against the costs?
o Were the benefits realized? *Not yet evaluated*

6. Extensibility
This section provides an assessment of how scalable and applicable is this ICT solution.

6.1. What was the cost of the solution and how was it funded? *Not Available Now*
6.2. How was scaling up or replication planned?
• What were the lessons learned in scaling up/replication? *Not available.*
• If replication is planned, has it been done with this application elsewhere or a similar application? And what were the lessons learned there? *Not Available.*

ICT in Forest Governance Field Study Questionnaire -
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Document version 1.0 – October 3. 2010
Page 6 of 6

Confidential

Ghana Case Study on Information Management and
Technology for Forest Governance
Document version 8.0 – January 6, 2011

Final Report

Page 41 of 52

Questionnaire Heading

Interviewee's First and Last Names or Group Name	Afua Adu-Boahene
Interviewer's First and Last Names	Eric Osiakwan
Interview Date	5th October, 2010
Identification Number	

Questionnaire Details

Consideration

13. Description
The description should provide a good overview of the ICT solution. The reader should be able to understand following the description the why, what, where, when, how and who of the solution. The description should also link the ICT solution to the forest governance areas whether it is current used in forest governance or not.

13.1. How related is this project to forest governance in Ghana? Include general description, location and funding.
- Select one of the five forest governance components (see directly below). If this project is not directly used in forestry discuss the areas of forest governance it could be applied to.
    - <u>Transparency, Accountability and Public Participation</u>
    - Stability of Forest Institutions and Conflict Management
    - Quality of Forest Administration
    - Coherence of Forest Legislation and Rule of Law
    - Economic Efficiency, Equity and Incentives
- Discuss funding model around the following criteria:
    - Public versus private funding
    - Initial costs versus Ongoing maintenance/operating costs
    - Comparison of budget versus actual – where there cost over runs or under runs?
    - What do users/customers pay for the project?
    - <u>Initial donor funding versus government (Forestry Commission) funding</u>
- Location:
    - Where was project executed? <u>Onshore</u>, offshore?
    - Where is project used? Entire nation or <u>localized</u>? And if localized, where? *Website – Nationwide; Intranet – localized in Forestry Commission offices that are connected to the WAN (Takoradi & Kumasi)*

13.2. How are ICTs used in this case study and what were the anticipated governance benefits of using ICTs at the project design stage?
- Describe the communication and information technology or technologies used *Website, Intranet, Email, Database*
- How do users access the system? Are they able to access (and afford) the ICTs? *Users*

Ghana Case Study on Information Management and Technology for Forest Governance
Document version 8.0 – January 6, 2011

Final Report

Page 42 of 52

(Forestry Commission Staff access system through LAN, WAN, PCs, ; access yes, afford no – in the sense that FC is not getting full benefit of interconnectivity because it is not ready or able to meet the full cost of ICT deployment. • What is the purpose of the system? Is it to inform, change behavior, track? *All* • What was the precedence for this system?

14. Information Management   This section should provide an understanding of the information elements and flow involved in the forest governance (or potential forest governance) solution. Is this as expected or has it changed over the life of the product? And how have ICTs been used to enable the interaction and processing of information elements and flow?
14.1. What is the information chain that is enabled by ICT? • Is this available in diagram or specifications format? – *Both, not readily available* • Who are the users or stakeholders at each stage of the chain?- *ICT staff & FC staff, General Public* • How does this information chain relate to the governance components (whether it be a forest governance application or not)? – *Transparency, accountability public participation*
14.2. How is ICT intended to enable this information chain? • Is it providing new information? – *No it is providing existing information* • Is it improving the quality of existing information? - *Yes* • Is it improving the efficiency in public, private or other stakeholders? If so, which ones? – *Yes, all.* • Is it making existing information more accessible? - *Yes*
14.3. Is the use of ICTs changing the way information is now generated or used? - *Yes* • If so, describe the changes in terms of information chain, numbers or types of users involved, and governance.
15. Users   This section should provide a detailed understanding of the users (end users, stakeholders, beneficiaries) and providers (operators, vendors) of the solution. It is important to define numbers, mix, intended versus unintended, inclusiveness or specificity of user base, and other considerations.

