Work performed by the EERA Working Group of Togo

as part of the project

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in cooperation with HELIO International, with the financial support from the Climate Development Knowledge Network (CDKN).

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**In collaboration with**
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The Director General of Energy
The Director of Environment
The General Director of the National Agency of Environmental Management
ABSTRACT

Access to energy services remains one of the major concerns, and is an essential parameter, for developing countries to achieve the Millennium Development Goals (MDGs) or post-2015 Sustainable Development Goals. Energy services development must simultaneously address the need to preserve the local and global environment, and to adapt to future changes, notably climatic ones, in order to ensure a long-term sustainable development.

The main goal of the Togolese government’s energy policy is universal access to energy services. This requires the development of different forms of energy and the implementation of appropriate strategies along the supply chain and final energy delivery.

Following the energy policy assessment work using the TIPEE (Processing Information for Energy Policy and Ecodevelopment\(^1\)) methodology developed by HELIO International, this technical note aims to present an analysis framework of the current and future energy system of Togo according to the principles of a Smart Energy Path (SEP). SEP refers to an approach to energy planning that aims to meet the peoples’ energy services needs in a participatory governance way that will lead to achieve the economic and social goals of the population residing in a given area (local, national, regional) while ensuring environmental feasibility.

This report includes an analysis of the current energy system and its aptness for meeting energy service needs, the identification of stakeholders to be engaged in SEP planning in Togo, the exploration of future possibilities in terms of energy services access, as well as a theoretical local case study developed on an area of eleven villages located in the Togo’s maritime region.

The analysis at national level illustrates how interventions in social and community infrastructure can allow all Togolese access to modern energy services, resulting in a considerable improvement in all MDG. It is important to note that only an estimated 9% of rural and peri-urban health centres in Togo have access to modern energy services, and only 24% of upper secondary schools and 2.5% of primary schools in rural areas are electrified. Among the recommendations raised from the analysis, we highlight the following:

- The importance of increasing the level of awareness and encouraging decision-makers in all sectors of the economy to evaluate the "energy" dimension explicit in sectoral policies and projects; in other words, to identify unmet needs in terms of energy services access with a view to support the country’s development, whether in terms of health, education, trade, etc., and

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\(^1\) See: [http://www.helio-international.org/toolkit/tipee](http://www.helio-international.org/toolkit/tipee)
including energy into the design of sectoral development project. Construction standards for health centres and schools that incorporate energy service needs should be envisaged. In this way, empowering a multisectoral committee such as COMET (Multisectoral Energy Committee of Togo) makes good sense.

- The law relating to decentralisation and related legislation should be more explicit in terms of energy, giving a greater role to Mayors and prefectural councillors. Identifying how the role of the local controlling body (or maître d’ouvrage local) should be played incorporating the energy sector in each town development planning. Transparency remains fundamental. For example, it would be useful to know the CEET budget for public lighting maintenance in each prefecture.

- The creation of a rural electrification energy control agency is an important step.

- On the regulatory front, the establishment a framework that promotes decentralised energy production and allows to sell that energy in the centralised grid is needed.

- The Benin-Togo electricity code would need to be reviewed and modified based on this new regulatory framework.

- In terms of stakeholders, the identification and involvement of all stakeholders, including participants beyond traditional energy stakeholders, must be improved. For example, experts from the fields of education and health should be involved so that the current and future energy service needs of the population in these sectors can be defined. This expanded stakeholder group would also allow for project design criteria to incorporate energy services strategies.

- Increasing the population’s awareness on the harmful effects of open cookstoves while at the same time providing them with information on the solutions available (improved wood cookstoves, improved coal cookstoves, carbonisation techniques) is fundamental. Emphasis on rural health, and on financial savings in urban areas, is recommended.

The proposed case study, which remains a theoretical exercise in the context of this note, highlights the possibility of implementing a multifunctional platform shared by several villages (Ando-Kpomey, Wolénou, Zikpé and Atti-Toyo), and the importance of increasing awareness and training of the population in the use of improved cookstoves. In the case study, the inhabitants of Ando-Kpomey will be shown the health related aspects of cookstoves to motivate change; since this town does not buy fuelwood and currently does not face supply difficulties or challenging collection conditions (since the wood is taken directly from the land where the farming is done).

This analysis in this technical note is the first stage in the SEP implementation for Togo. It is expected that local partners, ministry officials, NGO workers, academics and businesses will build on this framework by kick-starting the next steps of the
work through active collaboration with the energy service users. The Liaison Committee, set up in Togo as part of the EERA project, continues to be a relevant platform for stakeholder mobilisation.
# ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABREF</td>
<td>African Bio-fuels and Renewable Energy Fund</td>
</tr>
<tr>
<td>ADB</td>
<td>African Development Bank</td>
</tr>
<tr>
<td>ANADEV</td>
<td>National Agency for the Development of Biofuels</td>
</tr>
<tr>
<td>ANARE</td>
<td>National Authority for the Regulation of the Electricity Sector</td>
</tr>
<tr>
<td>C</td>
<td>Degree Celsius</td>
</tr>
<tr>
<td>CDKN</td>
<td>Climate Development Knowledge Network</td>
</tr>
<tr>
<td>CDM</td>
<td>The Clean Development Mechanism</td>
</tr>
<tr>
<td>CEB</td>
<td>Electricity Community of Benin</td>
</tr>
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<td>CEET</td>
<td>Electricity Energy Company of Togo</td>
</tr>
<tr>
<td>CFA</td>
<td>Franc of the African Financial Community</td>
</tr>
<tr>
<td>CH₄</td>
<td>Methane</td>
</tr>
<tr>
<td>CO₂</td>
<td>Carbon dioxide</td>
</tr>
<tr>
<td>CO₂e</td>
<td>CO₂ Equivalent</td>
</tr>
<tr>
<td>COMET</td>
<td>Consortium of NGOs and Associations on the Environment of Togo</td>
</tr>
<tr>
<td>CSO</td>
<td>Civil Society Organisation</td>
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<tr>
<td>DCN</td>
<td>Second National Communication on Climate Change</td>
</tr>
<tr>
<td>DGE</td>
<td>Directorate General for Energy</td>
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<tr>
<td>DGEA</td>
<td>Directorate General of Water and Sanitation</td>
</tr>
<tr>
<td>DGSCN</td>
<td>General Directorate of Statistics and National Accounts</td>
</tr>
<tr>
<td>EBID</td>
<td>ECOWAS Bank for Investment and Development</td>
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<td>ECOWAS</td>
<td>Economic Community of West African States</td>
</tr>
<tr>
<td>EERA</td>
<td>Energy, Eco-development and Resilience in Africa</td>
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<td>EIG</td>
<td>Economic Interest Group</td>
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<td>EIS</td>
<td>Energy Information System</td>
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<tr>
<td>FAO</td>
<td>United Nations Food and Agriculture Organization</td>
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<tr>
<td>F-PRSP</td>
<td>Full Poverty Reduction Strategy Paper</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>Gg</td>
<td>Gigagram (1000 tonnes)</td>
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<tr>
<td>GHG</td>
<td>Greenhouse Gas</td>
</tr>
<tr>
<td>GSPH</td>
<td>General Census of Population and Housing</td>
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<tr>
<td>GWh</td>
<td>Gigawatthour</td>
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<tr>
<td>HIPPC</td>
<td>Heavily Indebted Poor Countries</td>
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<tr>
<td>HIV</td>
<td>Human Immunodeficiency Virus</td>
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<tr>
<td>IDB</td>
<td>Islamic Development Bank</td>
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<tr>
<td>IMF</td>
<td>International Monetary Fund</td>
</tr>
<tr>
<td>LPG</td>
<td>Liquefied Petroleum Gas</td>
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<tr>
<td>MDG</td>
<td>Millennium Development Goal</td>
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<tr>
<td>MERF</td>
<td>Ministry of Environment and Forest Resources</td>
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<td>MW</td>
<td>Megawatt</td>
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<td>NEAP</td>
<td>National Environmental Action Plan</td>
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<tr>
<td>Acronym</td>
<td>Definition</td>
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<td>NEPAD</td>
<td>New Partnership for Africa’s Development</td>
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<td>NER</td>
<td>Net Enrolment Ratio</td>
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<tr>
<td>NGO</td>
<td>Non-Governmental Organisation</td>
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<tr>
<td>ODEF</td>
<td>Office for the Development and Exploitation of Forests</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Cooperation and Development</td>
</tr>
<tr>
<td>OIF</td>
<td>International Francophone Organisation</td>
</tr>
<tr>
<td>P/ETP</td>
<td>Precipitation/Potential Evapotranspiration</td>
</tr>
<tr>
<td>PNIASA</td>
<td>National Agriculture Investment and Food Security Programme</td>
</tr>
<tr>
<td>POLEN</td>
<td>National Energy Policy</td>
</tr>
<tr>
<td>PRADEB</td>
<td>Support Programme for Grassroots Development</td>
</tr>
<tr>
<td>PRASE</td>
<td>Referral Programme for Access to Energy Services</td>
</tr>
<tr>
<td>PRGF</td>
<td>Poverty Reduction and Growth Facility</td>
</tr>
<tr>
<td>PTF</td>
<td>Technical and Financial Partners</td>
</tr>
<tr>
<td>QUIBB</td>
<td>Questionnaire on the Basic Indicators of Well-being</td>
</tr>
<tr>
<td>RE</td>
<td>Renewable Energies</td>
</tr>
<tr>
<td>RPTES</td>
<td>Regional Programme for the Traditional Energy Sector</td>
</tr>
<tr>
<td>SCAPE</td>
<td>Strategy for Accelerated Growth and Employment Promotion</td>
</tr>
<tr>
<td>SEL</td>
<td>Solar Energy Laboratory</td>
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<tr>
<td>SEP</td>
<td>Soft Energy Path</td>
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<tr>
<td>SNPT</td>
<td>New Phosphate Company of Togo</td>
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<tr>
<td>TDE</td>
<td>Togolese Water Supply Company</td>
</tr>
<tr>
<td>TIPEE</td>
<td>Processing Information for Energy Policy and Ecodevelopment</td>
</tr>
<tr>
<td>UNDP</td>
<td>United Nations Development Programme</td>
</tr>
<tr>
<td>UNFCCC</td>
<td>United Nations Framework Convention on Climate Change</td>
</tr>
<tr>
<td>VAR</td>
<td>Vulnerability - Adaptation - Resilience</td>
</tr>
<tr>
<td>VAT</td>
<td>Value Added Tax</td>
</tr>
<tr>
<td>WADB</td>
<td>West African Development Bank</td>
</tr>
<tr>
<td>WAEMU</td>
<td>West African Economic and Monetary Union</td>
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INTRODUCTION

Energy service needs at the heart of policies

Why do we need energy? The driving role of energy in the development of a country is well established: heat for cooking and heating, light for reading, lighting, cold for preserving food and medicine, motive force for moving goods and services, operating domestic appliances and communication. Energy services are essential for any human population (100% of the population uses it in everyday life), but these services are often very poor quality, particularly in Africa. For example: cooking on open biomass-based stoves -whose adverse environmental impacts are well known-, human-made motive force or very mediocre lighting with paraffin oil lamp or candle. These are the "traditional" energy services. The "modern" energy services are expected to replace traditional energy services as they provide significant improvements to the lives of all, including improvements in ventilation, conservation (vaccines or foodstuffs), irrigation, agricultural product processing, or even the transport of persons or goods, as they induce a much smaller environmental impact (including climate change). Currently there is a coexistence of a "modern" energy system (energy grid, fuel distribution, sustainable biomass) and a "traditional" energy system (biomass collection, batteries, paraffin oil lamp, etc.) coexist.

Any public policy has one ultimate goal: to respond to the needs of the entire population. More specifically, economic planning aims to reduce poverty, so the energy system must contribute as much as possible and as quickly as possible to achieving the national poverty reduction goal. In this sense, defining needs for energy services is a political act; it forms the basis of the energy system as a whole. This is the first fundamental and absolutely essential stage; defining an "energy vision" on which policy will be built and then implementing the resulting energy strategy to realise the development of a coherent and viable energy system. The energy vision is primarily focused on defining how to provide energy services to all, that is to say in what timeframe, in what form, depending on the needs identified. As not all needs can be met at the same time (as the history of energy systems over the past fifty years has demonstrated), it is crucial to set priorities and a development plan for expanding access to energy services in a stepwise fashion.

Energy services access is now one of the major concerns and an indispensable parameter for developing countries in achieving the Millennium Development Goals (MDGs) or the post-2015 Sustainable Development Goals currently in definition. Energy service development must at the same time address the need to preserve both the local and global environment and have the flexibility to adapt to future changes, including climatic ones, in order to ensure a long-term viable development.
From TIPEE to energy service needs

The TIPEE (Processing Information for Energy Policy and Ecodevelopment\(^2\)) methodology developed by HELIO International, aims to measure progress in the implementation of energy policies incorporating the principles of eco-development, based on indicators selected on the basis of simplicity and relevance.

The ecodevelopment concept refers to development achieved in coherence with the potential of the given region and by ensuring the suitable and rational use of natural resources, technological styles and organisational forms, carried out in respect of natural ecosystems and local social and cultural patterns. This term is also used to describe an integrated approach to the environment and to development.

