Final Report

EuropeAid/127640/DSER/MZ

Capacity Building in Energy Planning and Management

CB & EPM

Ministry of Energy

Mozambique

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LIST OF ABBREVIATIONS AND ACRONYMS

CB&EPM	Capacity Building in Energy Planning and Management
CDM	Clean Development Mechanism
CEPAGRI	Agriculture Promotion Institute
CNELEC	National Electricity Council
CO_2	Carbon Dioxide
DE	Energy Use
DEP	Direction for Studies and Planning
DNC	National Directorate of Fuels
DNEE	National Directorate of Electric Energy
DNER	National Directorate of New and Renewable Energy
DNTF	National Directorate of Land and Forests
EC	European Commission
EdM	Electricity of Mozambique
ENH	National Hydrocarbon Company of Mozambique
EDAP	Energy Development and Access Programme
ERAP	Energy Reform and Access Programme
EU	European Union
FUNAE	Energy Fund
GoM	Government of Mozambique
GHG	Greenhouse Gas
GMCB	Grontmij | Carl Bro A/S consortium leading partner
HCB	Hydroelectric of Cahora Bassa, SARL
HQ	Headquarters
IMOPETRO	Mozambican agency for fossil fuels imports
INE	Instituto Nacional de Estatística
INP	National Petroleum Institute
Interim	Interim Report
IR	Inception Report
JNKE	Junior Non Key Expert
KE	Key Expert
kWh	Kilowatt-hour
LEAP	Long Range Energy Alternatives Planning System

LPG	Liquefied Petroleum Gas
MDs	Man-days
MoE	Ministry of Energy
MW	Megawatt
MGC	Matola Gas Company
MINAG	Ministry of Agriculture
MICOA	Ministry of Environmental Co-ordination
MIREM	Ministry Mineral Resources
MOTRACO	Mozambique Transmission Company SARL
MOZAL	Mozambique Aluminium Smelter
MUSES	Model for Urban Sustainable Energy Services
NORAD	Norwegian Agency for Development Cooperation
PETROMOC	Petroleum of Mozambique SARL
PSC	Project Steering Committee
Q	Quarter
QPR	Quarterly Progress Report
RNT	National Electricity Grid
RS	Research study
SADC	Southern African Development Community
SAPP	Southern African Power Pool
SNKE	Senior Non Key Expert
TA	Technical Assistance
TL	Team Leader
ToR	Terms of Reference
WB	World Bank
Wp	Watt peak – unit used in photovoltaic
WWF	World Wildlife Foundation

ACKNOWLEDGEMENT

This report presents the Final Report of the Capacity Building in Energy Planning and Management (CB&EPM) project ("the Project"). The CB&EPM project aimed to enhance energy planning and management capabilities of the personnel on central and provincial government level to contribute to: i) Sustainable use of traditional biomass fuels in main urban areas (Maputo, Beira, Nampula, Quelimane); and ii) Increasing access to adequate energy services in rural areas.

The CB&EPM project was funded by the European Commission and implemented by the consortium of consultants Grontmij A/S, Denmark and CESO CI, Portugal, led by Grontmij A/S and anchored in the National Directorate for Studies and Planning (*Direcção de Estudos e Planificação* – DEP) from the Ministry of Energy of Mozambique. The National Authorizing Officer/*Gabinete do Ordenador Nacional* (NAO/GON) is the Contracting Authority and signatory on the Contract.

The sole responsibility for its content lies with the Team Leader who is the author. It does not represent the opinion of the European Communities. The European Commission is not responsible for any use that may be made of the information contained therein.

The Draft of the Final Report was sent, presented and discussed by participants to Project Steering Committee nº 5, hold in Maputo November 26th from 09 till 11 AM at the Ministry of Energy, Av. 25 de Setembro 1218.

Project Steering Committee Composition		
Ministry of Energy		
Planning and Studies	Laura Nhancale	National Director
Fuels	Felisbela Cunhete	National Director
New and Renewable Energy	António Saíde	National Director
International Relations	Telma Matavel	Director
IT	José Pereira	Director
Electrical Energy	Ortigio Nhantombe	Deputy National Director
Planning and Studies	Inês Chalufo	Department Studies & Investment Analysis
Ministry of Foreign Affairs		

NAO-GON	Absence	Project Coordinator
Co-financiers		
European Commission	Ana Margarida	Programme Officer
PSC Secretariat		
Grontmij	Signe Christiansen	Project Manager Danmark
Grontmij/CESO CI	José Miguel Nicolau	Local Team Leader
CESO Moçambique	Ana Avillez	Local Representative

1 DESCRIPTION

The overall rationale of this CB&EPM project can be described as creating adequate tools to enable the National Directorate for Studies and Planning (DEP) of the Ministry of Energy to analyze in good time the various questions and problems that Mozambique faces in the energy domain in order to increase the level of exploitation and internal use of the rich indigenous energy resources, taking however decisive actions to contribute towards reduction of the global carbon foot print.

The focus of this particular Project was the sustainable use of traditional biomass fuels to main urban areas and increasing access to energy services in rural areas. Part of this effort was aimed at linking DEP with different players existing in Mozambique such as public and private actors and academics in order to inspire a culture of dialogue and collaboration among different institutions. The Energy Sector in Mozambique has undergone considerable development and changes during the implementation of this Project and already at the debriefing of the Project in April 2011, Terms of Reference (ToR) which were signed up in 2008 were adjusted to reflect current situation.

1.1 Coordinator of the Grant Contract

Gabinete do Ordinador Nacional, Ministry of Foreign Affairs and Cooperation of Republic of Mozambique

1.2 Contact Person

Mr. Victor Velho, Gabinete do Ordinador Nacional (GON)

1.3 Beneficiaries

The beneficiary country is the Republic of Mozambique with the Ministry of Energy, National Director of Studies and Planning as the specific beneficiary.

1.4 Title

The title of the project is Capacity Building in Energy Planning and Management, Ministry of Energy, Mozambique.

1.5 Contract Number

The contract number of the project is as follows: Service contract 2010/256-068.

1.6 Start and End Date

The project has officially commenced on 11th April 2011 and officially ended on 31st December 2012, with an inception phase from 15th April 2011 to 21st of July 2011.

1.7 Geographical Area

The project was carried out in Maputo including Matola, Beira, and Nampula in Mozambique.

1.8 Final Beneficiaries and Target Groups

The staff from government bodies dealing with energy issues was the target group of the project. The final beneficiaries are the rural and peri-urban population.

2 ASSESSMENT OF IMPLEMENTATION OF ACTION ACTIVITIES

2.1 Executive Summary of the Action - Capacity Building in Energy Planning and Management

The Specific Objective of the contract was to ***enhance energy planning and management capabilities*** in the field of energy through activities that have been identified and through the role of the Team Leader as a mentor and neutral partner to the Director of Studies and Planning in dealing with relevant professional questions.

This Final Report covers the whole project period from 11th April 2011 and to 31st December 2012. Originally, the Project was thought to run over 24 full months; however due to unavailability of the chosen Team Leader a substitute had to be appointed whereas the end date had to be the same. This led to the first amendment to the contract where TL man-days where reallocated to Non Key Expert man-days.

Below in section 2.2. the outcome is reported following the Logical Framework Approach. The Project activities were already at the debriefing meeting modified to reflect some changes in the surroundings. The proposed adjustments to the ToR were all within the framework of the ToR. They were based on careful studies of the existing situation as well as discussions with beneficiary – the Ministry of Energy, at the debriefing meeting represented by the Director of Studies and Planning Nazario Meguigy and the staff of DEP.

Formally, there was the appointment of a new Director of Studies and Planning (DEP) of the Ministry of Energy Ms. Laura Nhancale, and technically the inclusion to the study area of city of Matola as this area had literally emerged since the elaboration of ToR to probably be the second largest urban area of Mozambique. Later, at Inception Report stage, the exclusion of Quelimane was decided. Finally, it was decided to concentrate on traditional biomass, bio fuels, electricity and LPG, as Natural Gas was covered by other on-going studies. Regarding the training of officials, the exclusion of the local government officers was necessary as in reality none were dedicated to the energy management and planning functions. A Project Steering Committee (PSC) was created which followed the Project during implementation at five PSC meetings planned for and agreed at the 2nd PSC Meeting following the Inception Report.

With these adjustments in mind, an updated Logframe matrix and timetable of activities were presented and approved at the second Project Steering Committee meeting in November 2011.

The Specific Objective of the Project was sub-divided as follows:

Results	Indicator	Target value
SO1	Design and implementation of energy accounting systems and balance system, including all different types of energy as electricity, natural gas, mineral coal, charcoal and petroleum and their derivates	Established detailed energy account systems in application
SO2	Preparation and delivery of short-term courses in energy planning and management	A basic infrastructure of knowledge on the energy situation and development options and of the routines and tools for its review is established and updated
SO3	Identification of knowledge gaps, preparation of tender dossier and contract consultants for undertaking energy research studies on 5 topics relevant to the attainment of project objectives	Identified and recommended draft support measures and pilot project plans to promote desirable energy related developments
SO4	Conceive energy development scenarios, policy and strategy options	Energy officials conversant with relevant energy planning and management tools and policy formulation
SO5	Development of policy implementation instruments	Energy development scenarios, policy and strategies for contributing to sustainable use of traditional biomass fuels use in urban areas and improved access to modern energy services in rural areas are identified

For status of the different objectives please refer to chapter 2.2 Results and Activities, where the implementation of the activities is also presented.