15.1. What is the scale of the operation in this case study?
• How large is the area? *The whole country*
• How many people/locations/departments are involved?
   - *FC staff number about 4,000;*
   - *Location: all regions of the country*
   - *Departments: Wildlife Division, Forest Services Division, Timber Industry Development Division, Corporate Headquarters (each with its various departments: Finance and Administration, Operations, Human Resource and other units)*
• How many users are there?

15.2. Are there new uses or new users for this information? - *No*
15.3. Who are the different stakeholders in this case study and how inclusive is the model? *FC staff, Government Organisations, General Public, Non Governmental Organisations, International Community*
15.4. What benefit have the users obtained from the system? – *More information*

Ghana Case Study on Information Management and Technology for Forest Governance Document version 8.0 – January 6, 2011   *Final Report*

Page 43 of 52

15.5. Can users financially sustain the operating model for the project? – *Not entirely, donor dependent* • Do users pay for the ongoing cost of the project? If so, how and how much do they pay? – *FC pays service providers (web developers, internet service providers, hardware purchase and repairs, software purchase, subscription and maintenance)*
16. Technology In this section, the reader should understand what and how ICTs were used in the solution. The overview on ICT in Ghana should provide a basis for understanding the relevance, sustainability and implications of the ICTs used in the forest governance solutions.
16.1. What were the initial barriers to implementing the technology and how were they overcome? - Finance
16.2. Was the technology developed for this particular use, replicated from other pilots or projects, or a commercial off-the-shelf (COTS) package? – *Website / Intranet not COTS but custom - made*
16.3. How accessible is (are) the application(s)? Is (Are) the application(s) <u>public domain</u> or proprietary applications?
16.4. Please provide design specifications.
17. Outcome This section provides an understanding of the effects of the ICT solution on forest governance, the users, cost and really, the intended benefits.
17.1. Have there been any evaluations or mid-term reviews of the solution? - *No* • If so, when were these conducted? • Please provide documentation.

17.2. What were the findings of any assessments? What is the assessment of the level of achieving expected outcomes?
• If there are no assessments, determine the following:
   o If in the early stages, how did the project plan to justify the benefits against the costs? If further along, how did they or do they justify the benefits against the costs? – *Donor driven*
   o Were the benefits realized? – *Partly, website / intranet not properly maintained*

18. Extensibility This section provides an assessment of how scalable and applicable is this ICT solution.
18.1. What was the cost of the solution and how was it funded?
18.2. How was scaling up or replication planned? • What were the lessons learned in scaling up/replication? • If replication is planned, has it been done with this application elsewhere or a similar application? And what were the lessons learned there?

Ghana Case Study on Information Management and Technology for Forest Governance Document version 8.0 – January 6, 2011

Final Report

Page 44 of 52

Questionnaire Heading

Interviewee's First and Last Names or Group Name	Stella Britwum Acquah
Interviewer's First and Last Names	Eric Osiakwan
Interview Date	15th October 2010
Identification Number	

Questionnaire Details

Consideration

| 19. Description
The description should provide a good overview of the ICT solution. The reader should be able to understand following the description the why, what, where, when, how and who of the solution. The description should also link the ICT solution to the forest governance areas whether it is current used in forest governance or not. |
|---|
| 19.1. How related is this project to forest governance in Ghana? Include general description, location and funding.
   • Select one of the five forest governance components (see directly below). If this project is not directly used in forestry discuss the areas of forest governance it could be applied to.
      o **Transparency, Accountability and Public Participation ***
      o Stability of Forest Institutions and Conflict Management
      o Quality of Forest Administration
      o **Coherence of Forest Legislation and Rule of Law ***
      o **Economic Efficiency, Equity and Incentives ***
   • Discuss funding model around the following criteria:
      o Public versus private funding **Donor funded**
      o Initial costs versus Ongoing maintenance/operating costs **Donor funded**
      o Comparison of budget versus actual – where there cost over runs or under runs?
      o What do users/customers pay for the project? **Don't pay anything**
   • Location:
      o Where was project executed? Onshore, offshore? **Onshore FORIG-Kumasi**
      o Where is project used? Entire nation or localized? And if localized, where? **Worldwide** |
| 19.2. How are ICTs used in this case study and what were the anticipated governance benefits of using ICTs at the project design stage?
   • Describe the communication and information technology or technologies used, **Web based Internet System- CMS Drupal**
   • How do users access the system? Are they able to access (and afford) the ICTs? **Access was done through search engines and GFIS gateway www.gfis.net.** |