The TIPEE 2014 report, prepared by the Togo team, considers the years 2005 and 2010\(^3\). The report shows that environmental trends, renewable energies deployment, governance, and ultimately the resilience and vulnerability of Togo for future development requires improvement (see details in Annex 1). In addition the report reinforces the importance of Togo's energy policy, which should define strategies that remove barriers to the development of a viable system that meets the current and future energy service needs of the population, while ensuring environmental viability and participatory governance principles.

The TIPEE indicators are well suited to the evaluation of a country’s energy vision (environmental impacts, independence, technological choices, governance, vulnerability and resilience of the energy system, etc.), by focusing on "upstream" energy channels (final energy supply). In other words, this evaluation method concentrates on the traditional energy system that currently benefit a limited population group that have access to modern energy services for all, or part, of their needs. Thus, after completion of the TIPEE analysis, it is useful to examine the issue of "modern energy services needs" across the entire population. The expansion of modern energy service access will improve the country’s economic and social development. Rather than "goals," we seek to describe "trajectories," both in the socio-economic field and in the energy system framework. This approach is determined by the political priorities that decision-makers have set in the socio-economic field. These priorities define energy service needs that should be met using the appropriate energy system which should include some flexibility to meet these needs throughout a country’s development.

\(^2\) See: [http://www.helio-international.org/toolkit/tipee](http://www.helio-international.org/toolkit/tipee)
See also an overview of the results for three countries Togo, Mali and Benin: [http://www.helio-international.org/project/eera/](http://www.helio-international.org/project/eera/)
This technical note aims to present the analysis framework of the current and future energy system of Togo according to the principles of a Smart Energy Path (SEP). It includes an analysis of the current energy system and its relevance to needs in energy services, the identification of stakeholders to be involved in a SEP, exploration of possible futures in terms of access to energy services, as well as a local case study. This analysis is a first stage in the definition of a SEP for Togo. It is expected that local partners, ministry officials, NGO workers, academics, businesses, will take this framework to plan next steps through active collaboration of a wide range of representatives from energy service consumer groups.

**Review of Smart Energy Path**

Energy planning in accordance with a Smart Energy Path (SEP) aims to meet the energy services requirements that will ensure the economic and social goals of the population living in a given area (local, national, regional) to be achieved, in a manner consistent with environmental viability and participatory governance.

The framework for defining a SEP, as proposed in the EERA project (Energy, Eco-development and Resilience in Africa) initiated by HELIO International with the financial support of the Climate Development Knowledge Network (CDKN), has three main pillars:

- **Guide for decision makers on SEP**, proposed by HELIO International, which describes the principles and the seven steps for implementing a SEP (see Figure 1), at a national or local level.
- **Analysis of the current and future energy system**, according to the seven steps (Figure 1), and presented in this technical note.
- **Dissemination of information and results to stakeholders and local decision-makers**, targeting the progressive adoption of SEP principles suggested for the definition of policies, programmes and energy projects.

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A seven step process

STEP 1a. SCOPE: Base year, target year(s), geographical scope, sector coverage.


STEP 2. BASE YEAR PROFILE: Profile of the baseline energy system, by sector, by fuel, by end use.

STEP 3. RESOURCES AND TECHNOLOGY INVENTORY: Inventory of energy resources, supply and demand technologies, include analysis of vulnerability to climate change (e.g. TIPSE).

STEP 4. ENERGY SYSTEM GOALS: Define desired attributes of the energy system (national and local objectives and preferences, TIPSE indicators, etc.)

STEP 5. FUTURE YEAR ENERGY BALANCE: Balance supply and demand for the target year(s), respecting preferences (step 4) and using available resources (step 3).

STEP 6. POLICIES AND PRIORITY PROJECTS: Identify and implement policies, programs, and bankable projects.

STEP 7. EVALUATE AND IERATE: Evaluate progress (TIPSE indicators), iterate, and adjust.

Figure 1. Schematic of smart energy path (SEP)
SECTION 1. SOCIOECONOMIC OVERVIEW OF TOGO

This section provides an overview of Togo’s socio-economic situation, which is required for step 1 (socio-economic and development overview) of the SEP planning framework (Figure 1). Knowledge of the socio-economic situation (and expected development for the future, as described in Section 3) is crucial to the definition of a SEP, since the energy system is involved in all the activities that contribute to socio-economic development. So determining the minimum level of modern energy service needs is an indispensable tool for socio-economic development; it is not an afterthought based on development strategies.

The analysis must include the description of:

- demographic data (number of inhabitants, age, number of households, housing);
- economic data, such as the activities conducted by the inhabitants (agriculture, craft industry, trade), income of the population, poverty level;
- social and health data, including school enrolment rates, infant and maternal mortality rates, number of social and community infrastructures (health, education, market, public lighting, etc.) that exist or that are planned to be built and with which energy services are associated;
- environmental data, including local emissions and deforestation;
- institutional data, such as the existence of strategic policies at the national or local level (e.g. village development plan); and
- targets for each of the areas described above.

1.1 Key Features

General statistical data
Table 1, taken from the TIPEE 2014 report, shows the main characteristics of Togo through to 2010.

Economic growth
Togo’s cooperation with its key international partners only became effective in 2006 with the signing of the Global Political Agreement. Despite the impact of the global recession, the Government of Togo efforts have helped put the economy onto a path of growth (real GDP growth of 2.4% in 2008, 3.4% in 2009 4% in 2010, 4.9% in 2011, 5.6% in 2012).
### Table 1: Compilation of general information about Togo

<table>
<thead>
<tr>
<th>General statistical data</th>
<th>2005</th>
<th>2010</th>
<th>Source of info</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical area</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Country surface area</td>
<td>56,600 km²</td>
<td>56,600 km²</td>
<td>DGSCN</td>
</tr>
<tr>
<td><strong>Population</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total population</td>
<td>5,243,245 inhab</td>
<td>6 191 155 inhab</td>
<td>DGSCN / RGPH 2010</td>
</tr>
<tr>
<td>Share of rural population</td>
<td>64%</td>
<td>62.3%</td>
<td>DGSCN / RGPH 2010</td>
</tr>
<tr>
<td>Share of children under 15 years</td>
<td>40%</td>
<td>42%</td>
<td>DGSCN / RGPH 2010</td>
</tr>
<tr>
<td><strong>Population density</strong></td>
<td>95 inhab/km²</td>
<td>109 inhab/km²</td>
<td>DGSCN / RGPH 2010</td>
</tr>
<tr>
<td><strong>Workforce</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Share of total population</td>
<td>53.21%</td>
<td>54%</td>
<td>DGSCN / RGPH 2010</td>
</tr>
<tr>
<td>Share of women in the workforce</td>
<td>33.5%</td>
<td>34%</td>
<td>DGSCN / RGPH 2010</td>
</tr>
<tr>
<td>Share of men in the workforce</td>
<td>65.5%</td>
<td>66%</td>
<td>DGSCN / RGPH 2010</td>
</tr>
<tr>
<td><strong>Workforce in the agriculture sector</strong></td>
<td></td>
<td></td>
<td>DGSCN 3rd General Census of Agriculture</td>
</tr>
<tr>
<td>Share of the workforce in the agricultural sector compared to the total workforce</td>
<td>61.2%</td>
<td>62%</td>
<td>DGSCN 3rd General Census of Agriculture</td>
</tr>
<tr>
<td>Share of women</td>
<td>31.2%</td>
<td>32%</td>
<td>DGSCN 3rd General Census of Agriculture</td>
</tr>
<tr>
<td>Share of men</td>
<td>30%</td>
<td>30%</td>
<td>DGSCN 3rd General Census of Agriculture</td>
</tr>
<tr>
<td><strong>Economy and development</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Gross Domestic Product (GDP)</td>
<td>-</td>
<td>3756 MUSD*/year</td>
<td>SCAPE</td>
</tr>
<tr>
<td>Value added by agriculture (% of GDP)</td>
<td>-</td>
<td>36.8%</td>
<td>SCAPE</td>
</tr>
<tr>
<td>GDP per capita</td>
<td>-</td>
<td>605 USD*/year</td>
<td>SCAPE</td>
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<tr>
<td>Trade Balance</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Rate of variation between 2008 and 2011 current year</td>
<td>Between -14.3% of GDP to -12.5% of GDP (deficit)</td>
<td>SCAPE</td>
<td></td>
</tr>
<tr>
<td><strong>Human Development Index (and ranking)</strong></td>
<td>0.408 (165th)</td>
<td>0.435 (162nd)</td>
<td>SCAPE</td>
</tr>
<tr>
<td><strong>Multidimensional Poverty Index (and ranking)</strong></td>
<td>30.8%</td>
<td>26.7%</td>
<td>SCAPE</td>
</tr>
<tr>
<td>GHG emissions (this value is for CO₂ alone)</td>
<td>1 124 550 tCO₂</td>
<td>1 180 000 tCO₂</td>
<td>DCN</td>
</tr>
<tr>
<td>Share of population with access to safe drinking water (within 500 metres)</td>
<td>28%</td>
<td>52%</td>
<td>DGEA</td>
</tr>
<tr>
<td>Infant mortality</td>
<td>78.7%</td>
<td>78%</td>
<td>SCAPE</td>
</tr>
<tr>
<td><strong>Literacy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Share of total population that is literate</td>
<td>60.2%</td>
<td>62.5%</td>
<td>SCAPE</td>
</tr>
<tr>
<td>Share of women that are literate</td>
<td>10.2%</td>
<td>12%</td>
<td>SCAPE</td>
</tr>
<tr>
<td>Share of men that are literate</td>
<td>38%</td>
<td>45%</td>
<td>SCAPE</td>
</tr>
</tbody>
</table>

* 1USD = 500 CFA francs.

Poverty

The incidence of income poverty at the national level decreased from 61.7% in 2006 to 58.7% in 2011. This decline in poverty occurred in rural as well as urban areas. Poverty remains dominant in the rural environment with more than 73.4% of the population situated below the poverty line compared to 28.5% for Lomé and 44.7% for the other urban areas in 2011.

The analysis of non-income poverty is approximated through a Multidimensional Poverty Index (MPI) that takes into consideration ten areas of deprivation related to health, education, and living conditions. This approach was developed by the UNDP. The proportion of the population that is defined as "multi-dimensionally" poor declined significantly more than observed income poverty between 2006 and 2010. Furthermore, the massive reduction of multidimensional poverty has been felt in both urban and rural areas. Indeed, the proportion of the population that is "multi-dimensionally" has declined from 59.4% in 2006 to 51.9% in 2010, i.e. a reduction of 8 points. In urban areas, it moved from 33.0% to 25.8%, i.e. a reduction of 7.2 points. Reduction was greater in rural areas where “multi-dimensionally” poor declined from 76.0% to 67.6%, i.e. a reduction 8.4 points.

1.2 Millennium Development Goals

Since adoption in September 2000 by the General Assembly of the United Nations, the Millennium Development Goals (MDGs) remain at the heart of the international development agenda and lead the fight against essential development priorities like poverty and hunger, the improvement in education and gender equality, improvement in the health of the population, and protection of the environment. The government's commitment to achieving the MDGs has allowed these priorities to be incorporated into all development strategies, notably the Full Poverty Reduction Strategy Paper (DSRP-C5) and the Strategy of Accelerated Growth and Employment Promotion (SCAPE6), which currently governs public policy. With the support of partners, significant progress has been achieved.

Results

Two years before the 2015 deadline, the fourth MDG monitoring report (being finalised as this note is being written) allows the stakeholders in Togo’s development process to take stock of the progress accomplished towards achieving these goals. The report identifies the positive advances in development as well as the constraints and emerging challenges that, if taken into consideration, will provide more direction for economic policies to create stronger inclusive growth in Togo.

The report reveals the following (more details are provided in Annex 2).

5 In French: Document complet de Stratégie de Réduction de la Pauvreté (DSRP-C)
6 In French: Stratégie de Croissance Accélérée et de Promotion de l’Emploi (SCAPE)
The incidence of poverty, 58.7% in 2011, remains high even though efforts undertaken have helped to reduce it by 3 points compared to its 2006 value. Improving the business environment provides good prospects for employment promotion programmes that are currently under way. Constraints relating to low agricultural modernisation include inadequate availability credit as reasonable rates for the agricultural sector, ineffective training curricula, low level of capitalisation and external investment, and adverse effects of international crises hold back progress. Progress has been noted in education: after a decrease through 2007 school enrolment rate has since reversed and an increased number of students has been observed. Moreover, the gap between girls and boys has significantly narrowed over the period. The combined (boys and girls) completion rate of primary education increased from 66.6% in 2007 to 75.7% in 2012 and 100% is targeted for 2020 according to the Education Sector Plan (ESP). Concerning the gender question, the evolution of girl/boy ratios in primary education has improved and equal enrolled rates are expected in 2015. Moreover, the share of seats held by women in the National Assembly improved after the last parliamentary elections in 2013, but is still far from the targeted gender parity goal. Despite the presence of women promotion associations on gender issues, cultural views on the role of women remains static and further awareness programs should be pursued. Results obtained in health statistics remain mixed. Improvement in the health of mother and child is unfortunately hampered by the persistence of unfavourable socio-cultural factors. This situation supports the need for the expansion of awareness programs mentioned in the previous point above. Insufficient funding and services in maternity are veritable handicaps. In the areas of HIV, malaria and tuberculosis, the observed results are strongly encouraging. The main barriers to be lifted in the fight against these diseases include harmful traditional healing practices, dependence vis-à-vis the outside world for the financing of essential medical products, high cost of medicine and disruptions in the supply of medicine. The country's forest coverage has continued to deteriorate despite action initiation to improve preservation of the environment. Improvement in living conditions is hampered by the absence of sufficiently planned public policy and implementation combined with low level of citizen involvement. The penetration of new information technologies and communication has significantly increased. Poor economic relations with the rest of the world in areas of, deteriorating terms of trade, low absorptive capacity for development aid resources, and non-diversified exports that lack competitiveness on a global scale. Overall situation of MDGs progress in Togo is characterised by wide disparities related to place of residence. Indicators are often far from their
targets in rural areas where the incidence of poverty is often high. The Savannah region, where the incidence of poverty is the highest, is furthest from attaining the MDG targets.