2.2 Results and Activities

R1:		**Established detailed energy account systems in application**
1.1.		Number and quality of published detailed energy accounts; statistics and energy balances
A 1.0		**Conception and implementation of energy accounting systems**
Description:		The activity consisted of review and update of the existing energy accounting systems for energy consumption, supply and resources, including the compilation of existing reports, studies, statistics and information, the preparation of energy balances (retrospectively for 10 years – the *Brochura*) and developing scenarios of future supply and demand. Furthermore, it included the establishment of well-defined methodologies, routines and tools for collecting and processing relevant information and data by source including traceability and the establishment of a well-defined set of conversion factors and processes.
Achievement of Outputs:		This activity has been successfully terminated. A Data Bank was installed and a Brochure was prepared covering the first decade of the 2nd millennium. An energy balance could be prepared and main conclusions are: During the period 2000-2011 the production and consumption of energy in Mozambique grew considerably. Notwithstanding the substantial increase in consumption of electricity and natural gas since 2000, biomass products remain by far the most consumed energy type in Mozambique. According to our estimate, they comprise 78% of the fuel mix in 2011, against 88% in 2000. The underlying story is, in short, that for most of the rural population (70% of population in Mozambique) woodfuel is the only cooking and water heating option, while the fast-growing urban population primarily consumes charcoal for cooking, despite its increasing price and negative impact on health and ecosystems. Within the same period, electricity production in Mozambique grew on average with almost 5% per year. In 2011, 73% of electricity production was exported, down from 80% in 2000. Domestic electricity consumption in 2011 is

		about 4 times as high as it was in 2001. This is mainly due to the arrival and expansion of the Mozal aluminium smelter in Maputo province, which accounts for 75% of total final electricity consumption in Mozambique. If we exclude Mozal, electricity consumption grew on average by 8.3% per year since 2000. The latter is largely related to the fact that Electricidade de Moçambique (EdM) has achieved to multiply its number of clients by 5 since 2000. Consumption of fuels increased on average with 6% per year, and since 2009 even with 15% per year. The transport sector is responsible for the vast majority of fuel consumption, followed by industry. However, one cannot underestimate the effect of the fuels price subsidy, which has been in place since 2008, on this increase in sales. Because Mozambique does not produce fuels, all consumption is imported. Since 2006 natural gas production in Mozambique grew on average with 5.3% per year. About 95% of total natural gas production is exported. During the past decade, Mozambique was a key player in the regional electricity market as an exporter, thanks to its 2075 MW of installed capacity at Cahora Bassa, and its more than 5tcf of Natural Gas reserves in the Pande and Temane fields. Its total energy exports amounted to about 4 million ton oil equivalent in 2011, 95% of which was destined to the South African energy market. Mozambique's electricity consumption has grown steadily with GDP from 2001-2006, with an average GDP elasticity of electricity consumption of 1. However, since 2006, electricity consumption has grown 1,6 times faster than GDP, noting an electricity-intensification of the economy.
Observations:		There are reasons for concern regarding implementing energy accounting systems. This can be successful only if stakeholders are interested in participating and facilitating the tasks of (i) data collecting and (ii) submitting the procedures utilized by each stakeholder to collect and process data so that they can be inspected and audited in order to confirm the quality and reliability of data collected. This aspect (ii) shall be taken into consideration by the Ministry of Energy as one of the main foci for coming years in order to improve quality of data collected and enable good checking of routines used by stakeholders to do it.

		Also, it is worth noting that the quality of the existing data and information was of a dubious quality methodology wise (e.g. full year data was directly compared with years where data was only available for 10 months etc).
Activities implemented during reporting period:		• Review of existing energy accounting system and conception of a new database • A working document exposing the diagnose of the situation and consequential work plan (September 15th 2011) • Assisting the Ministry on specific requests namely verification of data for the Balaço do PSE 2010 • Identification of and Meetings with all relevant stakeholders to facilitate data collection • Gathering of detailed statistical information on energy supply and demand for the establishment of 11 year series Energy balances (2000-2010) • Collecting missing data at National Statistics Institute (INE) and Ministry of Planning and Development (MPD) • Estimation of data on Renewables and Biomass consumption, starting from historical data provided by the International Energy Agency (IEA) • Preparation of the draft document Energy Statistics 2000-2011 ('the Brochura') • Draft version presented on March 22nd 2012 to National Director of Studies and Planning (Mrs. Laura Nhancale), Deputy Director Adjunto of Studies and Planning (Antonio Manda), National Director of Fuels (Mrs. Felisbela Cunhete), Advisor to the Minister on Fuels (Cesar Mussagy), representatives of Energy Companies, about 7 technical employees of the Ministry of Energy and FUNAE. Facilitators of the presentation were Team Leader José Miguel Nicolau, Project Manager for Activity 1.1 and 1.2 Peter Mulder, and Junior Non Key Expert Gilberto Mahumane • Finishing the comprehensive statistic collection of data covering all relevant energy sources for the period 2000-2011 after final draft was sent for review beginning of May 2012. • The Brochura has been uploaded in the internal Project dataroom

		(Dropbox) and few copies were printed in relation with the Final Stakeholder Seminar. Otherwise, the Brochura is made available on CDs.
Risks/Problems and Solutions:		• Slow progress due to absence of several cadres from the MoE was balanced by follow up meetings • Negative impact by counterpart's request for official letters from the Ministry and subsequent slowness of the formalization process between the Ministry and the counterpart institution. A low response rate by the counterparts and slow reactivity were factors that built up pressure on expert's MD's assigned to this Activity versus expected outputs. An extra 40 man-days were requested and granted to further develop the statistics and in particular the cooperation between the MoE and the *Instituto Nacional de Estatística* (INE) • Process slowed by LPG crisis and vacations • Unexpected high level of bureaucratic requirements had to be overcome by considerable effort in terms of MD's and full collaboration of all involved stakeholders
Impact:		• The slowness of the process due to the formalities requested for the counterparts at other Ministries and the general (low) prioritization of their participation in the collection of data jeopardized the possibility in achieving the expected output; however the barriers were overcome by the allocation of extra man-days to undertake this part of the activity.
Changes and their reasons:		• Pls. refer to "Impact" above.
R2:		Energy officials conversant with relevant energy planning and management tools and policy formulation
2.1. 2.2.		Training courses conducted within 10 months of project start Number of officials trained

<table>
<tr><td>A 2.0</td><td></td><td>Short energy courses in energy planning and management</td></tr>
<tr><td>Description:</td><td></td><td>This activity consisted of the development of three one-week duration training courses (planned for 3x20 persons).
The courses focused on introduction to and training in the Energy Planning tool LEAP which is a software to develop scenarios in the energy area. The scenarios will be based on full accounting of the production, conversion and consumption in an economy or region, using various assumptions on population, economic growth, technology, prices, etc.. LEAP can be used for projecting the supply and demand of energy in the future, in order to identify problems and to assess the impact of policies and strategies. The great advantage of LEAP lies in its flexibility and ease of use, allowing a quick translation of ideas into policy analysis without the need to use complex models. LEAP can be used as i) database, ii) an instrument for making projections, and iii) an instrument for assessing policies in the energy sector, assessing their economic, physical and environmental impacts. Hence it was deemed that LEAP would be very relevant to develop the energy officers in both planning and management of energy issues.</td></tr>
<tr><td>Achievement of Outputs:</td><td></td><td>Technical staff from the Ministry of Energy and other institutes – including FUNAE, EdM, HCB, Petromoc, INE and Ministry of Planning and Development – was trained in using LEAP software for energy planning. The training was given 3 times (August 2011, March 2012, June 2012).
First training participants
<table>
<tr><th>Last name</th><th>Name</th><th>Institution</th><th>Departement</th><th>E-mail</th></tr>
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</table></td></tr>
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Third and final training participants

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Observa-tions:		A selection of participants (about 6-8 people) is very talented and motivated to use LEAP on the job. Unfortunately, not all people did participate in all training sessions because of other duties. The Consultant recommends that a contin-ued effort through refreshment courses, seminars and concrete planning ex-ercises is kept.				
Activities implement-ed during reporting period:		• Preparation and delivery (2011) of 1st course in energy planning and management, LEAP was undertaken under direct supervision of the SNKE (with nine participants) • JNKEs' and Key Experts' meetings to work on course content/ curricu-la • Preparation and delivery (2012) of 2nd course in energy planning and management, LEAP was undertaken under direct supervision of the SNKE (with eleven participants) • Preparation and delivery (2012) of 3rd course in energy planning and management, LEAP was undertaken under direct supervision of the SNKE (with eleven participants) • Wrap-up meeting between SNKE and Team Leader				
Risks/Probl ems and Solutions:		Some of the participants were called by their directors to engage in fulfilling other tasks with a bad effect on the level of participation, significantly reducing the efficacy of the training. Training sessions were advertised well before happening, but realities were not possible to deal with. As mentioned, the Consultant recommends that a continued effort through refreshment courses, seminars and concrete planning exercises be kept also after the termination of this Project. The Consultant facilitated such in the week of October 22-26th 2012 namely the *Biomass mini seminar* which really				