Ghana Case Study on Information Management and Technology for Forest Governance   *Final Report*
Document version 8.0 – January 6, 2011

Page 45 of 52

For FORNESSA Access is done through www.fornis.net and through www.gfis.net
• What is the purpose of the system? Is it to **inform, change behavior, track? All three**
• What was the precedence for this system? **To support and strengthen forestry research in order to contribute to the conservation and sustainable management and utilization of forest resources in Sub-Saharan Africa.**

20. Information Management
This section should provide an understanding of the information elements and flow involved in the forest governance (or potential forest governance) solution. Is this as expected or has it changed over the life of the product? And how have ICTs been used to enable the interaction and processing of information elements and flow?

20.1. What is the information chain that is enabled by ICT?
• Is this available in diagram or specifications format? **FORNIS governance**   • Who are the users or stakeholders at each stage of the chain? **End users are**   ○ **Policy makers**   ○ **Forest managers**   ○ **Researchers and Students**   ○ **Media people and general public**   • How does this information chain relate to the governance components (whether it be a forest governance application or not)?
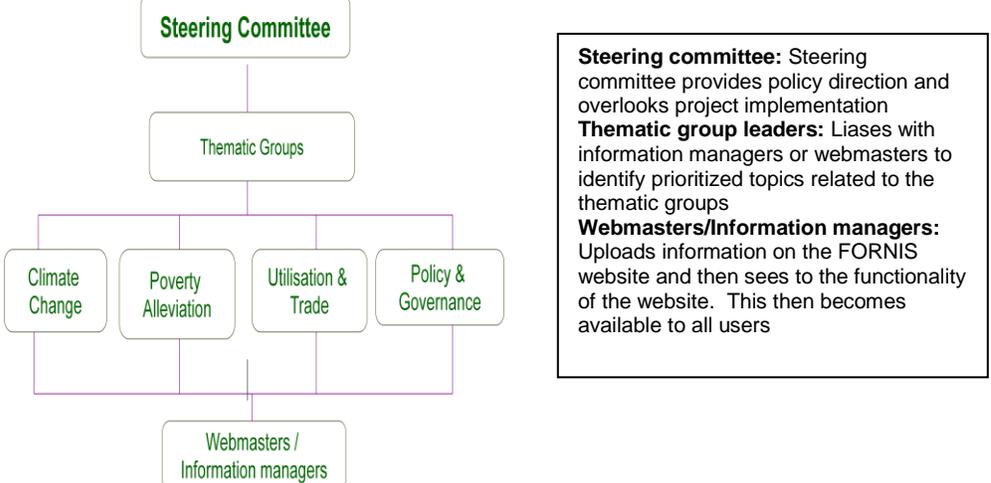
20.2. How is ICT intended to enable this information chain?
• Is it providing new information? **Yes**
• Is it improving the quality of existing information? **Yes**
• Is it improving the efficiency in public, private or other stakeholders? If so, which ones?
• Is it making existing information more accessible? **Yes**

20.3. Is the use of ICTs changing the way information is now generated or used? **Yes**
• If so, describe the changes in terms of information chain, numbers or types of users involved, and governance.

21. Users
This section should provide a detailed understanding of the users (end users, stakeholders, beneficiaries) and providers (operators, vendors) of the solution. It is important to define numbers, mix, intended versus unintended, inclusiveness or specificity of user base, and other

Ghana Case Study on Information Management and Technology for Forest Governance Document version 8.0 – January 6, 2011   *Final Report*

Page 46 of 52

considerations.
21.1. What is the scale of the operation in this case study?   • How large is the area?   •   • How many people/locations/departments are involved?   **7 Institutions from 6 African countries are involved at the moment. (More will be added later)**   • How many users are there? **Global hits from the website in September 719 unique visitors with 1262 number of visits**
21.2. Are there new uses or new users for this information? **Yes**
o   Who are the different stakeholders in this case study and how inclusive is the model?   o   **Forest managers**   o   **Researchers /Scientists**   o   **Students**   o   **Media people and general public**   o   **Policy makers**   21.3.