*Energy and MDGs*

None of the MDGs is directly related to energy but all make indirect reference to energy services access which are essential for reducing infant and maternal mortality, enabling universal access to primary school, providing universal access to safe drinking water, etc. Access to modern energy services also significantly improves the impact on the environment, both globally (climate change: emissions of greenhouse gas emissions, vulnerability) and locally (deforestation, dust, etc.). The role of energy services in achieving MDGs is therefore increasingly recognised, yet it remains important to repeat and highlight the links in such a way that the decisions reflect the energy needs associated with development. Table 3 highlights some of these relationships and the indispensable role played by SEP energy planning in supporting achievement of the MDG.

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7 We are approaching the goal year 2015 of the MDG, the international community is preparing a new set of goals (Sustainable Development Goals-SDG) for the "post 2015" period. The cost of energy will most likely be mentioned more directly in the MDG. As of July 2014, a specific goal on access to sustainable energy for all is proposed.
Table 2. Links between the MDG and modern energy services

<table>
<thead>
<tr>
<th>MDG and Targets</th>
<th>Access to modern energy services allows:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal 1 - Reduce extreme poverty and hunger</strong></td>
<td>• Development of local businesses for revenue generation and employment creation.</td>
</tr>
<tr>
<td>• Reduce by half, between 1990 and 2015, the share of the population with income &lt; $1 per day.</td>
<td>• Return of population to rural areas to set up and grow their business outside of urban centres.</td>
</tr>
<tr>
<td>• Ensure full employment and the opportunity for all, including women and young people, to find decent and productive work.</td>
<td>• Commercial activity beyond daylight hours.</td>
</tr>
<tr>
<td>• Reduce by half, between 1990 and 2015, the share of the population who suffer from hunger.</td>
<td>• Use of machines and thus improving productivity.</td>
</tr>
<tr>
<td></td>
<td>• Reduction of the time allocated to the production of energy necessary for the cooking of food and water, thereby improving the opportunities to learn and participate in an income-generating job.</td>
</tr>
<tr>
<td></td>
<td>• Reduction of post-harvest losses through better preservation: drying, smoking, chilling, freezing.</td>
</tr>
<tr>
<td></td>
<td>• Irrigation to improve food production and access to better nutrition.</td>
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</tr>
<tr>
<td></td>
<td>• Irrigation to improve food production and access to better nutrition.</td>
</tr>
<tr>
<td><strong>Goal 2 - Ensure primary education for all</strong></td>
<td>• Teaching beyond daylight hours, notably allowing evening usage of educational infrastructure in order to carry out adult literacy programmes.</td>
</tr>
<tr>
<td>• By 2015, provide all children, both boys and girls, around the world with the means to complete a full course of primary schooling.</td>
<td>• Creation of a better environment for teachers, resulting in the better engagement and retention of teachers in remote rural areas.</td>
</tr>
<tr>
<td></td>
<td>• Creation of a better environment for children through access to safe drinking water, sanitation, lighting, and heated/temperate areas, hence reducing absenteeism and abandonment.</td>
</tr>
<tr>
<td></td>
<td>• Access to schools and media centres for the purposes of communication and education.</td>
</tr>
<tr>
<td></td>
<td>• Usage of equipment related to teaching (overhead projectors, computers, printers, copiers, scientific equipment).</td>
</tr>
<tr>
<td><strong>Goal 3 - Promote gender equality and empower women</strong></td>
<td>• Reduction of time spent by girls and women in collecting fuelwood, water, inefficient cooking, and manual harvesting.</td>
</tr>
<tr>
<td>• Eliminate gender disparities (...) at all levels of education by 2015 at the latest.</td>
<td>• Reduction of exposure to air pollution and adverse health effects with the use of improved cookstoves or other modern forms of energy, plus better ventilation of spaces.</td>
</tr>
<tr>
<td></td>
<td>• Improvement in the safety of women and their economic activities (public lighting).</td>
</tr>
<tr>
<td></td>
<td>• Evening classes or home study.</td>
</tr>
<tr>
<td><strong>Goal 4. Reduce the mortality of children under five years old</strong></td>
<td>• Reduction of exposure to air pollution and adverse health effects with the use of improved cookstoves or other modern forms of energy, and better ventilation.</td>
</tr>
<tr>
<td>• Reduce by two thirds, between 1990 and 2015, the mortality rate among children under five years old</td>
<td>• Access to improved medical services for children through the use of special equipment (sterilisation, refrigeration of medicine), storage of vaccines and medication.</td>
</tr>
<tr>
<td></td>
<td>• Creation of a better environment for medical personnel, resulting in better engagement and retention of skilled personnel in remote rural areas.</td>
</tr>
<tr>
<td><strong>Goal 5 - Improve maternal health</strong></td>
<td>• Access to better medical services for mothers, such as refrigeration of medicine, sterilisation of equipment, hot water, and operating rooms.</td>
</tr>
<tr>
<td>• Reduce by three quarters, between 1990 and 2015, the maternal mortality rate.</td>
<td>• Reduction of excessive work and heavy manual work that can affect the overall health of a pregnant woman.</td>
</tr>
<tr>
<td>• Make access to reproductive medicine universal by 2015.</td>
<td>• Creation of a better environment for medical personnel, resulting in better engagement and retention of skilled personnel in remote rural areas.</td>
</tr>
</tbody>
</table>
Goal 6. Combat HIV/AIDS, malaria and other diseases
- By 2015, control malaria and other major diseases and begin to reverse the current tendency.
- Access to better medical services through the use of special equipment (sterilisation, refrigeration of medicine), storage of vaccines and medication.
- Creation of a better environment for medical personnel, resulting in better engagement and retention of this personnel in remote rural areas.

Goal 7. Ensure environmental sustainability
- Incorporate the principles of sustainable development (...) and reverse (...) the loss of environmental resources.
- Reduce biodiversity loss (...).
- Reduce by half, by 2015, the proportion of people without sustainable access to safe drinking water and sanitation.
- Protection of forest areas by reducing levies on fuelwood.
- Increase access to an improved drinking water source
- Reduction of CO2 emissions, while increasing access to energy services, by using low carbon energy sources and more efficient technologies.

Reference: Table proposed by Maryse Labriet and Michel Labrousse. Inspired by:
- Own experience of the consultants.

In conclusion, it is essential that development planners systematically consider the energy service needs associated with the development goals proposed. Too often, prime contractors, designers of an economic development plan, do not "dare" to provide modern energy services, notably for equipping a social infrastructure, because these services are considered inaccessible - both technically and financially. On the contrary, it is crucial and fundamental to include. Why should the national community and funders invest in the construction of a health centre, recruit skilled personnel, ensure the supply of vaccines and medicine, etc. if the health centre has limited modern energy service access, preventing it from fulfilling the role expected of it by the children, women and other prospective patients? We must convince sponsors and funders that such facilities (installed gradually but according to a clearly defined planning) and their good operating conditions are indispensables to add value to the community. In other words, we must advocate for the provision of modern energy services, essential in health centres. The same applies for schools and municipal structures, notably for public lighting.
1.3 Key policies and socio-economic strategies

Table 3 presents the main socio-economic policies and strategies in Togo. It is useful to understand and define the socio-economic evolution of the country and the associated energy services needs to be met short and medium term, which are supported by the socio-economic needs defined by the sectoral policies listed in Table 3.

When the "energy" dimension is not explicit in sectoral policies, it is recommended that policy makers receive training on the importance of including access to energy services in their policies and strategies. It is then their responsibility to identify the energy services needs (Part 4 of this paper presents a preliminary evaluation). The ministry responsible for energy will determine how, from a technically perspective, the energy systems that will meet these needs should be designed. The axis for further reflection relating stakeholders and the institutional framework is described in Sections 2 and 3 of this note. We can already observe that the law on decentralisation and related legislation should be more explicit regarding the need for energy services. Access to energy services should be mentioned in the policy documents for each sector (health, education, etc.). The roles and responsibilities in the energy sector, in particular the local and national governments, should be clarified.
Table 3. Togo socio-economic policies and strategies

<table>
<thead>
<tr>
<th>Policy/Strategy</th>
<th>Goals</th>
<th>Link to energy services</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy for Accelerated Growth and Employment Promotion (SCAPE) in Togo</strong></td>
<td>(i) Increase the average rate of real growth to 5.9% on average and per year, starting from 5.6% in 2012 to achieve 6% in 2015 and 6.1% in 2017; this should lead to a growth in GDP per capita of about 3% per year; (ii) Raise the overall gross investment rate to 20.9% on average and per year, starting from an average level of 18.6% over the last three years (2009-2011); (iii) Reduce the incidence of income poverty from 58.7% in 2011 to 50.9% in 2015 and 47.3% in 2017, i.e. a significant drop of 11.4 points in five years; (iv) Reduce underemployment from 29.1% in 2011 to 26.1% in 2015 and 24.5% in 2017.</td>
<td>SCAPE requires the assurance of a stable and improved access and a substantial national autonomy of supply, at a reasonable cost, while diversifying the energy sources, especially clean and renewable energies. It identifies the following needs for strengthening energy production capacities: increase the country’s energy generation capacity from 161 MW in 2010 to at least 300 MW in 2015 and 500 MW in 2020; construct nearly 700 km of high voltage lines across the national territory; promote improved and butane gas cookstoves; continue tax exemption for importing equipment related to renewable energies (solar, wind, biogas, etc.); aim for the construction of solar energy (5 MW) plants; wind energy (12 MW) plants; a natural gas thermal energy plant of 450 MW combined cycle by 2020. It also identifies the following needs for strengthening energy distribution capacities: cross-border electrification phase I and II, rural electrification phase I, construction of supplies for making the electrical energy provision to users in the interior of the country more reliable, adopt a rural electrification strategy (national agency for rural electrification and rural electrification fund). It might thus be possible to increase the population's access to electricity from 23% in 2010 to 40% in 2017 and 42% in 2020. For rural areas, the access rate would increase over this period by 5% to 16% and then to 18%.</td>
</tr>
<tr>
<td><strong>Support Programme for Grassroots Development (PRADEB)</strong></td>
<td>• Strengthen institutional foundations and professionalise Economic Interest Groups (EIG); • Facilitate the access of rural populations to modern energy services; • Reduce youth unemployment.</td>
<td>The programme facilitates access to electricity in rural intervention areas through the provision of multifunctional platforms.</td>
</tr>
</tbody>
</table>

Development framework in the medium term to achieve the General Policy Statement (DPG) of the Government, the Millennium Development Goals (MDGs) and the vision of the authorities to make Togo into an emerging country in 15-20 years, respectful of Human rights and promoting the rule of Law. SCAPE is the revised version of the Full Poverty Reduction Strategy Paper (F-PRSP).

<table>
<thead>
<tr>
<th>Policy/Strategy</th>
<th>Goals</th>
<th>Link to energy services</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>National Agriculture Investment and Food Security Programme (PNIASA)</strong></td>
<td>By 2015, achieve an annual minimum agricultural growth of at least 6%.</td>
<td>There is no specific mention of energy. However, the agriculture sector is directly related to modern energy services, notably through the needs of irrigation and machinery.</td>
</tr>
<tr>
<td>By adopting in Maputo in 2003, the Comprehensive Africa Agriculture Development Programme (CAADP), the agricultural component of NEPAD, the African Heads of State committed themselves to allocating at least 10% of their national budgets to agriculture so as to make it the foundation for growth of their economies.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| **Health Code** (Act No. 2009-007 of 15 May 2009 on the Code of Public Health of the Republic of Togo) | Every natural person has the inalienable right to health without distinction of origin, gender, age, social condition, race and religion. | All health centres, whatever their size, needs energy services to function. The UNDP report (2011) provides an inventory of rural and peri-urban health facilities and their access to modern energy services. The main conclusions are:  
- 516 health facilities inventoried of which 8.7% have access to modern energy services (59 in Maritime region, 58 in Highlands region, 27 in Central region, 59 in Kara region, and 23 in Savannah region).  
- Barriers identified: remoteness of rural localities from the CEET electricity grid, poor integration of modern alternative energies (especially solar) into the overall energy mix (non-adaptation of batteries of systems; low energy production in relation to needs; poor quality of the facilities), difficulties associated with generating sets (lack and high maintenance costs, low financial capacity of fuel supply; repeated breakdowns, lack of upkeep). |
| Defines the rights and duties inherent in the protection and promotion of the population’s health. |                                                                      |                                                                                                                                                         |
| **Education, teaching and learning**                                          | The abolition of school fees in public primary education aims to provide access for all to education, in | According to the UNDP report (2011 - same reference as above), upper secondary schools are the most electrified nationally with a rate of around 80% in urban areas and 24% in rural areas, while primary schools in rural and peri-urban areas |
| Over the past five years, Togo has made great                                   |                                                                      |                                                                                                                                                         |

8 UNDP (2011). Evaluation of access needs to modern energy services (solar energy) of the health and education infrastructures in Togo. ADA Consulting and KAPI Consult, 96 p.
<table>
<thead>
<tr>
<th><strong>Policy/Strategy</strong></th>
<th><strong>Goals</strong></th>
<th><strong>Link to energy services</strong></th>
</tr>
</thead>
</table>
| efforts in the field of improving the quality of education, teaching and learning. In particular, at the beginning of the school year 2008/2009, tuition fees in public primary education were abolished, which allowed a notable growth in pupil numbers to be recorded of 22% between 2007-2008 and 2009-2010 with a net increase in the number of girls of 42% over the two years against 41.5% for boys (UNDP, 2011). Next an emphasis was placed on teacher training with the creation of six (6) teacher training colleges (ENI), i.e. school by region. Finally, affirmative action in terms of tuition fees in secondary school. Girls pay less than boys. | particular, increasing the enrolment rate of girls. The creation of teacher training schools aims to improve the quality of teaching through teacher training. | are covered respectively at 10% and 2.5%.