		contributed to the practice in outlining policy scenarios of some of the key energy officials from the Ministry of Energy (DEP, Directorate of New and Renewables energy) and FUNAE.
Impact:		Those who have participated in at least 2 sessions have basic skills in using the software. Some staff has also participated in earlier trainings (2009, 2007) and provided that these resources are maintained it is safe to believe that LEAP can be used as an integrated part of the energy planning and scenario development activities in DEP in the future.
Changes and their reasons:		List of participants was decided by the Ministry and often changed last minute.
R3:		A basic infrastructure of knowledge on the energy situation and development options and of the routines and tools for its review is established and updated
3.1. 3.2.		Terms of Reference for energy research studies and surveys drafted within 10 months of project start Five critical studies identified, conducted and completed within 15 months of project start
A 3.0		**Short-term energy research studies**
A 3.1		**Identification of specific studies/research needs**
Description:		This activity was carried out to build the basis for Activity 3.2. It included the detailed identification of gaps, assessment of quality and reliability of existing data and knowledge for a better understanding of the problems identified, namely the overuse of wood fuels for heat purposes in and around the main cities and the reduced access to modern energy services in rural areas.
Achievement of Outputs:		This activity has been successfully terminated. Five different research/studies were identified. ToR were written, submitted and approved by PSC. Experts to perform the studies were selected and it was agreed how the studies would be implemented. The titles of the studies are as follows: RS 1: BIOMASS SUPPLY, USE & BUSINESS PROFILE RS 2: SOLAR WATER HEATING PROGRAMME – Proposal of an Organiza-

		tion to lead the SWH Programme RS 3: USE OF NATURAL GAS FOR VEHICLES IN MOZAMBIQUE RS 4: MODEL URBAN SUSTAINABLE ENERGY SERVICES RS 5: RURAL HOUSEHOLD ENERGY BALANCE & INCRESED ACCESS TO ENERGY SERVICES
Observations:		The identification of the Research Studies (RS) has definitely been essential for the outcome of the Project in terms of provision of knowledge on which to base the policy development - the identification of the Research Studies was hence quite essential for the success of the Project and the experienced time pressure due to the delayed start but fixed end-date. Uncertainties regarding the budget available for the implementation of the RS resulted also in several re-plans and adjustments. However, the Team Leader and involved Stakeholders showed great flexibility and developed some very relevant ToR to guide the research activities of the Project.
Activities implemented during reporting period:		• Five different Study areas were identified and re-planned during implementation to continuously reflect the needs of DEP and the Energy sector in Mozambique (pls. refer above for the final titles of the five studies) • Writing, submittal and approval of ToR • Meetings with the National Directorate of Fossil Fuels • The terms of reference for Research study 3 were complemented by terms of reference written in Portuguese to specifically address the use of natural gas on transportation entitled “Utilização do Gás Natural na Matriz Energética dos Transportes em Moçambique - Gás Natural Veicular - GNV”. • Research Study 5 was initially thought to be integrated with a simultaneous study performed by WWF, but finally the process was trusted with National Directorate of New and Renewable Energy (DNER) and FUNAE.
Risks/Problems and Solutions:		The major challenge regarding the identification of the Research Studies and the development of the ToR was the limited budget available which didn’t reflect the ambitions of the Project. Travelling throughout the country, basic col-

		lection of information (enumerators), highly specialized experts - all were heavy lines in a budget which was very limited. The Project mitigated these challenges by coordinating as much potential input to the studies with other on-going projects and initiatives in the ministries; this also included close collaboration with the academia of the country.
Impact:		The identification of Study Areas and the drafting of Terms of Reference for the Research Studies represented a broad effort in terms of establishing co-operation and coordination between different stakeholders and existing projects. This impacted positively the overall results of the studies themselves, but also inspired a culture of dialogue and collaboration among different institutions and increased the awareness of energy related issues among stakeholders who traditionally were maybe not regarded as key collaborators when it comes to energy. Together with A 1.1., this planning effort has left the authorities and private and public stakeholders with a closer sewed network to base future actions on.
Changes and their reasons		Apart from the budgetary challenges mentioned above, the changes during this activity were mainly adjustments of ToR and e.g. the change of RS3's name and content due to discussions with relevant stakeholder.
A 3.2		**Implementation of research studies**
Description:		This activity was based on Activity 3.1 and included research studies RS1 to RS5 to be carried out and to be completed, serving as inputs in the subsequent parts of the projects i.e. definitions of measures, policies and interventions.
Achievement of Outputs:		This activity has been successfully terminated. Research activities were carried out in several domains identified during the inception phase of the Project. Below the main results for each of the research activities undertaken are presented: **RS 1 BIOMASS SUPPLY, USE & BUSINESS PROFILE** *Introduction* Baseline fuel surveys were directed to households within neighborhoods of Maputo, Matola, Beira and Nampula. A total of **56 neighborhoods were**

covered, of which 25 are in the Maputo and Matola cities; 16 in Beira and 15 in Nampula.

A random sampling technique was implemented within a proportional range to represent the population ratio of each neighbourhood. Every third household was enumerated, as to assure greater representativeness. Within each household, enumerators asked to survey the person responsible for cooking.

For the collection of institutional related energy use, a survey was administered to a sample of take-away canteens, restaurants, hotels, bakeries, hospitals and prisons. A list of such establishments was provided by the municipal council of each respective city. The sample size was determined by the concentration of such institutions within each city. Generally, not less than 10 establishments of each category were considered.

Within each city, the surveys were administered by a team of eight enumerators. These were university students, with a background in social sciences or economics. The surveyors underwent a thorough two-day training, pilot survey implementation and subsequent data quality verification checks.

The household energy use survey was designed to collect a range of socio-economic data; household energy information, stove and fuel use statistics; as well as general cooking habits. Furthermore, a baseline fuel weighing procedure followed each survey to determine the weight of fuelwood used per household per day. The institutional energy use survey included questions about the number of daily cooked meals prepared; sources of cooking energy used; quantities of such fuels, as well as the costs associated with cooking energy.

Irrespective of income level, most households are connected to the electric grid in all cities surveyed. Within Maputo/Matola, 90% have electricity access, of which 81% pay via a pre-paid system (locally called “credelec”). In the case of Beira and Nampula, they both have 80% grid connectivity, of which 77% is pre-paid in Beira and 69% pre-paid in Nampula.

Overall results

The results show that the predominant stove type used by households in the cities surveyed is the charcoal stove. They are used by 87% of households in Maputo/Matola region, 85% of households in Beira city, and by

as much as 92% of households in Nampula city. For Maputo/Matola and Beira city, the second most common stove type owned is the LPG (gas) stove. It is used by 31% and 18% of the sample respectively. In the case of Nampula, the second most common stove type used is the firewood stove (either 3-stone or improved model). This is used by 13% of the households. Electric stoves are used by 26% of households in Maputo/Matola; 15% of households in Beira and only 4% of households in Nampula city.

This obviously reveals that **fuel-mixing is a common trend in urban Mozambique**. Households often rely on multiple fuel types to satisfy their cooking energy needs. Of the 87% of households in Maputo/Matola which cook with charcoal, only 35% exclusively use this fuel. Common fuel mixes include Charcoal-LPG (practices by 19%); charcoal-electricity (15%); and Charcoal-firewood (9%). It is also worth noting that in Maputo/Matola, of all the LPG users, only 3% exclusively rely on this fuel. Similar trends can be seen with electric stove users.

In both Beira and Nampula, charcoal is used more exclusively by a greater number of households. 64% of charcoal users in Beira rely only on this fuel, while as much as 77% of households in Nampula do so too. In Beira, the second most common fuel use strategy is charcoal-electricity. This is practiced by 9% of households.

From the analysis it can be noted that **in the Maputo/Matola region, there is a higher penetration of modern cooking fuels**. About 50% of households own and use either an Electric or LPG stove. Beira follows with 26% modern fuel use, while in Nampula the figure is 10%.

Since charcoal stoves are most commonly used, it is worth considering the type of charcoal stove used by households. The study shows that within Maputo/Matola, the majority of households (70%) use a double-burner charcoal stove. This trend is reversed in Beria and Nampula, where the majority (73% and 64%, respectively) use a single burner charcoal stove. Of these, only 6% and 8% of households in Beira and Nampula have two counts of these single burner stoves.

Consumption of energy

For those in Maputo and Matola using charcoal as their only cooking energy source, they consume 2.64 kg of charcoal per day. Firewood users consume 4.46 Kg of wood per day; LPG users go through 286 grams for the days cooking.

In Beira city of those using only charcoal, they consume 2.495 kg of charcoal per day; firewood users, make use of 2.9 kg of wood for the day; while those cooking exclusively with LPG consume 367 grams of LPG per day.

In Nampula city for those using only charcoal for cooking, an average of 3 Kg is consumed per day. Firewood users consume 3,94 kg per day. It can be noted that no households reported to using LPG as their only fuel source.

The average money spent to purchase fuel per household is largely based on the fuel type purchased as well as the quantities purchased at one time. Fuel prices also differ within the different cities. For Maputo/Matola for example, households spend on average 431 Meticais (15 USD) a month to purchase firewood. In the case of Beira and Nampula, the monthly expenditure is 199 Meticais (7 USD) in both cases.

With regards to expenditure on charcoal, 75% of charcoal users in Maputo/Matola purchase this fuel by the sack (+/-70kg). Doing so, they spend on average 559 Meticais (20 USD) per month on charcoal. It should be noted however that households which are reliant only on charcoal for all cooking needs, spend on average 651 Meticais (23 USD) for their fuel if purchased per sack. Those households which purchase charcoal in daily quantities (bundles), spend around 53% more than those who purchase sacks. Their monthly expenditure is at 854 Meticais (30 USD). Purchasing charcoal by the sack can therefore save households 3540 Meticais (126 USD) per year compared to those who purchase daily quantities. A reason for purchasing bundles may be because some households do not have the full amount of money up-front to pay for one sack of charcoal.