21.4. What benefit have the users obtained from the system?
     – **Better forest management**
     – **Increased communication among researchers from different regions**
     – **Greater dependence on science for policy decisions**
     – **Increased public awareness**
     – **More and stronger partnerships**

21.5. Can users financially sustain the operating model for the project?   • Do users pay for the ongoing cost of the project? If so, how and how much do they pay? **Users do not pay it is donor funded**
22. Technology   In this section, the reader should understand what and how ICTs were used in the solution. The overview on ICT in Ghana should provide a basis for understanding the relevance, sustainability and implications of the ICTs used in the forest governance solutions.

22.1. What were the initial barriers to implementing the technology and how were they overcome?
     – **Lack of high quality scanner; materials have to be sent to the US for scanning prolonging turn around time**
     – **Poor internet facilities in Africa frustrates commitment**
     – **Limited Internet bandwidth makes it difficult to upload large documents**
     – **Need to find ways of sustaining the process if donor support ends**

22.2. Was the technology developed for this particular use, replicated from other pilots or projects, or a commercial off-the-shelf (COTS) package? **Developed for a particular use, evolution with the old one but system structure has changed**
22.3. How accessible is (are) the application(s)? Is (Are) the application(s) public domain or proprietary applications? **Public domain, easily accessible**
22.4. Please provide design specifications. **www.fornis.net**

Ghana Case Study on Information Management and   *Final Report*
Technology for Forest Governance
Document version 8.0 – January 6, 2011

Page 47 of 52

23. Outcome This section provides an understanding of the effects of the ICT solution on forest governance, the users, cost and really, the intended benefits.

23.1. Have there been any evaluations or mid-term reviews of the solution?
    • If so, when were these conducted? No evaluations yet. **System is fairly new. It was implemented in July 2010**
    • Please provide documentation.

23.2. What were the findings of any assessments? What is the assessment of the level of achieving expected outcomes?
    • If there are no assessments, determine the following:
        o If in the early stages, how did the project plan to justify the benefits against the costs? If further along, how did they or do they justify the benefits against the costs?
        o Were the benefits realized?

24. Extensibility This section provides an assessment of how scalable and applicable is this ICT solution.
24.1. What was the cost of the solution and how was it funded? Have no idea about cost.   Please ask **FORNESSA co-ordinator: Dr. Joe Cobbinah, email: jrcobbinah@yahoo.co.uk**

24.2. How was scaling up or replication planned?
    • What were the lessons learned in scaling up/replication?
    • If replication is planned, has it been done with this application elsewhere or a similar application? And what were the lessons learned there?

Ghana Case Study on Information Management and Technology for Forest Governance Document version 8.0 – January 6, 2011

Final Report

Page 48 of 52

MINISTRY OF LANDS AND NATURAL RESOURCES (MLNR)
NATURAL RESOURCES AND ENVIRONMENTAL GOVERNANCE PROGRAMME (NREG)
FORESTRY SECTOR MATRIX

Program / Policy Objectives	Target 2009	Means of Verification (MOV)	Targets 2010	Targets 2011	EXPECTED OUTCOMES 2012 (End of 5 years)
Institutional Strengthening and Governance	Baseline survey conducted on percentage of 'legal' timber in domestic market	Market surveys	Monitor the percentage change of 'legal' timber in domestic market in reference to baseline	Monitor the percentage change of 'legal' timber in domestic market in reference to baseline	Improved law enforcement in the Forestry Sector: - *20% increase in Legal Wood supply to the Domestic Market;*
	Policy options and implementation plan for domestic wood supply approved by MLNR	Ministerial directives; - License registers;	Implementation of approved option piloted	Pilot program reviewed and domestic supply strategy implemented	- *75% of all timber exports verified as legal*
	Piloting of Wood Tracking initiated with 3 companies	**Verification reports**	1st FLEGT License issued	40% of all timber exports verified as legal	
Secure Natural Ecosystems for the benefit of all segments of society	Wildfire strategy fully implemented	Wildfire Annual Reports; Field visits	Continue implementation of Wildfire Strategy	Review Wildfire Strategy and make recommendations for implementation	Improved forest health: - *Incidence of wildfires reduced by 70%* - *Presence of keystone species in Protected Areas increased by 5%*
	Develop (10) Review (5) and implement (5) Management plans for forest reserves and Protected Areas (PAs)	- Budgets; - Annual reports; - Field visits - Management Plans	Continue the development, review and implement Management Plans for forest reserves	Continue the development, review and implement Management Plans for forest	