MEPSA (Ministry of primary and secondary education and literacy), in an effort to improve and harmonise the school infrastructures especially in primary education in construction terms, prepared a document "National strategy of primary school buildings". This document rules on existing school models (accessible classrooms, play area, water point, latrines, office and shop. However, it does not contain specific information on energy service needs! [http://planipolis.iiep.unesco.org/upload/Togo/Togo_MEPSA_Primary_School_Building_Strategy_French.pdf](http://planipolis.iiep.unesco.org/upload/Togo/Togo_MEPSA_Primary_School_Building_Strategy_French.pdf) |

**Law No. 2007-011 of 13 March 2007 relating to decentralisation and local freedoms.**

Law passed as part of the process of decentralisation, it grants an operational autonomy to local authorities in the management of their lands. The Ministry in charge is the Ministry of Territorial Administration, Decentralisation and Local Authorities. Its aim is to divide the country into territorial communities with legal personality and financial autonomy. Created in ascending order are the Town, the Prefecture and the Region. Their specific skills are recognised in the management of affairs of local interest concerning the welfare of the inhabitants of a community linked by common destiny and solidarity of interests. Articles 53, 138 and 199 confer powers to communities in promoting and implementation grassroots socio-collective infrastructures including energy. The management of energy infrastructures will be entrusted to local authorities. But this is not without consequences, since the latter do not have the expertise nor the experience for better management. |
SECTION 2. ENERGY BALANCE AND RESOURCES

This section provides an overview of the energy balance and resources nationally available, and their suitability for energy service needs. This analysis is required for steps 2 (profile of the base year), 3 (inventory of resources and technology) and 6 (policies) of the SEP planning (Figure 1).

2.1 National energy balance

Since 2005 with the support of the International Francophone Organisation (OIF), Togo has established an Energy Information System (EIS). This information system has allowed the country to have a series of energy balances published from 1990 to 2008. The study of these energy balances is the basis of the orientation of the energy policy as well as the calculation of eco-development indicators. This section describes the Togo’s current energy balance.

2.1.1 End consumption

Overview
The base year selected was 2008 because we have validated data from the Energy Information System (EIS).

End energy consumption per inhabitant in 2008 was 0.29 toe, compared to 0.5 toe/inhab on average in Africa. Biomass energy (fuelwood, charcoal, crop waste) represents 71% of total end consumption, followed by petroleum (26%) and electricity (3%) products.

End energy consumption breakdown presents a structure similar to other countries in the West African sub-region (States of ECOWAS) or the Economic and Monetary Union of West Africa (UEMOA), with a predominance of ligneous fuels such as fuelwood, charcoal and a section of agricultural residues used for energy purposes.

Three segments share almost all of the final energy consumption. This consists of households (67%), transport (22%) and market and public services (9%). The industry, for its part, represents less than 2% of consumption.


**Households**
Household energy consumption is characterised by a very high prevalence of Biomass (Fuelwood, Charcoal, and to a lesser extent Plant Waste) which represents nearly 92.5% of consumption, divided between fuelwood (58.0%) and charcoal (34.5%).

Rural households using wood in traditional three-stone cookstoves represent 75% of the population versus 25% who use improved wooden cookstoves. In the urban environment, on the other hand, 52% of households use improved cookstoves against 48% who cook on traditional stoves.

Charcoal improved cookstoves have reached a penetration rate of 59% in urban households and 29% in rural households.

Household consumption of other energy sources is 7% and is primarily divided between paraffin oil lamp (3.8%) and electricity (3%). Consumption of LPG (Liquefied Petroleum Gas) represents only 0.4% of household energy consumption, result of a very low penetration of this fuel into culinary behaviour.

The urban population (37%) consume 94% of the electricity while the rural population (66%) consumes only 6% of the total electricity consumed.

The demand for fuelwood will remain strong over the next 10 years and is expected to be double the country’s production capacity by the 2020’s. Demand and supply were last balanced in 2010. Today demand exceeds supply, which indicates that a ligneous products shortage is already present and it is critical to find methods to reduce demand and/or increase production.

**Other sectors**
The energy consumption in the industrial sector represents less than 2% of final energy consumption and is divided between fuel oil (54%) and electricity (40%) and diesel (6%).

Consumption in the transport sector (22% of final energy consumption) accounts for 83% of end petroleum products consumption. Remaining petroleum product consumption is split between the household sector (11%), industry sector (5%), while non-energy uses (bitumen and lubricants) represent only 1%. The consumption of petrol and gas/diesel are 43% and 36% respectively. Jet fuel that supplies air transport accounts for 21% of consumption in this sector.

**Summary of end consumption by sector**
From 2005 to 2012, the annual final energy consumption per inhabitant in Togo remained in the range of 0.27 to 0.3 toe/inhab. This value is very low compared to the
African average of 0.5 toe/capita. Biomass energy (fuelwood, charcoal, plant waste) represents 77% to 80% of total end consumption. Commercial energies namely electricity and petroleum products, represent 3-4% and 20-22% respectively of total end consumption.

2.1.2 Electricity Sector

The total electricity delivery for the country in 2009 was 922 GWh. The energy supplied to the Electrical Energy Company of Togo (CEET\textsuperscript{10}) grid is mainly from Electricity Community of Benin (CEB\textsuperscript{11}) at 97% (from imports and Togo based generation) while the remaining 3% generated is from CEET’s own isolated thermal plants.

Electricity production delivered by the CEB in 2009 to Togo, was 899 GWh with a maximum delivery rate of 156 MW and an associated load factor of 65.5%. The addition production of 22.8 GWh was from CEET’s thermal facilities. CEB’s delivery into Togo was split between delivery to the CEET grid and directly to industrial customers.

- 734 GWh delivered by CEB to CEET
- 165 GWh (18%) to WACEM (West African Cement) and SNPT (New Phosphate Companies of Togo).

It should be noted that 87% of the energy delivered by CEB is imported from Ghana, Nigeria, Ivory Coast, and marginally from Niger. Only 13% is produced by CEB gas-fired generation facilities in Lomé and Cotonou and the Nangbeto hydro-electric plant on the Mono River, Togo.

In 2009, Togo imported 84% of its electricity needs, all of which were provided by CEB. This explains the why Togo has a recurring deficit problems due to the reliance on transmission line imports.

In early 2011, Togo’s generation capacity increased to 180 MW, with the addition of 100 MW from the Contour Global gas plant in Lomé, equipped with 6 Wärtsilä brand motors. This 100 MW energy plant is built on the existing site of the Lomé Thermal Plant. It plans to use natural gas from West African Gas Pipeline (WAGP). Prior to the stable and continuous availability of the WAGP, the Contour Global plant used heavy fuel oil (HFO) for running the electricity generation turbine. This met the environmental standards issued by the World Bank. Consequently, the production cost using heavy fuel oil is much higher (120 CFA francs/kWh of HFO) than natural gas (45-50 CFA francs/kWh of natural gas).

\textsuperscript{10} CEET: Compagnie Energie Electrique du Togo
\textsuperscript{11} CEB : Communauté Electrique du Bénin
Regarding hydro-electric resources, the hydropower plant of Nangbeto (2 x 32.5 MW) constructed and operated by CEB was commissioned in 1987. Hydropower is currently the second largest electricity generation source in the country, contributing to about 18% of the total installed and dedicated capacity in Togo. Hydropower potential is currently installed on the Mono River, which is the only river suitable for facilities large enough for a grid connection. However, the Mono River is exposed to climate variability which is event-driven and can be seasonal or multi-year. The uncertainty of this generation resource requires that an equivalent amount of production available in the event of low water or drought situations. High replacement costs can occur in the event of prolonged drought.

2.1.3 Energy Information Systems

Togo set up an Energy Information System (EIS) in 2005 with the support of the Francophone Institute of Environment and Energy (IEPF now Francophone Institute for Sustainable Development, IFDD) and ECONOTEC, private consultant. The goal of this system is to organise reliable information for use in the creation of a coherent energy policy. Access to energy involves energy choices determined from technical, economic and socio-political considerations and trade-offs. Such approaches require accurate analyses, based on available and reliable data. The role of energy in the proliferation of greenhouse gas emissions and the adverse effects of climate change are now widely understood. These climate change and environmental issues make the EIS an important tool for evaluating the current state and the future strategy.

The energy balances of Togo are published and available for the years 2005 through 2008, while the most recent balances are available but not yet validated.

Energy balances are developed in such a way as to trace the evolution of primary production to energy end consumption and its related distribution. Many areas of the energy balance do not provide the sufficient disaggregation of the data to understand the raw data inputs. This is the case for the biomass data where there is no breakdown between fuelwood, charcoal and residues. The Hydropower data does not indicate breakdown between domestic primary production and hydropower imported into Togo by CEB. Furthermore, there is no information on renewable energies (solar, wind, etc.), which do exist, although in small quantities. As the renewable energy investments increase, we expect to have data available when some small level of critical mass is achieved to motivate the investment of time for data collection.

2.2 Energy resources

Energy resources analysis is important for defining the foundation of the country's energy development strategies. Apart from the hydropower potential of the Mono River and other micro-hydroelectric plants, the other renewable energies available in
Togo are derived from solar, wind, and biogas. The various technologies using renewable energy emerged recently (in the 1980s) with the introduction of a solar panel systems and experimental biogas units.

2.2.1 Plant biomass
Togo is not a country that is naturally endowed with forest resources. However, the natural resources are characterised by a small-sized dense forest, the majority of which is located in inaccessible mountain areas and protected reserves.

2.2.2 Hydropower potential
In Togo, several potential hydropower sites have been studied. The latest, conducted by Tractionnel\textsuperscript{12}, identified 39 sites of which 23 present have individual generating capacities greater than 2 MW. Most of this potential lies in the rivers Mono and Oti. The potential combined power of these sites is 224 MW which corresponds to a potential energy production of approximately 850 GWh/year.

2.2.3 Solar potential
Measurements taken by the Solar Energy Laboratory (LES) of the University of Lomé and the Directorate of National Meteorology at different latitudes of the country were used to estimate the average overall solar energy radiated on a horizontal plane at 4.4 kWh/m\textsuperscript{2}/day for Atakpamé and 4.5 kWh/m\textsuperscript{2}/day for Mango. These ratings could exceed 700 watts/m\textsuperscript{2} in the dry season when the sky is clear humidity levels are low. Solar energy has significant potential for supplying energy in rural areas.

2.2.4 Wind resource
Wind resources are insufficient for economic electricity production from wind turbines. Although instantaneous peak winds can reach up to 4 m/s in some areas, wind speeds are low across the country. The coastal area of the country has relatively low average wind speeds of 3 m/s.

2.2.5 Biofuels
In 2011, a study on bioenergy development in Togo was conducted with UNDP\textsuperscript{13} support. The study assessed the development potential of modern bioenergies resources in Togo.

In terms of liquid biofuels, Togo has a good production potential of sugar-rich plants that can be used for the production of alcohol biofuel such as ethanol (sugar cane, cashew apple, sorghum, millet, maize, cassava) and oilseed plants such as cotton, cotton.


jatropha, peanut, palm oil used in the production of oil or biodiesel biofuels. Togo also has a potential from land unwanted areas (deteriorated and marginal lands, fallow land) that could be used for biofuels production. However, the precise quantity of surface areas available for biofuels production has not yet been evaluated.

Biogas development, on an industrial or community scale (communal biogas), in Togo, is considered difficult in the short term due to resource logistics and transport problems, high capital investments requirements, absence of strong leadership and self-management at the local level. As a result, most industrial and community biogas installations have a high failure rates. In contrast, domestic biogas has major advantages when compared to industrial or community projects. The technology is small-sized, inexpensive and manageable by the local population, as illustrated by observations in Burkina Faso and Senegal where national scale domestic biogas programmes provide 15,000 families in each country with a biodigester for cooking and lighting energy.

Average dung production per family is approximately 39 to 44 kg; which provides enough biogas for the cooking and lighting (2-3 lamps) needs of an average seven person family. This is calculated by the following assumptions; average of 12 kg of dung per capita per day for fully sedentary animals, 5 kg per day per capita for semi-sedentary animals (returning to the barn every night), herd of five to six heads per family, two animals being kept in family compound while the rest pasture during the day, returning to the stable in the evening.