In the case of Beira, those which purchase charcoal sacks spend around 417 Meticais (15 USD) per month; while those which purchase daily bundles spend on average 579 Meticais (20 USD) per month. The charcoal price in Nampula is much cheaper than the two other regions. Households purchasing sacks, spend on average 271 Meticais (9.6 USD) for charcoal per month;

while those purchasing in bundles spend almost double, at 300 Meticais (11 USD) per month. Both in Beira and Nampula, 17% of the households purchase daily quantities (bundles); while in Maputo/Matola, 25% purchase in daily quantities. This is possibly due to the higher price of a charcoal sack compared to the two other cities.

Monthly expenditure for LPG is similar amongst the three urban regions studied. Within Maputo/Matola, households spend on average 717 Meticais (26 USD) per month for LPG. In Beira and Nampula, households spend 680 Meticais (24 USD) and 750 Meticais (27 USD) respectively. The price spent for electricity is much lower compared to all other fuel types (average of 90 Meticais amongst all cities). This is possibly due to the fact that the charcoal stoves are primarily used for fast cooking, such as boiling water, re-heating food or frying.

Cooking fuel monthly expenditure differs amongst the different cities. For Maputo/Matola, households spend on average 846 Meticais (30 USD) per month for their cooking energy. In Beira, this expense is less, at 551 Meticais (20 USD) per month. Household in Nampula city have the lowest monthly expenditure on cooking fuels. They need on average 441 Meticais (16 USD) per month. This difference is largely due to the low price of charcoal observed in Nampula. In Maputo and Matola, the price of a charcoal sack is currently reported to cost around 650 Meticais (23 USD). In Beira city, the charcoal sack is sold for an average price of 220 Meticais (9 USD). In Nampula, the price of a sack of charcoal is the lowest, at 130 Meticais (4.6 USD). It should be noted that the average weight of the charcoal sack differs amongst the cities.

The table below shows the average monthly expenditure per cooking fuel type per household in meticais.

Fuel	% of Maputo respondents	Maputo/Matola	% of Beira respondents	Beira	% of Nampula respondents	Nampula
Firewood	11%	431	7%	199	11%	199
Charcoal in Sack	55%	559	76%	417	84%	271
Charcoal in Bundle	13%	854	9%	579	8%	300
Charcoal in a can	2%	821	0%	-	0%	-
Gas (LPG)	22%	717	15%	680	5%	750
Electricity for cooking	24%	130	14%	87	3%	52
Kerosene	0,4%	528	0%	-	0%	-

Energy saving techniques

With the rising price of cooking fuel in the cities, it was asked of households whether they make use of fuel saving technique. One of the most fuel consuming meals in Mozambique is cooked beans. It can take up to 3 hours of cooking time. One of the methods which can be used to reduce cooking time is soaking the beans in water a few hours before cooking. Households were therefore asked whether they practice this technique. The results show that in Maputo/Matola, only 20% of households soak the beans before cooking. This practice is even less in Beira and Nampula where 5% and 7% respectively, do so.

Another fuel saving technique involves lighting the charcoal stove only once and cooking all meals while the charcoal is hot. This is practised by 38% of households in Maputo/Matola, and only 8% of households in both Beira and Nampula. One of the reasons why more households practice fuel saving techniques in Maputo/Matola is probably due to higher fuel prices in this region compared to the other cities.

Health impacts

Similarly, households were asked whether they think firewood and/or charcoal use has negative impacts on the environment. Except for Beria, where the majority (68%) agreed about the negative impacts, the majority of respondents in Maputo (77%) and Nampula (54%) either disagreed or were unsure of any environmental problems associate with these fuels.

Households were also asked whether they think the use of charcoal has an impact on one's health. The results show interesting trends amongst the different cities. Regarding firewood, only 34% of households in Maputo agreed that there are health impacts associated with firewood. Within Beira, as much

as 81% agreed and in Nampula 64% associated health problem to firewood use. When it comes to charcoal use and its impact on one's health, the majority of respondents in all cities disagreed about this link. In Maputo, only 17% associate health impacts to charcoal use; in Beria it is 42% and in Nampula 32% of respondents agreed. A further 13% of households in Both Beria and Nampula were not sure how to answer.

RS 2 SOLAR WATER HEATING PROGRAMME – Proposal of an Organization to lead the SWH Programme

The Government of Mozambique is leading the Mozambique Solar Water Heating Programme (MSWHP) which has set national targets of 40% of households' water heating electrical energy consumption to be provided by thermal solar water heating systems by 2013, substituting conventional main grid electrical energy supplies.

The Energy Strategy for Mozambique – approved by the Council of Ministers March 10th 2009 – states the following regarding thermal solar power:

In this sector the following strategic initiatives will be taken:

- Launch a Thermal Solar Systems (TSS) programme aimed at Electricidade de Moçambique's (EdM – the national electricity provider) consumers, but not limited to them, to substitute electricity used in water heating with TSS. From 2009 to 2013 concentrated efforts in Maputo, Matola, Beira, Tete, Nampula and Pemba;
- Adopt and apply legislation promoting TSS;
- Create conditions to capture revenues from carbon credits to enable the Fundo Nacional de Energia (FUNAE – National Energy Fund) to implement TSS with anticipated revenues from the credits, revenues from deferring investments in generation capacity due to savings resulting from installing TSS."

The MSWHP will be structured on a rebate system to reduce the effective purchase price paid by consumers of approved solar water heating systems. The price reduction calculation will primarily consider the performance of the TSS based on it's associated energy-saving potential equivalent cash values (from electricity, gas or charcoal) while also accounting for the ability of con-

sumers to pay.

Only registered products complying with a set of predefined technical standards, supported by a comprehensive guarantee over a significant period, installed by a duly approved installer will be eligible for rebates under the MSWHP.

In order to promote this programme it is important to discuss aspects related to what may be called institutional architecture and in this regard a paper was prepared to investigate the role of a dedicated entity to lead such a programme.

The primary function of an entity of the type under consideration is to establish itself as the development enhancer agent and, at the same time, the market regulator in which it acts.

To answer this ambivalent function and ensure sustainability required to the implementation of a thermal solar program, the entity will have to be provided with the necessary means to take action in the following areas:

- Collection and processing of information to produce credible estimates of the size and economic expression of the thermal solar sector in Mozambique in order to provide market with trustable information for decision making. This information is also important for the economic support of the entity.
- Creation of awareness on the theme of the solar thermal to professionals, investors and the population in general.
- Analysis and approval of projects. In addition to the necessary approval of projects is the development of skills that enable its evaluation in terms of different impacts, namely, the impact in the field of energy efficiency and environment conservation, being the last one an appreciation of the project resulting from the non-depletion of natural resources.
- Quality control and certification of products. One of the fundamental aspects of the legislation will be the creation of a normative instrument that allows transparency to the market performance of the equipment. The organization shall play a crucial role in the fulfillment of this regulation on the part of all players involved.
- Auditing and licensing of facilities. Training and accreditation of skilled

agents. The implementation of any program depends on the qualification of the human resources available. Without human resources it is necessary to train them. Structured actions with well-established training curricula, possibly with external entities, taking into account the independent agents (e.g. planners and installers).

- Coordination with other institutional sectors. As the body responsible for compliance with the current legislation, it will be well positioned to transmit to other sectors of the State, particularly the legislative branch, the feedback of the practical application of the law. This feedback is essential for the continuous adjustment of the real needs of the market and it is the guarantor of permanent adaptation of these needs.

It is the recommendations of the Consultant that the statutory model and the functional organization of the entity be designed to cope with these requirements and the paper prepared suggests a model for further consideration by the Ministry of Energy.

RS 3 USE OF NATURAL GAS FOR VEHICLES IN MOZAMBIQUE

Natural gas (NG) is currently used as an energy source in a wide range of applications ranging from heating, industry, power generation, fuel for vehicles, and many other applications. In a wide number of applications NG is considered a potential substitute of fuels derived from petroleum.

The potential of NG has been growing due the enormous proven reserves of natural gas all over the world. There are several sources that have been proven recently that has changed the scenery of natural gas in the world. Examples of these sources are the conventional NG reserves and recently the huge reserves of shale gas that started to be exploited due to recent technological developments that allow exploring this new NG source, as well as the huge NG reserves that have been recently proven in Mozambique in Rovuma basin.

According to IEA projections, the consumption of natural gas will overcome coal consumption before 2030 and the tendency will be to overcome the oil consumption in the years after 2035. Another important trend is that after 2030 the consumption of natural gas will rise at a rate of 2% per year.

The Research Study 3 aimed to analyze the use of natural gas in the energy matrix of the vehicles in Mozambique.

The promotion of Natural Gas powered Vehicles (NGV) nearby the places where natural gas currently is available is critical in order to create positive perceptions about the use of NG in vehicles.

In the short/medium term, a programme to promote the use of NGV shall be established and led by the government, because only with the government support this kind of initiative will move forward. Besides the government supporting the initiative, the government could involve itself directly in the programme (e.g. converting its own fleet of cars) in order to give credibility to the project. Here below some aspects to be considered in establishing such a programme are introduced:

1) **Public awareness campaigns for the use of natural gas as vehicle fuel –** These campaigns should focus on the economy, the reliability and safety of natural gas, so as to avoid the creation of wrong ideas and myths about the use of NG that might negatively impact the credibility of the NGV project.

   The target audience of these actions should be as diverse as possible. These campaigns should take place in various locations, such as ministries, schools, vehicle conversion centers and transportation companies, among others. These campaigns should be launched in the provinces where there is already NG distribution infrastructures like, inter alia, Maputo and Matola and should focus on those vehicles that have more advantages with the conversion to NG, such as taxis, public transport (*chapas*) and vehicles with big consumption like heavy duty vehicles.