Program / Policy Objectives	Target 2009	Means of Verification (MOV)	Targets 2010	Targets 2011	EXPECTED OUTCOMES 2012 (End of 5 years)
				reserves	
3. Sustainably Finance and Promote Investment in Forestry Sector	Legislation related to financial framework approved	Minutes of Parliamentary deliberations;	Approved legislation related to financial framework implemented	FC financial framework reviewed	Predictable and diversified sources of funding for FC secured: *- Timber Revenues increased by 20% (Base year is 2008)*
	Potentials for accessing carbon credit schemes assessed	Reports on revenues; Budget forestry sector;	Proposals for accessing carbon financing developed	Implementation of approved proposals for carbon financing initiated	*- Eco-Tourism revenues increased by 10% (base year is 2008) - Payment for environmental services (PES) revenues increased by 10% (base year is 2010)*
	Strategy for tertiary wood processing developed and approved	Annual reports forestry sector;	Implementation of two priority areas in strategy initiated	Export of tertiary processed wood products increased by 10%	
	Land lease and Benefit Sharing Agreements with 10 investors signed and monitored	Archive of Benefit Sharing Agreements	Land lease and Benefit Sharing Agreements signed and monitored with an additional 10 investors	Land lease and Benefit Sharing Agreements signed and monitored with additional 10 investors	Increased Private Sector investment framework in Forest and Wildlife Sector: *- Carbon financing implemented. - Export of Tertiary Processing Wood increased by 15%. - Plantation Forest Area increased by 30%, through increased Private investment.*
4. Strengthen Monitoring & Evaluation / Information	M&E System for FC and MLFM approved.	Joint annual review	M&E System for FC and MLFM developed	Quality of M&E data reviewed	Evidence-based management decision making system put in place:

Ghana Case Study on Information Management and Technology for Forest Governance Document version 8.0 – January 6, 2011

Final Report

Page 50 of 52

For World Bank

Program / Policy Objectives	Target 2009	Means of Verification (MOV)	Targets 2010	Targets 2011	EXPECTED OUTCOMES 2012 (End of 5 years)
Communication Technology Systems	Comprehensive Database Management System designed		Data communication linkage for FC districts and Parks implemented		*Data from M&E system being generated on a monthly basis, disclosed and submitted to policy and decision-makers*
5. Promote equitable resource access rights and benefits for all segments of society	Conduct a survey (contracted to an NGO) to assess current level of awareness at community level on resource access rights and benefits	Survey report	Develop framework for promoting community involvement in resource access rights and benefits	Implement framework	Data on revenue collection and distribution fully and actively disclosed to local communities (transparency):
	Dissemination of bi-annual Revenue Disbursement Reports within 30 days of *publication by FC	**Disbursement reports; Independent verification by CSOs**	Continue dissemination of information based on agreed timelines	Evaluate impact of dissemination of disbursement reports on communities	*Percentage of beneficiary communities actively informed on revenue collection and distribution.*
	10 Regional and 1 National Forest Forum adequately resourced and functional	District Assembly reports; Field surveys	Modalities developed for integration of Forest Fora into District Assembly Structures	Forest Fora integrated into District Assembly structures	Active participation of communities in decision-making regarding resource management: *-Number of Forest Forums functional*

*Publication of bi-annual revenue report 3 months after the end of the period and dissemination within 30 days after publication by FC

Ghana Case Study on Information Management and Technology for Forest Governance Document version 8.0 – January 6, 2011

Final Report

Page 51 of 52