2.2.6 Climate vulnerability of the energy sector

It is estimated that by 2050, temperatures will range from +1.46°C in the south-west to +1.76°C in north-eastern Togo, while rainfall will decrease (3%) in the South and increase (2%) in the North. The highest temperatures are found in the Savannah Region. Most severe rainfall deficits are recorded in the Maritime region and a one area of the Highlands. The Savannah Region is the wettest. These climate changes are expected to follow a similar trend and by 2100 temperature will be higher while the rainfall decline will be -8% in the South and the extreme North could see an increase between 1% and 5%.

The impact of potential temperature and rainfall changes on essential energy supplies in four sub-sectors have been considered:

- biomass energy: strong reduction of potential resource production (up to 27% in the worst case scenario by 2025); consequences would be an increase in market prices, conflicts between governments and populations for the implementation of certain international conventions on biodiversity and a

deterioration in the standard of living, both rural and in part urban, due to a higher vulnerability;

- hydropower: minimal impact on the Oti basin, decrease flow on the Mono River basin by approximately 7% by 2025 up to 36% in 2050;
- renewable energies: increase in the yield from photovoltaic installations;
- hydrocarbons: indirect impacts (reduction in biomass and hydropower energies is expected to increase hydrocarbons consumption).

2.3 Key policies and energy strategies

2.3.1 The Energy Policy of Togo

Togo’s energy policy, being discussed on the basis of the proposed 2012 dated document by the consulting firm Sofreco, is designed to build on the existing national development strategies and plans such as SCAPE. The policy attempts to simultaneously address energy security, threats, risks, vulnerability and hazards associated with world climate change and the pressing in-country development needs. All forms of energy are discussed in the policy to ensure that activities and funding mechanisms include consideration of adaptation, mitigation, technology transfer and diffusion processes, carbon market mechanisms, sustainable development and poverty reduction. This approach will support resolution of problems related to energy security and climate change. The National Energy Policy vision is to ensure, by 2030, that the entire population has access to a competitive quality clean energy that preserves the environment. These efforts will include development of an efficient and sustainable energy system based on individual and joint public and private initiatives, capable of stimulating Togo’s economic and social development.

The national policy document proposes, in the 2020-2030 time period, a legal and regulatory institutional framework that strengthens energy security in an approach that gradually transitions from biomass to other forms of energy such as hydraulic, natural gas, liquefied petroleum gas (LPG), mineral coal, electricity, nuclear power for peaceful purposes, renewable energies (thermal and photovoltaic solar, wind, micro-hydro, geothermal, etc.), biogas, biofuel and other renewable energies. This policy should enable Togo, through appropriate mitigation actions at the national level, to contribute to global Greenhouse Gases (GHG) reductions. The policy document also proposes a goal to service 15% of Togo's energy needs from renewable sources by 2020 and 30% by 2030. The proposed energy mix expected after implementation of the Energy Policy is presented in Table 4.

The national policy document is currently being validated after receipt of comments from consultations with state and private stakeholders in 2012-2013. It must also be reformulated according to the format adopted for sectoral policy documents.
Table 4. Energy mix proposed under the Energy Policy (POLEN)

<table>
<thead>
<tr>
<th>Energy type</th>
<th>2010 (%)</th>
<th>2015 (%)</th>
<th>2020 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomass</td>
<td>71</td>
<td>55</td>
<td>40</td>
</tr>
<tr>
<td>Oil</td>
<td>24.7</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>0</td>
<td>6.7</td>
<td>7.5</td>
</tr>
<tr>
<td>LPG</td>
<td>1</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Hydropower</td>
<td>0.3</td>
<td>0.3</td>
<td>1.5</td>
</tr>
<tr>
<td>Mineral coal for households</td>
<td>0</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Mineral coal for electricity</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Imported electricity</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Off grid renewable energy (solar, micro-hydraulic etc.)</td>
<td>0</td>
<td>5 (3% for solar, 2% for micro-hydraulic)</td>
<td>7 (4% for solar, 3% for micro-hydraulic)</td>
</tr>
<tr>
<td>Grid renewable energies (wind, solar etc.)</td>
<td>0</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Biogas, biofuel</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

2.3.2 The ECOWAS framework

The ECOWAS (Economic Community of West African States) White Paper calls for improved access to energy services for rural and peri-urban populations by 2015, proposes that 100% of the total population must have access to modern cooking fuels, that at least 60% of the rural population have access to energy services for productive purposes, 66% of the population will have access to an individual electricity supply.

A three year Regional Programme for Access to the Energy Service (PRASE) supported by ECOWAS and West African Economic and Monetary Union (also known by its French acronym, UEMOA) started in 2006. Within this initiative, a Multisectoral Energy Committee of Togo (COMET) was established in 2008 with the aim of elaborating a programme of access to modern energy services that takes into account all the target populations. COMET was composed of members representing all ministries. It has not functioned since 2010. Today, this committee is in the process of being reactivated. The UNDP is preparing a workshop to relaunch activities in the region.
2.4 Observation

2.4.1 Analysis of the energy balance by energy commodity

The table below displays, in ktoe, the final energy consumption (excluding non-energy use).

**Table 5. End energy consumption for certain sectors**

<table>
<thead>
<tr>
<th>Togo EIS Year 2008 Units ktoe</th>
<th>Petroleum products</th>
<th>Biomass</th>
<th>Electricity</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>End energy consumption</td>
<td>421</td>
<td>1169</td>
<td>55</td>
<td>1644</td>
</tr>
<tr>
<td>Industry</td>
<td>20</td>
<td>-</td>
<td>13</td>
<td>34</td>
</tr>
<tr>
<td>Transport</td>
<td>355</td>
<td>-</td>
<td>-</td>
<td>355</td>
</tr>
<tr>
<td>Services</td>
<td>-</td>
<td>146</td>
<td>8</td>
<td>154</td>
</tr>
<tr>
<td>Residential</td>
<td>45</td>
<td>1023</td>
<td>33</td>
<td>1102</td>
</tr>
</tbody>
</table>


*Electricity*

In Togo, 37% of the population that lives in urban areas consumes 94% of the electricity while 66% of the population living in rural areas consumes only 6% of total electricity consumed. In addition, total end consumption of electricity increased by 15% between 2000 and 2012; the national population, meanwhile, grew by nearly 27% while economic growth was 17% over the period\(^{15}\). In other words, growth in consumption remains largely below growth in needs as reflected by the population growth.

According to the EIS of Togo, total electricity consumption of services is even more striking by its low level: 93 GWh, or 16 kWh per inhabitant, while total electricity consumption in the residential sector is 65 kWh per inhabitant, and total consumption of electricity is 106 kWh per inhabitant. So, while not having access to electricity services on an individual level, the population could be benefitting from modern energy services on a communal level. This is not the case. The "Services" line of the energy balance (Table 5) perhaps does not include all the infrastructures of the "Tertiary" sector but it is understood that the major share of the social infrastructure are lacking in electrical services. Thus, in the case of Togo, only 9% of health facilities in rural and peri-urban areas have access to modern energy services; 80% of upper secondary schools in urban areas are electrified, compared to only 24% in rural areas, while primary schools are respectively electrified at 10% and 2.5%.\(^{16}\) These

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\(^{15}\) Energy Information System of Togo (SIE) 2009.

very poorly equipped social infrastructures are therefore not able to play the role expected from them. An energy planning in conformity with the precepts of the SEP approach should lead to an electrification rate (by grid or by autonomous and decentralised manner) close to 100%, which is what the future energy system must aim at.

These findings demonstrate the inadequacy of the electrical sector of Togo, as this sector, in all its complexity (interconnected grid and decentralised installations) should meet most of the social and community infrastructure needs.

Other consumption
Consumption of hydrocarbons contained in the "Residential" line of the energy balance (Table 5) covers the consumption of paraffin oil lamp (almost stable) and LPG (in sharp increase, essentially in urban areas). Comparing the consumption of hydrocarbons and biomass by households reveals the considerable gap in cooking system equipment. Despite the growth in the penetration of LPG, biomass represents 20 times the consumption of hydrocarbons. To bridge this gap, the energy balance should see the consumption of biomass decrease (or at least remain stable) through improvement of performance induced by the widespread use of improved stoves, and the substitution of biomass by equipment using LPG.

Negative externalities associated with the massive use of biomass, almost exclusively by the residential sector, and which represents 71% of the total energy balance, have been widely commented elsewhere. Consumption per inhabitant per year is 170 koe, which is about 2 kg of biomass per day per inhabitant. Assuming a number of people per household in Togo in the range of 6, it is necessary each day to collect a dozen kgs of wood to ensure the cooking of a family's food. We then measure the impacts of this situation in terms of time spent collecting (women and sometimes children), health impacts of the smoke, and impacts of harvesting on the environment.

2.4.2 Legal and institutional framework for energy

The energy planning conducted to date does not take account of the primary goal of economic planning, which is planning "by tendering"; the energy sector does not "serve" the fight against poverty; it is an autonomous economic sector that needs to find customers. This characteristic applies to all sectors: electricity, fuels (including traditional biomass).

To meet the energy services needs arising from the fight against poverty, we must perform planning "by need": define a hierarchy of needs, the nature of services, the sectors in question, the time frame etc. At national level the "policy" principles can be laid down, such as for example: "Not a single health centre in town and in the countryside, should remain unequipped with modern energy services in the next
decade: efficient lighting, reliable vaccine conservation, constantly available ventilation, hot water and sterilisation available at any time of the day or night...". In order to applying these great principles and implement projects that are technically and financially feasible, we must look to the local level. On the scale of a significant territorial entity, a town, a canton, a department etc., the governance of which is provided by an autonomous entity with all legitimacy and power to take charge of the "energy work site" resulting from the planning. Sections 4 and 5 illustrate this type of analysis.

Concerning the legal and institutional energy framework, Togo currently has a very limited portfolio of regulatory texts applicable to this sector. This regulatory deficit will make it difficult to implement a SEP, primarily concerns the sub-sectors of oil, electricity and renewable energies. In addition, the decentralisation process is still unfinished in Togo, which is characterised by the absence of clear power transfers. Project management comes under the State via its decentralised services.

In this sense, local stakeholders made several recommendations of an institutional nature, at the workshop of July 2014.  

_Recommendations for institutional and regulatory plans (workshop July 2014):_

- Create a rural electrification and energy control agency.
- Implement and accelerate the decentralisation to the towns planned by the legislation and the Government, and afford a greater role to Mayors and prefectural councillors.
  - The planning of the populations' needs can be decentralised in order to allow this same to better express their needs.
  - The promotion of renewable energies can be decentralised.
  - The training of all the stakeholders would be a very critical requirement for the success of such a system.
  - It is important to promote transparency; for example the prefecture, who is in charge of the maintenance of public lighting, to know the overall planning of the CEET.
- On the regulatory front, amend the Benin-Togo electrical code to allow independent producers to sell their energies through systems decentralised on their requests.
- Extend the remit of the National Authority for the Regulation of the Electricity Sector (ANARE) on the installation of renewable energies, by modifying the 2000-12 Electricity Act.
- Create services within the Ministry of Energy for the monitoring of electrical installations in buildings and plants before connection to the grid or commissioning.

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17 The full report of the workshop is available at: http://www.helio-international.org/event/eera-togo-decision-maker-workshop/
• Incorporate the energy question into the project design of health centres and schools; this recommendation is of value at project level but also at national policy level;
• Set construction standards for health centres and schools that incorporate energy service needs; this approach requires an inter-institutional collaboration.

Recommendations in terms of the Energy Policy (workshop July 2014):
• Monitor the above recommendations.
• Strengthen the capacities of all stakeholders, in particular the service providers.
• Reformulate the policy according to the format adopted for sectoral policy documents;
• Develop guiding plans for electricity and renewable energies with action plans containing quantified targets each year;
• Have a participatory approach involving all stakeholders in all processes related to action plans or documents to prepare;
• Take into account in POLEN the development programmes of priority sectors such as health, agriculture etc.
• Attract private investment into the sector by the public-private partnership system and eliminate administrative procedures for the issuance of concession agreements to private operators.
• Provide tax exemption for equipment used in the development of renewable energies.
SECTION 3. SET OF STAKEHOLDERS

This section provides an overview of the stakeholders involved in energy at the national level. Energy services concern stakeholders directly involved in the energy sector, but also representatives of social or productive sectors such as health, education, hydraulic, rural development, etc., all of which are sensitive to the importance of increasing energy services access in their respective areas. These stakeholders are identified below.

This analysis is useful for the entire SEP planning.