2) **Priority Segments for the use of NG** - Priority shall be given to vehicles that travel more kilometers daily and vehicles moving within the ratio of available refueling NG premises. Examples of high priority segments are taxis, public transport (*chapas*), buses and heavy duty vehicles.

3) **Creation of Refueling Infrastructure** – It is necessary to accelerate the creation of refueling infrastructures in areas in the vicinity of off-

take points of existing pipelines. Before a NG distribution network is in place, the creation of refueling infrastructure shall be anchored in alternative forms of NG transportation (mother and daughter station concept). Even if the concept of mother-daughter station should be viewed, in most cases, as a temporary solution, the government shall consider establishing adequate measures for this type of investment to ensure attractiveness and confidence and provide comfort to investors of such facilities (until the existence of the NG distribution network in order not to prejudice any private investment in daughter stations, with the arrival of natural gas pipeline network to the area of these stations). If these measures are not created, investments may be constrained because investors will prefer to wait for the NG distribution network.

The creation of refueling infrastructure should be supported by government. The government should establish measures to support the creation of infrastructure, because only in this way it will be possible to create a reliable refueling network.

4) **Price of NG** – A differential between the NG final price and the traditional fuels (gasoline and diesel) in the order of 50% shall be considered for a period of time to ensure a clear stimulus to users.

5) **Initial conversion program –** An initial programme for vehicle conversion limited to a certain number of vehicles representative of different segments shall be established. Within this programme the government, in collaboration with banking systems and financing agencies, shall study and create a financing mechanism tool that allows converting an initial number of vehicles (e.g. 1000 vehicles) with a reasonable expected consumption such as taxis and *chapas*, to be paid with installments matching the ability to pay of private individuals.

As an example of how this could be achieved, the programme could be designed so that the government gives the refueling stations a quantity of NG equivalent to the cost of the conversions and the refueling stations pay the conversion cost to the conversion centers. This measure will cause the rapid growing of numbers of NGV. The

		government should be pioneer in the adoption of the NGV and should commit the conversion of a considerable percentage of its fleet in order to give credibility to the project. These kinds of measures are widely used in countries where NGV projects are in an early stage of development. **6)** **Vehicle conversion** – The conversion of vehicles is currently practiced in 4 workshops in Maputo. Additional training of conversion technicians shall be promoted to increase efficiency and improving the quality of the service provided. **7)** **Legislation** – Only with a clear legal framework it will be possible to expand the project on sound ground. Adequate legislation dealing with issues such as security, reliability of refueling stations, as well as the reliability of vehicles conversion shall be in place. It should be noted that the inexistence of legislation to regulate this kind of activity might lead to construction of refueling stations as well as vehicle conversions without proper safety and reliability, which could cause serious accidents or serious reliability problems. For the development of appropriate legislation all the local stakeholders of the NGV sector should be involved as well as external support from markets where NGV is in an advanced stage of development should be sought. This would make it possible to integrate the specifics of the local conditions with the experience gained in other markets where NGV is perfectly developed. Legislation from markets where the NGV are in a mature state of development shall be collected and considered. **8)** **Creation of a supervisory authority** – Supervision entities involving private sector to act across the entire NGV sector, from the vehicle conversions to the construction and operation of refueling stations, shall be considered with the task of promoting and helping the sustainable development of the NGV project. To ensure a high standard of these entities, the government should monitor their activities, to ensure that they act according to expectations. **9)** **Reduced taxes to NGV imported equipment** – The NGV equipment is not locally manufactured so reduction in or absence of taxes

for the import of conversion equipment, equipment for refueling stations or even to NG vehicles shall be duly considered. This measure should be considered until the market has technology available domestically or until the NGV market is in a mature state of development.

10) **Pilot Projects –** Pilot projects, to enable the growing and development of GNV project, shall be considered to act as examples. These projects should involve as many transportation segments as possible to demonstrate the advantages and potential of NGV. Below are indicated some of the possible pilot projects to carry out in Mozambique.

- **Heavy duty vehicles** – Mozambique is under rapid economic development, so the construction area will also develop quickly. One of the transport segments that could use NG due the typology of their route (centralized route), is the segment of concrete mixer trucks. The conversion to NG or acquisition of these vehicles from Original Equipment Manufacturers (OEM), and also the construction of a private NGV refueling station to these kinds of fleets should be evaluated. Another segment where a pilot project could be applied is the Mozal truck fleet. These trucks have centralized routes that allow the use of GN.
- ***Chapas*** – Given the importance of semi collective transportation in main urban areas within Mozambican society, the use of NGVs shall be considered despite scattered past experiences that were not too promising. If conversion or engines of these vehicles proves not to be a viable option, the use of OEM vehicles in a pre-defined number of selected routes could be considered. Once the feasibility of the project is certain, it may be expanded by creating new routes.
- **Government Vehicles** -. If the government put the use of NGVs into practice by some ministries it will send a clear and powerful message of trust and a signal of credibility to the project.

11) **Additional Studies/Analyses –** For the project to be developed

properly, some additional studies and analyses need to be developed, focusing on the Location of NG Refueling Stations. At the beginning of the project, as there are not so many stations, the location of stations may be a critical success factor, so any project for the construction of NGV fueling stations should be subject to a careful study about their location.

RS 4 - MODEL URBAN SUSTAINABLE ENERGY SERVICES

Mozambique's urban population of approximately 8 million in 2012 will rise to over 23.6 million by 2030.

Cities represent the major centers of future Residential Demand for Energy and it is widely recognised that buildings account for a large share End Use Energy. Advances in energy efficiency and on-site renewable energy production can influence energy security, climate stability and public health. It is against this backdrop that the technical research project 'Model Urban Sustainable Energy Services' (MUSES), which explores the potential for improving energy performance of buildings was advanced.

Given the scale of energy consumption by buildings, which account for close to 40% of total end use of energy, the implications of potential reductions in building's energy needs is large enough to influence security policy, climate preservation and public health on a national and global scale (IEA 2008 pp. 10). It is this rationale that forms the backdrop of the MUSES case study.

The MUSES project used a site-specific case study of a 50-unit condominium residential development in Maputo City to assess the application of different energy efficiency and on-site renewable production measures to improve energy performance of buildings.

The research results are a preliminary step towards the introduction of an Energy Performance Programme for Buildings.

Green Economy Roadmap - Developing nationally appropriate legislation

Supporting Mozambique's Green Economy Roadmap, an Energy Performance Programme for Buildings would enable national policy makers to proactively respond to the public services challenges embodied in the projected

growth of urban areas and associated energy demand.

Study results identify significant opportunities for improved energy efficiency performance of buildings by ***taking advantage of passive cooling and heating dynamics*** through simple measures in urban macro land use planning, urban density, street and building orientation for solar radiation and prevalent winds, plantation of vegetation and thermal resistance of materials.

Ensuring ***higher energy efficiency rating of electric appliances*** represents another important area for improved energy efficiency performance of buildings. In terms of on-site renewable energy production research results indicate solar photovoltaics could supply sufficient energy for residential buildings' lighting needs, which typically account for approximately 20% of household energy consumption. However solar photovoltaics remain financially unattractive at current mains grid electricity rates; in due course renewable energy feed-in tariffs being developed with the assistance of the World Bank could change this scenario.

Solar thermal water heating is financially more accessible and could supply adequate hot water to meet all domestic water heating needs, which accounts for approximately 25% of domestic electricity consumption. The initiation of an energy performance-auditing programme for buildings constitutes a vital first step towards improved energy performance of building stock. Clearly an energy performance-auditing programme will require new capacity in the public and private sector. All sectors should be consulted to develop auditing programme practices and capacity. Given the experience of the European Union with implementing energy auditing programmes it would be beneficial to avail of their lessons learned at the outset of this process.

After consolidating the energy-auditing programme for buildings then voluntary Energy Efficiency and On-Site Renewable Energy Production standards legislation for buildings could be introduced, with subsidies to encourage first movers to adhere to the standards.

The capacity building support provided by the European Union for the Ministry of Energy to undertake the MUSES study has resulted in locally relevant insights on how to improve the energy performance of buildings in Mozambique. This information comes at a critical time in the long-term national plan-

ning horizon for energy services, in other words, before the projected growth of urban areas is played out over the next 15-20 years. Developing nationally appropriate legislation will play a critical role in the promotion higher energy performance of buildings and may be used to stimulate private sector and international sustainable energy interests to drive the transition to sustainable and efficient energy performance of Mozambique's rapidly growing building stock.

Building Performance Standards for Energy Efficiency (EE)

Establishing practical EE performance standards legislation for buildings, setting maximum energy consumption for a determined building floor area per year, is very complex to develop and apply with fixed thresholds across a heterogeneous building stock. Nonetheless EE standards legislation for new buildings could be applied to ensure best practices are utilized to guarantee appropriate:

1) Shading of windows exposed to strong solar radiation to the South-East, East, North and South-West, and West;
2) Thermal resistance of materials and insulation of roofs;
3) Land use mix, prioritizing green areas to create local micro climate cooling and reducing distances required for motorized transport;
4) Density levels of housing developments;
5) Planting vegetation for passive cooling during summer months and to protect against cool prevalent winds in winter months;
6) Orientation of buildings main axis East-West to reduce passive heating gains during summer months; and
7) Orientation of buildings to ensure greater passive cooling gains from prevalent summer winds.