3.1 The stakeholders of the current energy system

The following stakeholders are particularly important, as they are involved in the design and management of the current energy system:

- **Ministries**
  - Ministry of Mines and Energy in charge of managing the mining and energy sectors; with its branches (Directorate General of Mines and Geology, Directorate General of Hydrocarbons, Directorate General for Energy, National Authority for the Regulation of the Electricity Sector (ANARE));
  - Ministry of Trade and Private Sector Development supervises the companies importing and distributing petroleum products;
  - Ministry of Environment and Forest Resources in charge of environmental management, the sustainable use of natural resources and protection of the environment;
  - Ministry of Agriculture, Livestock and Fisheries in charge of agricultural policy with strict respect of the environment and food security;
  - Assistant Ministry to the Ministry of Agriculture, Livestock and Fisheries, in charge of Rural Infrastructure, ensuring the implementation of the acquisition and management of policy of rural facilities and the opening up of rural areas;
  - Ministry of Higher Education and Research, responsible for development and popularisation of solar energy through the "Solar Energy Laboratory” at the University of Lomé;
  - Ministry for Grassroots Development, Craft Industry and Youth Employment, responsible for implementing initiatives to respond to the basic needs of the most vulnerable populations of Togo, both in the rural environment, and in urban and peri-urban areas;
  - Ministry of Economy and Finance;
  - Ministry of Planning, Development, and Land Management, responsible for the development, implementation, monitoring and evaluation of government policy in these matters, in relation to other ministries and institutions of the State.
• **Public stakeholders of production, transmission and distribution of electrical energy**
  - Electrical Community of Benin (CEB) responsible for the import, production and transmission of electrical energy to supply Benin and Togo;
  - Electrical energy Company of Togo (CEET) in charge of the distribution and marketing of electrical energy in Togo;

• **Stakeholders of the import and distribution channels for petroleum products:**
  - Togolese Storage Company of Lomé (STSL/public stakeholder);
  - Private companies approved by the State: Shell Total, Oando, Cap Esso, Corlay, Somayaf, Etoile du Golfe and Sodigaz;

• **Stakeholders in the production and distribution of biomass energy:**
  - Office of Forestry Development and Operations (ODEF) which markets the rebus from exploitation of teak plantations in the form of a bundle of fuelwood and develops wood plantations for fuelwood production;
  - Small farmer producers of fuelwood and charcoal, which operate informally and sell these products in rural markets;

• **Structures for consultation, coordination and sectoral and intersectoral impulse:**
  - Multisectoral Energy Committee of Togo (COMET) for access to modern energy services in connection with the initiation of the ECOWAS/UEMOA;
  - National Agency of Environmental Management (ANGÉ), which conducts environmental impact studies and issues environmental compliance certificates;

• **Regional stakeholders,** such as the West African Power Pool (WAPP), sub-regional institution that deals with problems of electric energy in the ECOWAS area through the construction of electricity plants and interconnection lines and the electrification of certain localities. In Togo, the WAPP is involved in the cross-border electrification and construction of the Accra-Lomé-Cotonou switchyard.

• **Users, consumers, civil society organisations, such as:**
  - New Phosphate Companies of Togo (SNPT);
  - Togolese Consumers Association (ATC);
  - Young Volunteers for the Environment (JVE), which conducts large-scale initiatives in the field of renewable energies and climate change;
  - Friends of the Earth and Entrepreneurs of the World, active in energy and the environment;
  - Urbisfoundation, Foundation for the Environment and International Solidarity, providing various forms of support in the field of health education while working to protect the environment and the climate.
  - ACDI-Solar, known in the field of solar installations and in the training of technicians;
  - Atodes in solar energy;
- NGO Rafia, in the field of traditional energies;

- **Universities**
  - University of Lomé through its Solar Energy Laboratories (LES) conducts research in this area;

- **Funding agencies (local and international).**
  - Bilateral cooperation agencies: the German Development Cooperation (GIZ) is involved in organising the fuelwood channel in the central, highland, and maritime regions.
  - Multilateral cooperation bodies: International Monetary Fund (IMF), International Francophone Organisation (OIF), West African Economic and Monetary Union (UEMOA), Centre for Renewable Energy and Energy Efficiency of ECOWAS (ECREEE);
  - Climate financing, particularly through the Regional Collaboration Centre of the UNFCCC, based at the WADB, Lomé.
  - Banks: Bank for Investment and Development of ECOWAS (BIDC), Islamic Development Bank (IDB), African Development Bank (AfDB)

### 3.2 An expanded view of energy system stakeholders

*Seven families of stakeholders*

The contracting authority is the authority that decides on the energy services to be met for a given population in a particular type of infrastructure, of one kind or another, within a certain time period. As a holder entity of project, it defines and ensures the programme planning. How to proceed to completion, and who are the different stakeholders involved? In other words, who undertakes the planning of access to modern energy services? Who has the technical skills? Who has the legitimacy to carry out the proposed planning aiming to provide to the entire population (gradually but surely) access to all the modern energy services?

Seven families are distinguished\(^\text{18}\), each family groups a greater or a lesser number of entities. Table 6 presents the stakeholders identified for Togo. The mobilisation of all local stakeholders is crucial.

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\(^\text{18}\) See Methodological Note "The seven groups of stakeholders involved in energy policy," [Les sept familles d'acteurs concernés par la politique énergétique](http://www.helio-international.org/toolkit/sep/) June 2014.
Table 6. The seven groups of stakeholders in Togo

<table>
<thead>
<tr>
<th>Public bodies</th>
<th>Suppliers (manufacturers, services)</th>
<th>Energy operators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supranational</strong></td>
<td>involved in the implementation of energy channels (supply of services, equipment)</td>
<td>ensuring the final energy supply</td>
</tr>
<tr>
<td>Economic Community</td>
<td>- Stove manufacturers</td>
<td><em>Electricity</em></td>
</tr>
<tr>
<td>Economic Community of West African States (ECOWAS)</td>
<td>- Solar kit manufacturers</td>
<td>- West African Power Pool (WAPP)</td>
</tr>
<tr>
<td>West African Economic and Monetary Union (UEMOA)</td>
<td>- Efficient bulbs manufacturers</td>
<td>- Electricity Energy Company of Togo (CEET)</td>
</tr>
<tr>
<td>- Energy Pool</td>
<td>- Energy service companies (ESE/ESCO)</td>
<td>- Electrical Community of Benin (CEB)</td>
</tr>
<tr>
<td><strong>Centralised national (legislative, executive, regulation):</strong></td>
<td>- BEBETECH (grid extension works and sale of electrical equipment)</td>
<td>- Contour Global</td>
</tr>
<tr>
<td>- National Assembly</td>
<td>- PES (installation work, selling of solar equipment)</td>
<td><em>Hydrocarbons</em></td>
</tr>
<tr>
<td>- Ministry of Mines and Energy</td>
<td>- Eco Energy (installation work, selling of solar equipment)</td>
<td>- Togolese Storage Company of Lomé (STSL)</td>
</tr>
<tr>
<td>- Ministry of Environment and Forest Resources</td>
<td>- Green Power (installation work, selling of solar equipment)</td>
<td>- Togolese Warehousing Corporation (STE)</td>
</tr>
<tr>
<td>- Ministry of Commerce</td>
<td></td>
<td>- Professional Association of Petroleum (GPP), Shell Total, Oando, Cap Esso, Corlay, Somayaf, Etoile du Golfe and Sodigaz</td>
</tr>
<tr>
<td>- Ministry of Higher Education</td>
<td></td>
<td>- Gas Distribution Corporation (Sodigaz)</td>
</tr>
<tr>
<td>- Ministry of Economy and Finance</td>
<td></td>
<td>- SYNTREBACT</td>
</tr>
<tr>
<td>- Ministry of Planning</td>
<td></td>
<td><em>Biomass</em></td>
</tr>
<tr>
<td>- Ministry of Health</td>
<td>- Small farmer charcoal manufacturers</td>
<td></td>
</tr>
<tr>
<td>- Ministry of Education</td>
<td></td>
<td><em>International funders</em></td>
</tr>
<tr>
<td>- Ministry of Hydraulics</td>
<td></td>
<td><em>Bilateral agencies</em></td>
</tr>
<tr>
<td>- Directorate General for Energy, National Authority for the Regulation of the Electricity Sector (ANARE);</td>
<td></td>
<td><em>Multilateral cooperation agencies, including the UNFCCC national branches and others</em></td>
</tr>
<tr>
<td>- National Agency for Environmental Management</td>
<td></td>
<td>- International Monetary Fund (IMF)</td>
</tr>
<tr>
<td>- National Commission for Sustainable Development</td>
<td></td>
<td>- International Francophone Organisation (OIF)</td>
</tr>
<tr>
<td>- Multisectoral Energy Committee of Togo (COMET)</td>
<td></td>
<td>- West African Economic and Monetary Union (UEMOA)</td>
</tr>
<tr>
<td>- Office of Forest Development and Exploitation (ODEF)</td>
<td></td>
<td>- Centre for Renewable Energy and Energy Efficiency of ECOWAS (ECREEE)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Decentralised national (Local authorities)</th>
<th>Financial Services</th>
<th>Mediators (NGOs, civic associations, unions, political parties, research and standardisation bodies, etc.)</th>
<th>International funders</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Users and beneficiaries</strong> (industry, households, farmers)</td>
<td><em>Public Funds</em></td>
<td>- Young Volunteers for the Environment (JVE)</td>
<td><em>Bilateral agencies</em></td>
</tr>
<tr>
<td><strong>Industrial users</strong></td>
<td><em>Microcredit associations, cooperatives</em></td>
<td>- Urbanisation</td>
<td><em>Multilateral cooperation agencies, including the UNFCCC national branches and others</em></td>
</tr>
<tr>
<td>- New Phosphate Companies of Togo (SNPT)</td>
<td>- Craft Workers Savings and Credit Cooperative (CECA)</td>
<td>- ACDI-Solar</td>
<td>- International Monetary Fund (IMF)</td>
</tr>
<tr>
<td>- West African Cement (WACEM)</td>
<td></td>
<td>- Atodes</td>
<td>- International Francophone Organisation (OIF)</td>
</tr>
<tr>
<td>- Cement of Togo (CIMTOGO)</td>
<td></td>
<td>- Rafia</td>
<td>- West African Economic and Monetary Union (UEMOA)</td>
</tr>
<tr>
<td>- New Oilseeds Industry of Togo (NIOTO)</td>
<td></td>
<td>- Friends of the Earth</td>
<td>- Centre for Renewable Energy and Energy Efficiency of ECOWAS (ECREEE)</td>
</tr>
<tr>
<td>Etc.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The set of stakeholders associated with the energy sector is governed by a legal and regulatory framework that must be adapted so that each player can perform its role, especially at local level. For example: Does the legislation provides the delegation of services in an electrified territory or one that is in the process of becoming electrified? Should CEET specialise in urban areas and not have the monopoly on distribution? Is it possible for the government to train technicians in renewable energies, which in return would commit them to work for a certain number of years for the Government?

Local stakeholders made several recommendations at the workshop of July 2014\(^\text{19}\), which complements the recommendations formulated in the previous section:

- The identification of all stakeholders, including beyond the traditional energy stakeholders, must be strengthened. For example, experts from the fields of education, health, etc., must be involved so that the current and future needs of the population can be defined, as well as the criteria for incorporation of energy services into the project design.
- As mentioned in the previous section, we must accelerate the decentralisation process to towns in order to give a greater role to Mayors and prefectural councillors, and in this sense, strengthen the capacities of these latter, as well as those of the service providers.
- Raise the populations on the harmful effects of open cookstoves and on the solutions available (improved wood stoves, upgraded coal stoves, carbonisation techniques) is fundamental. Emphasis on rural health, and on financial savings in urban areas is recommended.

\(^{19}\) The full report of the workshop is available at: http://www.helio-international.org/event/eera-togo-decision-maker-workshop/
SECTION 4. ENERGY SERVICES NEEDS

The primary goal of a Smart Energy Path (SEP) planning is to promote modern energy services access to the country’s entire population. By modern energy services, we mean the provision of cooking uses, motive force uses and specific uses of electricity (lighting, ventilation, conservation, etc.) in good technical, economic and ecological conditions. It is therefore important to complete the analysis of the energy balance previously presented with an analysis focused on the current and future needs for modern energy services. This analysis is based on steps 4 (Goals of the energy system), 5 (Balancing) and 6 (Policies and projects) of the SEP planning (Figure 1).

4.1 Needs Analysis Grid

Are all needs in modern energy services being met today? For this to be so, it is necessary that each individual has at their disposal, at all times of their life, in their home, but also in their social (school, health centre, etc.) and economic (workshop market, etc.) activities, both the equipment suitable for producing the services they need (cooking, lighting, engine, etc.) and access to modern end energies required to operate such equipment. For conducting this analysis we propose to use a "grid" for structuring reflection, explaining the situation, quantifying the issues and prioritising the actions surrounding SEP.

Based on Togo’s current population (2013), if everyone had access to various modern energy uses, both in town and in country, the situation would be as follows (Table 7):

### Table 7. Population to be satisfied in energy services in 2010

<table>
<thead>
<tr>
<th></th>
<th>Urban and peri-urban areas</th>
<th>Rural area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Communal services</td>
<td>Individual services</td>
</tr>
<tr>
<td>Heat-cooking uses</td>
<td>2.4 M inhab. concerned</td>
<td>(38%(^{13}))</td>
</tr>
<tr>
<td>Motive force</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other uses</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The reality is however far from this ideal. To know the gap, detailed investigations would be needed, but are rarely available. Approximate values are provided in the following table, allowing a first situation analysis illustrating the framework for a

---


\(^{11}\) Source: UNDP (2013). All countries in the world 2013: [population societal 2013_503_population_monde_1.pdf](http://www.ined.fr/fichier/t_telechargement/66571/telechargement_fichier_fr_publi Pdf1_population_societes_2013_503_population_monde_1.pdf)

\(^{22}\) Source: Population and Housing General Census 2010
SEP, which should be deepened by policy makers. We should remember that the analysis provided aims to illustrate the type of analysis to be performed, and not to make precise calculations. The detailed calculations are beyond the goals of this pursuit.

Table 8. Population with access (rated A for access) or not (denoted NA for Non-Access) to modern energy services in Togo in 2010

Total population: 6.2 M inhab.

<table>
<thead>
<tr>
<th>Urban and peri-urban areas</th>
<th>Rural area</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4 M inhab. (38%)</td>
<td>3.8 M inhab. (62%)</td>
</tr>
<tr>
<td><strong>Communal services</strong></td>
<td><strong>Communal services</strong></td>
</tr>
<tr>
<td><strong>A: Cooking-heat uses</strong></td>
<td><strong>A: Motive force</strong></td>
</tr>
<tr>
<td>A: 1.7 M inhab. (70%)</td>
<td>A: 1.9 M inhab. (80%)</td>
</tr>
<tr>
<td>NA: 0.7 M inhab. (30%)</td>
<td>NA: 0.5 M inhab. (20%)</td>
</tr>
<tr>
<td><strong>Individual services</strong></td>
<td><strong>Individual services</strong></td>
</tr>
<tr>
<td>A: 1.4 M inhab. (60%)</td>
<td>A: 2.4 M inhab. (100%)</td>
</tr>
<tr>
<td>NA: 1.0 M inhab. (40%)</td>
<td>NA: 0.0 M inhab. (0%)</td>
</tr>
<tr>
<td><strong>Communal services</strong></td>
<td><strong>Communal services</strong></td>
</tr>
<tr>
<td>A: 0.4 M inhab. (10%)</td>
<td>A: 1.6 M inhab. (41%)</td>
</tr>
<tr>
<td>NA: 3.4 M inhab. (90%)</td>
<td>NA: 2.2 M inhab. (59%)</td>
</tr>
<tr>
<td><strong>Individual services</strong></td>
<td><strong>Individual services</strong></td>
</tr>
<tr>
<td>A: 0 M inhab. (0%)</td>
<td>A: 0.04 M inhab. (1%)</td>
</tr>
<tr>
<td>NA: 3.8 M inhab. (100%)</td>
<td>NA: 3.8 M inhab. (99%)</td>
</tr>
</tbody>
</table>

| **Other uses**             | **Other uses** |
| A: 1.9 M inhab. (80%)     | A: 1.2 M inhab. (50%) |
| NA: 0.5 M inhab. (20%)    | NA: 1.2 M inhab. (50%) |
| **Communal services**     | **Communal services** |
| A: 0.3 M inhab. (9%)      | A: 1.1 M inhab. (3%) |
| NA: 3.5 M inhab. (92%)    | NA: 3.7 M inhab. (97%) |

A: Access to modern energy services
NA: Non-access to modern energy services.
%: Percentage of the urban and peri-urban population, and the rural population, according to the column.

In urban and peri-urban areas:

- **Cooking-heat uses**: an estimated 10% of households are equipped with gas cooking (LPG) and 59% have improved cookstoves (charcoal and wood); accordingly, in the range of 70% of the population has access to individual cooking MES. The penetration of modern cooking equipment into community infrastructures (canteens, health facilities, street food) is certainly higher; it is assumed to be 80%.

- **Motive force**: concerning individual services, it concerns access to drinking water, water related public services, but also craft industry machinery. A priori 100% of requirements are met but a section of these facilities runs on electricity, and as power cuts are frequent needs are not met; by default, it is proposed to use 80%, both for individual and communal services in order to indicate this total non-satisfaction.

- **Other uses**: these uses are, in the "modern" version, provided by electricity. Household electrification rate is a good indicator of the situation; it is 52% (EIS-Togo Report, reference previous page). In other words, one in two households is not connected to the electricity grid. It is assumed that the electrification of the community infrastructures is performed at 100%, but for
the same reasons as in the case of the motive force, it is limited to 80% in order to indicate the lack of reliability.

In rural area:

- **Cooking use in rural areas:** it is estimated that about one quarter of total households (1.6 million) use improved wood cookstoves; yet, urban and peri-urban households that use improved cookstoves alone represent about 1.6 million households; in other words, we can consider that the use of improved cookstoves in rural households is almost zero; we can consider that the same is also true for communal services.

- **Motive force:** individual services concern domestic equipment, those used to pound millet in particular. It is considered that these operations are carried out manually and exclusively by women, so the access rate is equal to 0%. For communal services, motive force usage refers to water pumping and the conversion of agricultural products. Only 41% of the rural population has access to safe drinking water; we select this value as an indicator of access to communal motive force services. Access to facilities for the conversion of agricultural products, for example, multifunctional platforms, is much lower.

- **Other uses in rural areas:** the household electrification rate is only 3% in rural areas (EIS-Togo Report, reference previous page); it is the rate selected for the individual services. For community infrastructures, the only indications available are the electrification rate of health facilities and schools. In rural and peri-urban areas, only 9% of 516 health facilities are equipped with electrical systems and 2.5% of 19,670 primary schools (10% of 4,156 lower secondary schools and 24% of 366 upper secondary schools). We select the overall value of 9%, a value not in excess as the cited study does not separate establishments in rural areas from those located in urban areas. The rate of 8% is a national average.

The "NA" values indicate that the population that, in 2010, had no access to basic energy services, and so energy service needs are not met. These various cells show the issue of non-access to MES. It does not prejudice how these energy services could be ensured nor the type of final energy that would be required.

A projection into the future on the basis of demographic growth allows us to evaluate the population, that should be considered in modern energy services development projects between now and 2030. It consists of the population non-equipped in 2014 (from Table 8) plus the additional population induced by the demographic growth. It

---


is assumed that by 2030, Togo's population will reach 9 million inhabitants\textsuperscript{25}, and still be growing rapidly (about 2\% per year\textsuperscript{26}). The urban population will be the majority (55\%), the rural area will number 4.1 million inhabitants, 0.5 million more than in 2014.

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|c|}
\hline
 & \textbf{Urban and peri-urban areas} & & \textbf{Rural area} & \\
 & 4.9 M inhab. & (+2.5 M inhab. compared to 2013) & 4.1 M inhab. & (+0.3 M inhab. compared to 2013) \\
\hline
\textbf{Communal services} & 3.2 M inhab. & 3.9 M inhab. & 3.7 M inhab. & 4.1 M inhab. \\
\textbf{Individual services} & & & & \\
\hline
\textbf{Motive force} & 3.0 M inhab. & 2.5 M inhab. & 2.5 M inhab. & 4.1 M inhab. \\
\textbf{Other uses} & 3.0 M inhab. & 3.7 M inhab. & 3.8 M inhab. & 4.0 M inhab. \\
\hline
\end{tabular}
\caption{Modern energy needs to be met by 2030*}
\end{table}

*Population unequipped in 2014 (taken from Table 8) plus the additional population induced by the demographic growth

4.2 Focus on specific needs

Each urban and rural population group can be further analysed to determine the type of service to which people can/must have access (communal and individual) and for which energy usage (cooking, motive force, and electricity). For illustrative purposes in Table 10, an analysis is presented for "Motive force" and "Other uses" in "Rural area" and "Communal services." Further analysis is required to understand the situation of other energy needs in the population groups. Some values are already available (health centres, schools, etc.), whereas others values are approximated.

\textsuperscript{25} Togo. Rapid evaluation and gaps analysis. Sustainable Energy for All [Togo. Evaluation rapide et analyse des gaps. Sustainable Energy for All-Energie Durable pour Tous] UNDP June 2012. Revision of the annual demographic growth rate to 2.4\% due to the value recorded in 2013 (2.6\%). [Révision du taux de croissance démographique annuelle à 2,4\% compte tenu de la valeur constatée en 2013 (2,6\%)]

\textsuperscript{26} Like most sub-Saharan African countries, Togo will barely have begun its demographic transition in 2030. A fundamental issue to which access to modern energy services (as long as it constitutes a policy priority) could effectively contribute.
Table 10. Needs in motive force and other uses for communal infrastructures in rural areas in 2010.

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>Total number of infrastructures</th>
<th>Source/Assumptions</th>
<th>Number of infrastructures to serve</th>
<th>Source/Assumptions*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health facilities</td>
<td>516</td>
<td>UNDP Report, 2011. Evaluation of access needs to modern energy services (solar energy) of the health and education infrastructures in Togo.</td>
<td>443</td>
<td>Consideration of non-electrified infrastructures, according to the UNDP report mentioned opposite.</td>
</tr>
<tr>
<td>Schools</td>
<td>19670</td>
<td>Ibid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower Secondary Schools</td>
<td>4156</td>
<td>Ibid</td>
<td>6480</td>
<td>Consideration of infrastructures in solid materials according to the UNDP report mentioned opposite.</td>
</tr>
<tr>
<td>Hydraulic boreholes (drinking water)</td>
<td>7300</td>
<td>Ministry of Grassroots Development - UNDP (2011). National development programme of the multifunctional platform of Togo.</td>
<td>1825</td>
<td>25% of boreholes (value by default)</td>
</tr>
<tr>
<td>Public lighting</td>
<td>1032</td>
<td>344 rural towns, 3 street lights by towns, only the centre village is equipped with public lighting. According to <a href="http://www.cifal-ouaga.org/Presentations_Pays/Togo.pdf">http://www.cifal-ouaga.org/Presentations_Pays/Togo.pdf</a></td>
<td>1011</td>
<td>Consideration of non-electrified infrastructures, considering an electrification rate equal to that of schools, 2%</td>
</tr>
<tr>
<td>Telephone charging</td>
<td>5000</td>
<td>Assuming a charging system for around 100 households, i.e. around 700 people*</td>
<td>4850</td>
<td>Based on the household electrification rate in rural areas: 3%</td>
</tr>
<tr>
<td>Town Hall</td>
<td>344</td>
<td>344 rural towns. According to <a href="http://www.cifal-ouaga.org/Presentations_Pays/Togo.pdf">http://www.cifal-ouaga.org/Presentations_Pays/Togo.pdf</a></td>
<td>337</td>
<td>Consideration of non-electrified infrastructures, considering an electrification rate equal to that of schools, 2%</td>
</tr>
<tr>
<td>Multipurpose room</td>
<td>344</td>
<td>344 rural towns. According to <a href="http://www.cifal-ouaga.org/Presentations_Pays/Togo.pdf">http://www.cifal-ouaga.org/Presentations_Pays/Togo.pdf</a></td>
<td>337</td>
<td>Consideration of non-electrified infrastructures, considering an electrification rate equal to that of schools, 2%</td>
</tr>
<tr>
<td>Irrigation</td>
<td>7000</td>
<td>Assuming twenty irrigated areas by rural town*</td>
<td>6790</td>
<td>Considering that 3% of irrigated areas are already supplied by the grid (household electrification rate).</td>
</tr>
<tr>
<td>Multifunctional Platform</td>
<td>500</td>
<td>Limiting itself to half the programme announced by the Min. of Grassroots Development*</td>
<td>485</td>
<td>Considering that 3% of platforms are already supplied by the grid (household electrification rate).</td>
</tr>
<tr>
<td>Craft Industry</td>
<td>3500</td>
<td>Assuming approximately ten craft industry companies by rural town*</td>
<td>3395</td>
<td>We consider that 3% of workshops are already supplied by the grid (household electrification rate).</td>
</tr>
<tr>
<td>S</td>
<td>7000</td>
<td>Assuming twenty small businesses by rural commune*</td>
<td>6790</td>
<td>We consider that 3% of small businesses are already supplied by the grid (household electrification rate).</td>
</tr>
<tr>
<td>Total</td>
<td>57728</td>
<td>-</td>
<td>32743</td>
<td>-</td>
</tr>
</tbody>
</table>

*Proposed default value for the purposes of illustration. Real data should be collected and used by those involved at the time of defining their SEP
The corresponding cost analysis can be performed using typical costs, including the costs of downstream facilities (lighting, ventilation, vaccine conservation, etc.) and upstream facilities for final energy supply (electricity grid, PV array, etc.). It is necessary to take both investment costs and operating costs into account. Investment costs results are presented in Table 11.

### Table 11. Investment costs, for illustration, of Motive force services and Other uses designed to meet the population frequenting communal infrastructures in the rural environment, in 2010.

NB: This chart is provided for illustrative purposes only. The values of the investment costs are rough orders of magnitude.

<table>
<thead>
<tr>
<th>Number of infrastructures</th>
<th>Investment (million CFA francs)</th>
<th>Source/Assumptions for the cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health facilities</td>
<td>443</td>
<td>2187</td>
</tr>
<tr>
<td>Schools</td>
<td>6480</td>
<td>21096</td>
</tr>
<tr>
<td>Hydraulic boreholes</td>
<td>1825</td>
<td>31025</td>
</tr>
<tr>
<td>Public lighting</td>
<td>1011</td>
<td>1213</td>
</tr>
<tr>
<td>Telephone charging</td>
<td>4850</td>
<td>16975</td>
</tr>
<tr>
<td>Town Hall</td>
<td>337</td>
<td>2023</td>
</tr>
<tr>
<td>Multipurpose room</td>
<td>337</td>
<td>2023</td>
</tr>
<tr>
<td><strong>Total social services</strong></td>
<td><strong>15283</strong></td>
<td><strong>76542</strong></td>
</tr>
<tr>
<td>Irrigation</td>
<td>6790</td>
<td>67900</td>
</tr>
<tr>
<td>Multifunctional platforms</td>
<td>485</td>
<td>6790</td>
</tr>
<tr>
<td>Craft industry</td>
<td>3395</td>
<td>18673</td>
</tr>
<tr>
<td>Small businesses</td>
<td>6790</td>
<td>27160</td>
</tr>
<tr>
<td><strong>Total productive services</strong></td>
<td><strong>17460</strong></td>
<td><strong>120523</strong></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>32743</strong></td>
<td><strong>197065</strong></td>
</tr>
</tbody>
</table>

The above table shows that by intervening today in 15,000 social and community infrastructures (of which one third are schools) requiring in the range of 77 billion CFA francs (107 million EUR) of investment plus approximately 18,000 production units, costing an additional 120 billion CFA francs (180 million EUR), the entire rural

²⁷ Department of grassroots development, craft industry, youth and youth employment, in 2011. National development programme of the multifunctional platform of Togo. UNDP 72 p.
population of Togo would have access to modern energy public services. This total investment equals roughly 197 billion CFA francs which is 9% of Togo’s GDP. Effective implementation of these investments would create considerable improvement in all MDG indicators: population below the poverty line, education, primary school completion, boy girl ratio in education, infant-child mortality rate, maternal mortality rate, access to safe drinking water, etc.