RS 5 RURAL HOUSEHOLD ENERGY BALANCE & INCRESED ACCESS TO ENERGY SERVICES

This Research Study aims at understanding Energy Balance in the Rural countryside and possible interventions to positively impact the present energy balance so that significant achievements can be attained in making available

		net energy to rural households as a first step towards energy sustainability. At an initial stage WWF showed great interest to participate in this activity. However WWF did not manage to secure funding for this activity aimed at increasing rural access to energy services. A natural course to proceed will be to entrust DNER and FUNAE to undertake this very important research activity to understand the best way to increasing access to energy services in rural areas.
Observations:		The Research Studies accounted for a large share of the input and output of the Project. Financially, as the regional investigations were man-power demanding and logistically heavy; result-wise in terms of *significance* because one could say that capacity was built among many actors and this more broadly than government officials only – it was done "on-the-job"/"hands-on" and led to results very useful for the Ministry of Energy in the further development of their policies and scenarios.

Activities implemented during reporting period:		• Approval of experts' CVs
		• TOR preparation
		• Submittal of reports
		RS1:
		• Field work in Beira
		• Fieldwork in Maputo and Matola
		• Fieldwork in Nampula
		• Data prepared and submitted to BEST
		• Drafting of :
		  ○ Biomass Profile Report (household & institutional Energy use);
		  ○ Biomass value chain report;
		  ○ Biomass supply report.
		• Results presented at the Stakeholder Seminar
		
		RS2:
		• Working group on Solar Water Heating systems coordinated by DEP
		• Results presented at the Stakeholder Seminar

		RS3: • Several working meetings with National Director Felisbela Cunhete and cadres from Direcção Nacional de Combustíveis (DNC) and several documents prepared for submission to the Minister of Energy. • Specific Terms of Reference were drafted concerning the use of existing Natural Gas for public transportation vehicles • Results presented at the Stakeholder Seminar RS4: • Detailed work plans and a complete draft study report structure • Research and analysis work for the Concise Reference Manual • Real estate site, object of the Case Study, was visited by the team and complete plans shared by the real estate developers • Preparations of Team member work plans • Project Master Implementation Plan prepared • Results presented at the Stakeholder Seminar RS5: • Attempts to make WWF join the research and coordinate with current project • National Directorate of New and Renewable Energy (DNER) and FUNAE was encouraged to take over
Risks/Problems and Solutions:		As mentioned and also identified by the first monitor by the Facility, the budgetary constraints of the RS was a challenge. The involvement of university (Universidade Eduardo Mondlane) teachers as well as students was essential, and luckily approval was given to enter this path – this was a good way of meeting the financial constraints and even turned out to be a win-win as the intellectual resources already present in the country contributed to the base for development of future Energy Scenarios and Politics. Hopefully, cooperation between the two institutions will continue and the “young brain trust” will continue their careers in benefitting the energy sector of Mozambique.
Impact:		The RS were intended to form the base of the future energy scenarios, strat-

		egies and policies. Particularly the Biomass study which included regional information too has provided essential input to this, if not fundamental research. FUNAE's participation in both Beira and Nampula prepared this organization to conduct surveys on biomass issues. This means that capacity has been built and FUNAE is now able to carry out surveys on biomass on their own. As mentioned above, it is the hope that the involvement of the academia will lead to continuous capacity strengthening of the Ministry of Energy and DEP in particular.
Changes and their reasons:		Apart from the budgetary constraints which mainly led to changes in the drafting of the RS ToR (A 3.1), the RS were implemented as planned (adjustments in timing were necessary due to climate/weather in the regions).
R4:		Energy development scenarios, policy and strategies for contributing to sustainable use of traditional biomass fuels use in urban areas and improved access to modern energy services in rural areas are identified
4.1.		Development scenarios, policy and strategy options are defined within 18 months of project start
A 4.0		**Energy development scenarios and policy, strategy options**
Description:		The activity was linked to results from Activity 1.0 and outcome of particularly RS1 & RS4 of Activity 3.2. Its purpose was to investigate the energy problems through the use of alternative energy development scenarios; policies, strategies and the policy implementation instruments intended to solve the problems identified. For the different options the positive and negative implications of financial, social and environmental nature were to be identified and discussed in order to select those that are appropriate/sustainable and practicable in the context for which they are chosen.
Achievement of Outputs:		This activity has been successfully terminated. Quite early in the Project process it was clear that the Biomass development was the critical issue. Also NGV was discussed and a one day workshop was held to follow up on RS results; despite the fact that it was quite late in the Project implementation, the seminar was a success. Scenarios and strategy options concerning Biomass options were developed

and the results are as follows:

BIOMASS DEVELOPMENT SCENARIOS AND POLICY, STRATEGY OPTIONS

Objective 1: Ensure sustainable supply of charcoal for urban areas

Promote private sector involvement in plantations and charcoal production around urban areas

- Provision of land for plantations, eg. a concession scheme
- Financial instruments

Promote community production of wood for charcoal production

- Attach monetary value to preserving trees
- Monitoring of stock of trees
- Advice/training on sustainable production of wood
- Incentivize communities to preserve wood resources

Dialogue with charcoal sector on issues and solutions

- Gov. dialogue with communities e.g. discuss energy issues in formal dialogues
- Gov. dialogue with professional charcoal associations (producers, transporters, retailers)

Certification of sustainable charcoal and restricting production of charcoal in selected areas.

Objective 2: Improve the efficiency of charcoal production

Promote the use of efficient charcoal production methods

- Improved kiln (Kiln is a thermally insulated chamber, or oven, in which a controlled temperature is kept and woodfuel is transformed into charcoal) scenario: improve efficiency of 30% of charcoal production by 2030 from current 7 kg of wood to 1 kg of charcoal (15% weight efficiency) to that of 5 kg of wood to a kg of charcoal (20% weight efficiency)

Demonstrate use of charcoal residues

- Use residues from kilns for briquettes

Objective 3: Reduce or stabilize charcoal consumption in urban areas at 2010 levels by 2030

The use of charcoal for cooking can be reduced by shifting away for charcoal, by improving efficiency of use, and reducing cooking needs.

Promote of LPG in urban areas

- Port gas transfer facility is a precondition for LPG initiatives
- Improve safety of LPG appliances (education, certification)
- Promote 5 kg LPG canisters
- LPG scenario: 60% penetration of LPG for cooking in Maputo, 20 in Beira, and 15% in Nampula by 2015

Promote ethanol for cooking in Maputo

- Ethanol scenario: 20% penetration of ethanol for cooking in Maputo by 2015.
- As a matter of fact a biotech-based company, headquartered in Denmark and employing approximately 5,400 people in 30 countries, has established a company in Mozambique called Cleanstar Mozambique that has been strongly involved in promoting ethanol stoves for cooking.

Promote other clean cooking fuel alternatives

- Electric stoves provided sufficient production of electric power
- Natural gas for community cooking and large users such as restaurants and institutions
- Briquettes from residues (charcoal, wood, hard coal, crops)

Deterring charcoal use

- Restricting use in apartments or selected urban areas
- Taxation of charcoal

Promote use of improved charcoal stoves in urban areas

- Improved stoves scenario: 40% penetration of improved charcoal stoves in Maputo/Matola, Beira and Nampula by 2030; and 20%

penetration in other urban areas by 2030.

Promote energy conscious cooking habits

- Institutional and commercial kitchens
- Users of charcoal stoves eg. improved charcoal stoves users

Objective 4: Create energy employment

Stimulate formal employment opportunities in modern cooking fuels business

- Ethanol (manufacturing, distribution and retail of stoves and fuel, production of ethanol)
- Improved charcoal stove (manufacturing and retailing)
- Briquettes, (manufacturing and retailing of briquettes)

Upgrading of skills and techniques in charcoal supply chain

Objective 5: Reduce respiratory health problems due to use of firewood and charcoal use for cooking

Education and awareness raising

- Cooperation with Ministry of health about promotion of safe cooking habitsCreate awareness about dangers of exposing women and children to fumes.

THE ROLE OF ENERGY PRICING

Although the mechanisms and methodologies applied for end-user tariff setting in electricity and fuels sector in Mozambique in general follow internationally accepted principles, the pricing policy could be improved and made clearer in a number of areas. The areas are presented below.

- **The cost of electricity generation and transmission will increase** significantly in the future as massive investments in new and more expensive infrastructure is needed to satisfy the increase in demand. Although the share of low-consumption consumers is increasing as the electrification of the country progresses, the main driver of electricity consumption is the economic growth and the need for electricity to industry and large commercial entities. These changes in consumer base and in the future cost of supply necessitate a rethinking of the

electricity tariff regime to be able to ensure quality supply for industry and productive entities. As the electricity sector expands the need increases for a clear demarcation of cost of monopoly services and that of commercial activities.

- It is recommended to relate the discussions on tariff setting to that of the **future electricity market structure** envisaged for Mozambique. One challenge is to ensure that low cost electricity generation options in Mozambique is not exported without any benefit to the consumers in Mozambique, who then are forced to pay for expensive imports during peak hours. One way to encourage generation in Mozambique could be to introduce a levy on electricity exports.
- **Social concerns** form part of both the electricity and fuel price setting. Although the methodologies for determining electricity and fuel tariffs follow the same principles of cost reflective tariffs, the principles of setting the final consumer tariffs are very different in fuels and electricity sectors. Where the principle of uniform geographical tariffs is used for electricity and follows a progressive tariff regime - the higher the consumption the higher the unit cost - the fuel prices are differentiated according to the allowed transport margin from fuel supply centers.

While it is acknowledged that the electricity and fuel sectors have different development paths, it might be worthwhile making a common approach to setting end-user tariffs while at the same time ensuring the financial viability of the companies involved in the service delivery. The principles for the distribution of the costs on various consumer categories according to e.g. social development objectives in the various energy subsectors should be aligned and transparent. Inclusion of social concerns in energy tariff setting is difficult albeit legitimate and should be done carefully to avoid unnecessary subsidies and complexity. It is important for the government to have an overview of key mechanisms in energy price setting that have a social element, e.g. a clear view of target groups (who qualifies), what are total impact of the subsidies and other levies on various consumer groups, are there groups who can afford to pay more?

Tariffs for off-grid services are currently being analyzed in a study initiated by the Ministry of Energy together with feed-in-tariffs for renewable energy technologies. FUNAE is becoming more and more involved in direct energy service delivery and a discussion seems needed of the role of FUNAE in providing the services in the future and the need for regulation of these activities. Review of the **concession arrangements** to introduce a simpler process for small-scale generation and service delivery would be instrumental in promoting renewable energy and harvesting the potential for small-scale generation.

STRATEGY OPTIONS

On a continuous basis the Team Leader has played a role as a mentor to the Director of Studies and Planning in dealing with high level professional questions associated with definition of strategy options, always and only at the discretionary request from the National Director responsible for DEP. Particular focus has been given to issues related to transmission planning (Energy Backbone Project); Hydropower development options and strategies; Utilization of low grade coal by-products; Natural gas for power generation and establishing guiding principles to frame institutional development programmes; Solar Water Heating Systems; Railway Electrification. The National Director of Studies and Planning has participated in all workshops during the Project implementation and included staff as deemed relevant.

The NGV workshop

The objective of the workshop in which a mix of government officers and stakeholders from different institutions/companies participated (25 in total) was to discuss the use of natural gas in the energy matrix of fuel used in vehicles in Mozambique. Components discussed were:

- Analysis of the use of natural gas as fuel road in the world;
- Potential applications of NG in the transport sector;
- Outputs: Sales price / environmental footprint of using GN / identifying scenarios conversion / Quantification of vehicles /

		identifying needs.
Observations:		This part of the Project has taken the form of one-on-one "on-the-job" training and recommendations as well as the implementation of workshops/seminars with several participants. Policy formulation documents are in the hands of DEP whereas the documents and studies leading up to these are outputs of the Project.
Activities implemented during reporting period:		• Team Leader provided assistance on several high level professional questions at the discretionary request from the National Director • Mission on pricing issues and tax policy and submittal of mission report including circulation among stakeholders • Workshop on NGV • Development of Scenarios
Risks/Problems and Solutions:		This part of the Project is the part that suffered the most from the time pressure due to the initial delay and the constant request to implement the same ambitious RS with shorter calendar time available. Also the availability of ME (not to mention provincial) staff was a risk that was not possible to mitigate. The focus has therefore been on continuously involving preliminary results of the different studies and discussions in the daily work and challenges of DEP thereby linking, where relevant, the RS objects to every day planning and development.
Impact:		The support measures drafted and discussed for Biomass and NGV the scenarios developed will, when initiated and implemented, greatly develop the use of traditional biomass fuels in a more sustainable way and will also lead to improved health. The structural issues of access to energy in rural areas need further focus, and capacity strengthening will have to start with recruitment of dedicated staff in the provinces.
Changes and their reasons		It was agreed to focus attention on biomass issues in order to be able to discuss possible options for alleviating wood fuel shortages around the main consumption centers and to discuss the role of Energy Pricing to achieve desirable outcomes.

R5:		Identified and recommended draft support measures and pilot project plans to promote desirable energy related developments
5.1. 5.2. 5.3.		Study visit(s) conducted within 6 months of project start Stakeholder seminar carried out within 22 months of project start Drafts of support measures detailing implementation methodologies and procedures as well as plans for pilot projects ready within 23 months of project start
A 5.0		**Develop policy implementation instruments**
A 5.1		**Study visits to foreign countries**
Description:		The purpose of this activity was to provide the energy officials involved in the implementation of the action and policy makers with an opportunity to observe the energy policy and programme implementation experiences of other countries with similar energy challenges as Mozambique by discussing relevant experiences in the visited countries with key local entities, including government organs. The activity included the selection of countries to be visited and the selection of visit objectives and visits to be made.
Achievement of Outputs:		This activity has been successfully terminated. Six study visits were planned and executed and focus went on strengthening relations with the International Energy Agency as it was from the inception considered a priority to align practices in Mozambique with those adopted by the IEA rather than visiting countries similar to Mozambique. The opportunity came before that visit for one of the key staff in DEP to participate in the *2nd Regional Training and Capacity Building Workshop on Energy Statistics and Databases*, in SA, organized and financed by The African Energy Commission (AFREC). This Project only had to supply per diems as AFREC did not cover this expense. Training was provided in energy data collection and energy balances and statistics. The visits to the IEA also incorporated a component of training. The main objectives of the training-workshop were as follows: • Provide training to the National Focal Points in energy statistic, data

		collection, energy balances and improve their capacities in validating the collected data; • Capitalize on the knowledge base acquired by the IEA in energy statistics, energy data collection and analysis including formation of energy balances, validation techniques of the collected data and structures and layouts of energy databases.
Observations:		As mentioned, already during Inception phase the IEA was identified as a key player on which to turn for directions on the development of the energy sector of Mozambique, in order to align practices with this important international institution. It was therefore decided that capacity would be better built by letting staff participate in a training-workshop here than participation in a more traditional study visit. It was investigated whether it was possible to arrange someone from IEA to come to Maputo for sessions; it turned out not to be feasible.
Activities implemented during reporting period:		• Planning and execution of 6 study visits to the International Energy Agency IEA with the National director of DEP • Planning and execution of one study visit to the 2nd Regional Training & Capacity Building Workshop in Energy Statistics, Data Collection and Energy Balances for the AFREC's National Focal Points of the Southern African Region and Indian Ocean Community • Submittal of study tour reports
Risks/Problems and Solutions:		N/A
Impact:		The visit to EIA has strengthened relations and has aligned practices with the agency in terms of data collecting, storing, processing and planning. The prior participation in the AFREC workshop also strengthened these practices and put focus on the challenges of Mozambique in collecting data for energy statistics and balances. Both contributed with a structured training programme from which lessons learned can be implemented in the ME and DEP ahead.
Changes and their		Apart from the decision at debriefing to focus on IEA, no changes were experienced.

reasons:		
A 5.2		**Workshop for stakeholders**
Description:		This activity comprised the organization of a "Grand Finale"; a workshop for all stakeholders subsequently to the team of experts having carried out the preparation of detailed energy accounts, consumption and supply projections, and the energy development scenarios and policy options to share the information and knowledge obtained and the conclusions on the potential impact of the policy options and implementation measures formulated on the improvement of the sustainable energy consumption of the final beneficiaries. Furthermore it comprised the proceedings from the workshop to be prepared and edited. The final workshop was the major visibility event of the Project, along with the publishing of the Energy Balance which was also distributed at the Stakeholder Workshop.
Achievement of Outputs:		This activity has been successfully terminated. A workshop took place in Maputo December 6th. The number of registered participants reached more than 60, and was composed of people from different stakeholder groups. The programme of the Workshop was approved at the PSC nº5 meeting. The Deputy Minister of Energy together with EC Ambassador Paul Malin, the Representative of the European Union in Mozambique, made opening speeches at the workshop. During the seminar, presentations were held on all the major activities that had been carried out. Also, an opportunity to present areas and ideas to be developed in future co-operation programmes and projects was provided. A comprehensive compilation of the most relevant documents produced during the life of the project like the statistical indicators for period 2000 until 2011 was available (the Brochura), and this including results from research activities, as well as papers on different subjects like the role of pricing, will be published on CDs by the Ministry of Energy with support from the Project in order to be made available to those interested (distributed to all stakeholders involved in the Project) and in order to be a depository of what has been produced.
Observations:		The Final Stakeholder Workshop was part of ToR and the contract and contributed together with the initial stakeholder identification and involvement to visibility of the Project and in particular the Results of the Project.

Activities implemented during reporting period:		• Planning and carrying out of the final workshop including the invitations of speakers as well as participants • Presentations prepared by key and non-key experts • Wrap-up with the National Director of DEP • Arrangements for the printing of the Brochura and compilation of all other key documents produced under the Project for publishing on CD.
Risks/Problems and Solutions:		The National Director of DEP insisted on participating in the identification of participants or the Final Workshop and signing and sending out the invitations which unfortunately led to some delay in that process. It was not possible to mitigate this challenge.
Impact:		The impact of the Final Stakeholder workshop was partly that it raised awareness about the Project Results, partly feedback and ideas for further actions were received from the participants.
Changes and their reasons:		The number of participants for the final workshop turned out to be 60 instead of the initially estimated 150-170, due to an unanticipated delay in sending the workshop invitations.
A 5.3		**Design of public support measures to support the recommended development actions**
Description:		The purpose of this activity was a cross-cutting part of the other activities, rather than an isolated activity. The results were to be achieved in presenting an array of measures and policy instruments together with their possible impacts, the identification of Pilot Projects in a format suitable to attract funding and the marketing of Pilot Projects and partners for implementation.
Achievement of Outputs:		The outputs have successfully been achieved. Pls. refer particularly to Activities 3 and 4 above.
Observations:		Pls. refer particularly to Activities 3 and 4 above.
Activities implemented during		Pls. refer particularly to Activities 3 and 4 above.

reporting period:		
Risks/Problems and Solutions:		Pls. refer particularly to Activities 3 and 4 above.
Impact:		Pls. refer particularly to Activities 3 and 4 above.
Changes and their reasons:		N/A

2.3 Continuation of the Project subjects

Establishing new routines requires perseverance and trust building among stakeholders. The project has focused very much on doing so; sustainability of the project will be linked to the further establishment of a comprehensive working network between the Ministry, the department (DEP) and the stakeholders. The Consultant recommends that well defined targets be established in order for cadres from different directorates of the Ministry to continue the interaction with stakeholders undertaking research initiatives. These have already been clearly identified and are all addressing identified challenges and knowledge gaps needed to be remediated in order to provide reliable data and good understanding of what is happening in the various energy domains.

Concretely, Research Studies number 2, 3, and 5 have been handed over to relevant stakeholders for their further implementation. The results of RS 1 and 4 are also ready to take in on future energy policy scenario development and planning; and the publishing of the statistics as well as the built capacity in the further collection and elaboration of statistical data is a great resource for future work on energy balances.

2.4 Monitoring and Evaluation of the Project

The Project has been monitored two times during implementation; first by the Energy Facility and later by the ROM. Already in the first week of October 2011, Mr. Antonio di Vietro was in Maputo monitoring the Project on behalf of the Energy Facility. The results of the Monitoring has never reached the Consultant despite the numerous requests to see them; nevertheless what was being discussed in general was the need for reinforcement of Incidentals in terms of amount available for the RS; as well as the extension of eligibility of expenses to be considered.

In the third week of July 2012, the ROM mission (EU independent performance-based monitoring system) took place, coinciding with a real work peak of the Project. Mr Fabio Lucantonio visited the Project and expressed concern about the late implementation (mainly regarding status of the RS). It seemed that the updated timetable for activities had not reached his table as in general the expedition of progress reporting apparently has not always reached the EU Delegation.

However, the worries expressed regarding the termination of RS reports in order for them to be useful for the Ministry of Energy during the projects implementation is hopefully steadied with this Final Report which shows that results obtained during implementation have naturally and ad hoc been integrated in the planning activities of the Ministry of Energy albeit the postponement of finalizations of the RS.

2.5 Materials produced during the Project

The numerous materials produced during the Project implementation have all been submitted to the beneficiaries and due to the considerable size of many of the documents, they have been made available for download in a dedicated Dropbox. Please find the indexation of that Dropbox on the following page.

Further, the ME has been granted CDs and other equipment needed to print and distribute the results on CDs. The status of this process is beyond the influence of the Consultant.

Directory Dropbox EuropeAid127640DSER	
Acti 1	
	Apresentacâo Brochura 2000-2011
	Brochure 29 Novembro 2012 RASCUNHO FINAL
	ESTATISTICA DE ENERGIA 2000-2011
	Importações e Exportações de Moçambique, 2004-2011
	O Balanço energético de Moçambique
Acti 2	
	Example of LEAP Training Exercises 2012_03_Portuguese
	LEAP Workshop2012-Participants_Final
Acti 3.2 RS1 Biomass	
	BEST Moz V6 (traducao portugues), final
	Campanha Nacional de Mudanca Comportamental
	Final Report Mozambique Urban Biomass
	Mozambique Energy Analysis 2012
	Mozambique Energy Baseline Study 2012
Acti 3.2 RS2 SWHS	
	Entidade Implemendatora dum Programa Solar Termico FINAL vrs PT
Acti 3.2 RS3 CNG for Vehicles	
	Apresentacâo GN em Mocambique
	Estudo GNV - Mocambique - Versão final
	Estudo GNV - Mocambique - Versão PT-FINAL
	Study on Use of Natural Gas in Vehicles November 2012
	Sumário executivo - Estudo GNV Mocambique
Acti 3.2 RS4 MUSES	
	MUSES - Presentation of Study Results - 6th December 2012 Hotel VIP - 05.12.2012
	MUSES Summary Report - Efficient Sustainable Building Energy Performance 05.12.2012
	MUSES Technical Report - Efficient Sustainable Building Energy Performance 05.12.2012
Acti 4	
	Report on Tariff Mechanisms
	Woodfuel Policy Options - Objectives and Measures
Acti 5	
	Report Visit & Training in Paris IEA
	Study Visit to South Africa Helton Xavier
Workshop documents	
	Covite para o Stakeholder Workshop de 6 de Dezembro 2012
	Proposed Agenda for Stakeholders Workshop and Questionnaire

3 BENEFICIARIES/AFFILIATED ENTITIES AND OTHER COOPERATION

Cooperation with institutions during the implementation of this Project is of (at least) two different kinds. There is on the one side the cooperation with institutions that operate *under* the umbrella of the Ministry of Energy and on the other side the cooperation with institutions *outside* the umbrella of the Ministry of Energy.

Concerning the cooperation with institutions *under* the umbrella of the Ministry of Energy as is the case with EdM and FUNAE, it shall be referred that an ongoing institutional relationship among the institutions already exists and that this project contributed to further and deepen that same relation. Below the areas where this project had an impact in deepening the existing institutional collaboration are described:

Electricidade de Moçambique – EdM

A working group aimed at starting a Solar Water Heating (SWH) program targeting EdM's consumers (not exclusively) to substitute the electricity used on water heating with SWH, where EdM is also represented, has been established . The study is soon to start supported by World Bank funds regarding project financing. Terms of Reference was drafted for this study and invitations were sent to several project finance consultants based on these ToR. Under this collaboration a paper with proposals regarding the organizational aspects pertaining to launching a program of this nature was published.

FUNAE

Very comprehensive dialogues have been held with FUNAE in order to involve the energy fund in the process of guaranteeing sustainable use of traditional biomass fuels to main urban areas. Further, capacity has been built within FUNAE so that the staff now has the know-how to carry out additional research in matters pertaining to the use of Biomass. FUNAE is as EdM represented in the working group which has been established to launch the program aimed at starting a Solar Water Heating - SWH program.

The Project also established cooperation with institutions outside the umbrella of the Ministry of Energy. These links between DEP and other institutions could result in long-term working relations with positive impact in planning exercises. Below, a short presentation provides an indication of what has been achieved in this respect.

Biomass Energy Strategy – BEST

In the beginning of the implementation of the Project, a formal cooperation agreement was signed with the EUIE funded project *Biomass Energy Strategy (BEST)* which was based in the Directorate of New and Renewable Sources of Energy (DNER). Its purpose was to establish a strategy for Biomass in the Ministry of Energy. A constant flow of information was passed on to as the present Project started to have elaborated results from the Research Studies, and BEST has expressed its appreciation for this contribution.

World Wildlife Fund – WWF

Despite the fact that cooperation with WWF did not materialize as initially expected by both entities due to unexpected reductions on budget available to WWF, a channel of dialogue has been opened enabling exchange of views between the Ministry of Energy and WWF. A seminar among Ministry officials was promoted by the WWF, creating awareness of environmental considerations when doing energy planning.

Universidade Eduardo Mondlane

As mentioned, regarding activities 3.1 and 3.2 special attention was given to involve teachers from the University in all research activities carried out under this Project and actually, almost all research received inputs from University employees or students, in particular the ones involving Biomass issues.

Faculdade de Arquitectura (Architectural Department of University)

The Architectural Department of University had a special involvement in the activities related to the creation of a Model for Urban Sustainable Energy Services and is now familiar with techniques employed in this context.

INE

Collaboration with The *Instituto Nacional de Estatística* (INE) will prove very instrumental in the quest for getting disaggregated data on a bottom-up approach on use of energy per category of consumers and this path shall be further pursued.
INE, has the possibility to gather and present data on several issues, namely:

- Trade and repair of vehicles;
- Civil Construction;
- Mining;
- Manufacturing;
- Water, Gas and Electricity industry;
- Services

As well as getting information organized by:

- Number of workers;
- Turnover in meticais;
- Fossil Fuels spending in meticais;
- Electricity bill in meticais.

Under this Project, small initial steps were undertaken in this direction; however a long-term and permanent collaboration between both organizations is envisaged. Cadres of INE have been involved in training and also in a mini seminar where Biomass findings were presented and analyzed and recommendations were put forward.

International Energy Agency

This Project put a special emphasis in strengthening the collaboration between the Ministry of Energy (DEP) and the International Energy Agency since the latter is at the heart of the global dialogue on energy, providing unbiased research, statistics, analysis and recommendations. It is important to mention that the Ministry of Energy (DEP) is in the process of becoming the designated entity qua INE as the official source of energy data on Mozambique. This further underlines the importance of reinforcing the cooperation with the IEA and aligning Mozambique practices with those recommended by the IEA.

4 VISIBILITY

It is in the nature of the Project that visibility should mainly be given to the outcomes of the activities. As the name indicates, the Project is a capacity building act and t is, therefore, more important to see if capacities have been built in a sustainable manner and present the results obtained due to the built capacity. As for the Project itself, main tool of visibility was the Final Stakeholder Workshop held on December 6th 2013. This not only served as a presentation of all the Results reached but also provided outputs for distribution.

5 LOCATION OF RECORDS, ACCOUNTING AND SUPPORTING DOCUMENTS

5.1 Project inputs

Please refer to the Final Report for details on the input delivered. The simple table below illustrates the overview of man-days spent to date on the Project:

	MDs	End December 2012
Team Leader	**380**	**380**
SNKE Peter Mulder	**35**	**35**
SNKE Christine Wennerberg	**30**	**30**
SNKE (RS1 – 60; RS4 – 85)	**145**	**144**
JNKE	**435**	**435**

Name of the contact person for the Action: ……

Signature: ……Location: ……

Date report due: ……..…Date report sent: ……