The above approach is different to universal access because it focuses on prioritising and building energy services for infrastructures delivering communal services instead of energy access to households. In rural areas, electrification would involve the connection of approximately 600,000 households to an electricity supply system (grid or decentralised system) (estimation assuming an average number of persons per household of 6, and 3.49 million people are without access to electricity). Today, only 20,000 households are electrified. Using a calculation similar to the one used for communal services, an investment of almost 1,200 billion CFA francs, or 60% of GDP would be required to electrify all homes. Estimation done by assuming 600,000 homes to be equipped, and that half of them would be connected to the grid and half to decentralised systems. Assuming that decentralised systems are mainly solar facilities, a total investment of 1 million CFA francs is required for grid extension systems and 3 million CFA francs for decentralised individual home systems. This is based on comparable projects in the sub-region.
4.3 Benchmarking for illustration

Not all outstanding energy service needs can be met at the same time, so the definition and implementation of a SEP requires the establishment of priorities and a plan for staged implementation for an energy services access program. Such a prioritisation exercise should be carried out at project level and at national level with the population's participation.

A prioritisation exercise was conducted to illustrate this concept with the participants of the EERA workshop held in Lomé in July 2014. Participants were asked to rank, in order of priority, 12 types of energy services. The final ranking is presented in Table 12.

<table>
<thead>
<tr>
<th>Number of participants: 27</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>12</td>
</tr>
</tbody>
</table>

It is interesting to observe that energy services related to health are considered as priorities.

Figure 2 shows the total costs for each infrastructure-type mentioned later, by inhabitant served, including costs of investment, cost to upkeep (on average, 10% of investment costs) and consumption (average electricity price of 100 CFA Franc/kWh). This figure is for illustrative purposes only, since the costs are based on approximate values. The data is consistent with the assumptions described above. The goal is to demonstrate how such a figure can be a basis for discussion to assist decision-making to defining the development plan priorities for energy services access, while considering costs (higher for serving individual housing, lower for meeting community needs), the population’s needs and the expected improvements. This approach is equally useful at national level and local level. It is relevant for a mayor as well as all ministers (health, education, rural development, energy, etc.). A mayor, for example, may have different priorities to those shown in the table regarding public lighting, which is the survey result is not considered as priority. Public lighting is a service that directly impacts a municipality, which allows the entire population to benefit, and it has a cost that is lower than electrification of individual housing. The mayor can make public lighting a priority in their town and take steps to lobby for this investment to occur.
Figure 2. Priority Curve / Cost of Modern Energy Services

<table>
<thead>
<tr>
<th>Language Key</th>
<th>French</th>
</tr>
</thead>
<tbody>
<tr>
<td>Priorité</td>
<td>Priority</td>
</tr>
<tr>
<td>Salle polyvalente</td>
<td>Multipurpose room</td>
</tr>
<tr>
<td>Recharge téléphone</td>
<td>Telephone charging</td>
</tr>
<tr>
<td>Eclairage publique</td>
<td>Public lighting</td>
</tr>
<tr>
<td>Mairie</td>
<td>Town Hall</td>
</tr>
<tr>
<td>Artisanat</td>
<td>Craft Industry</td>
</tr>
<tr>
<td>Commerce</td>
<td>Small Businesses</td>
</tr>
<tr>
<td>Ecoles</td>
<td>Schools</td>
</tr>
<tr>
<td>Irrigation</td>
<td>Irrigation</td>
</tr>
<tr>
<td>Logement réseau</td>
<td>Housing grid</td>
</tr>
<tr>
<td>Logement décentralisé</td>
<td>Housing decentralised</td>
</tr>
<tr>
<td>Formations sanitaires</td>
<td>Health facilities</td>
</tr>
<tr>
<td>Eau potable</td>
<td>Drinking water</td>
</tr>
<tr>
<td>Cout (FCFA/personne.an)</td>
<td>Cost (CFA Francs/person.year)</td>
</tr>
</tbody>
</table>
SECTION 5. LOCAL CASE STUDY

Defining an area or "energy territory" on which the analysis can be carried out is the number one step of SEP planning. The area should feature a physical unit (consistency of infrastructures) and an institutional unit (decision making, coherence with the decentralisation of institutions under way (even effective) in many African countries).

Although the ultimate goal of SEP planning is to contemplated at the national level, it is possible to implement such planning at regional, municipal and even village level. Balancing energy demands and resources at the local level using the SEP approach with transparent access to information and active local stakeholder involvement can be very effective.

A local SEP application is considered, while retaining the following principles:

• The chosen scope, the case study is the "model" of a SEP at national level;
• The case study provides a better understanding, through practice (learning through action), the challenges and key stages of the process (better capacity strengthening of the national team),
• The case study remains a methodological exercise the goal of which is to show, with real features (more meaningful to decision makers), how to apply a SEP planning.

5.1 The choice of a community: Ando-Kpomey and its surrounding area

The community selection criteria are the following: willingness to participate and availability of the community representatives; understanding by the community that the case study is an "exercise" and does not necessarily lead to the implementation of projects in the short term; near Lomé to facilitate travel, and include contacts of some members of the EERA team.

The Ando-Kpomey community, in the prefecture of the AVE, 70 km from Lomé, was selected. This community includes the village of Ando-Kpomey, nine villages nearby with ties to Ando-Kpomey, and one town (Assahoun) where the locals regularly go for business and health care purposes.
Ando-Kpomey, with the support of APTH (Togolese Association for Human Protection), received the 2012 Equator Prize of the UN Development Programme, at the Rio+20 summit on sustainable development for its initiative in protecting the environment and promoting biodiversity.

"The Equator Prize is intended to honour innovation and outstanding leadership from local communities around the world. By their action, the winners of the Equator Prize show that the sustainable management of ecosystems is not only beneficial for the environment, but also empowers local people, increases their capacities and expands their selection of options for livelihood".

Helen Clark, UNDP Administrator (cited in http://www.undp.org/content/undp/fr/home/ourwork/environmentandenergy/successstories/developpement-durable-comment-une-petite-communaute-au-togo-pa/).

The village of Ando-Kpomey was originally founded by one family’s decision. It was built by the ancestor Awhga who had decided in 1862 to move to this land, given its richness in forest and water to cultivate it and feed his family. The family grew and has around 500 members today. Each adult has access to 0.5 hectares of land where they grow subsistence food crops (maize, cassava, yams, sorghum, pearl millet, and groundnut). Excess production is sold by the women in the local market. The village is well organized. A Village Chief act as the traditional leader taking care of traditions and culture and different civil committees take care of development, management, and security issues. Committees are chaired by a president. Some projects examples from these committees included: the creation of a green belt around the town to protect it in case of fire, a primary school was built in 1992, and a water reservoir for drinking water and irrigation.

In 1973, after a devastating wildfire, the village of Ando-Kpomey created a buffer zone, a "green belt" around its community, a belt, which transformed into a forest of 100 hectares. A participatory management committee was established to monitor the forest resources and to regulate their usage. The community allows controlled exploitation of resources to meet its subsistence needs (both wood and non-wood forest products) and centrally manages the revenues generated through the sale of forest products. The women in the community are allowed to enter the forest to access the wood which significantly reduces the average time spent sourcing fuel for cooking. Many cultures are present in this community, including many that believe in using locally sourced medicinal plants for health care needs.

To learn more about Ando-Kpomey:
5.2 The current situation

Introduction

The area selected for the study is composed of eleven (11) villages situated within a radius of 14 km; Assahoun, Ando-Kpomey, Akpuivé, Klobale, Bedo, Toyo, Wolenou, Zikpé, Agbadjanakè, Atti-Atovou, and Ando-Yoto. The area under consideration is located in the canton Assahoun in the south-west of Togo’s Maritime region in the prefecture of Ave (Figures 3 and 4).

The area has a population of approximately 9700 inhabitants which a slightly higher number of women than men (about 4700 men and 5000 women). The principal activity is agriculture, craft industry (weaving) and small business. This area is unique in that a majority of villages in the area work to protect the environment through the conservation of forest and wildlife.

Figure 3. Location of the study area (yellow circle)
Figure 4. Map of the study area
Table 13 provides background data on the 11 villages considered in the case study. Table 14 describes the main infrastructures in the study area.

### Table 13. The 11 villages

<table>
<thead>
<tr>
<th>Village name</th>
<th>Distance to Ando-Kpomey (km)</th>
<th>Total population (inhab)</th>
<th>Number of households</th>
<th>Surface area (Ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ando-Kpomey</td>
<td>0</td>
<td>500</td>
<td>100</td>
<td>103</td>
</tr>
<tr>
<td>Akpuivé</td>
<td>2</td>
<td>280</td>
<td>56</td>
<td>1.5</td>
</tr>
<tr>
<td>Klobale</td>
<td>3</td>
<td>113</td>
<td>23</td>
<td>3</td>
</tr>
<tr>
<td>Bédo</td>
<td>3</td>
<td>347</td>
<td>70</td>
<td>3</td>
</tr>
<tr>
<td>Toyo</td>
<td>2.5</td>
<td>400</td>
<td>80</td>
<td>3</td>
</tr>
<tr>
<td>Wolenou</td>
<td>3</td>
<td>272</td>
<td>55</td>
<td>2</td>
</tr>
<tr>
<td>Zikpé</td>
<td>4</td>
<td>300</td>
<td>60</td>
<td>1.5</td>
</tr>
<tr>
<td>Assahoun</td>
<td>14</td>
<td>4611</td>
<td>922</td>
<td>-2.5</td>
</tr>
<tr>
<td>Agbadjanakè</td>
<td>6</td>
<td>361</td>
<td>73</td>
<td>8</td>
</tr>
<tr>
<td>Atti-Atovou</td>
<td>10</td>
<td>1802</td>
<td>361</td>
<td>10</td>
</tr>
<tr>
<td>Ando-Yoto</td>
<td>7</td>
<td>716</td>
<td>144</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>-</td>
<td>9702</td>
<td>1941</td>
<td>-</td>
</tr>
</tbody>
</table>

Estimated annual growth of the population: 3.2% (canton total)
Poverty rate: 67.6% (canton total)
School enrolment: 23% (canton total)
Number of persons per household: 5, according to data from the area

General view of the village of Ando-Kpomey
Table 14. Infrastructures available in the 11 villages

<table>
<thead>
<tr>
<th>Village name</th>
<th>Current population (inhab)</th>
<th>Health centres</th>
<th>Primary schools, lower and upper secondary schools</th>
<th>Boreholes</th>
<th>Communal services</th>
<th>Agricultural units</th>
<th>Workshops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ando-Kpomey</td>
<td>500</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>Akpuivé</td>
<td>280</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Klobale</td>
<td>113</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Bédo</td>
<td>347</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>Toyo</td>
<td>400</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Wolenou</td>
<td>272</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Zikpé</td>
<td>300</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Assahoun</td>
<td>4611</td>
<td>1</td>
<td>11</td>
<td>Several</td>
<td>Several</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Agbadjanakè</td>
<td>361</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Atti-Atovou</td>
<td>1802</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Ando-Yoto</td>
<td>716</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>15</td>
</tr>
</tbody>
</table>

* Mainly subsistence agriculture
** Mainly weaving workshops; security checkpoint is also located in Ando-Yoto, which motivated its electrification.
*** The only modern energy services available within the area are in Assahoun
Economy
The economy is based on agriculture, craft industry and small business. In agriculture, it is mainly subsistence farming, but this does not prevent the sale of surplus production such as maize, cassava, yams and tarot which allows the population to cover other needs. Livestock operations are small and family-run.

The majority of the craft industry is traditional weaved loincloth.

Moreover, honey production began in 2012. Production volumes remain low.

Infrastructures
The canton of Assahoun, like most cantons in Togo, is underdeveloped. Within the canton only the village of Assahoun is directly connected to the National Road number Two which is the only paved road in the area (the rest of the road network in other villages consists of tracks covered in laterite). Assahoun is also the only canton connected to a 12kV high voltage line and actively receiving electricity from the grid. The village of Ando-Yoto is in the process of being electrified (the presence of a security checkpoint probably contributed to the electrification decision). The village of Atti-Atovou has been identified as being a priority town for electrification (no date set) (Figures 5 and 6).

The entire area has mobile telephony access while the only community with a landline network is Assahoun.
Health facilities in the area include; one maternity unit located in Assahoun and three peripheral care units in Agbadjaneke (6km from Ando-Kpomey), Ati-Atovou (10km from Ando-Kpomey) and in Yoto (7km from Ando-Kpomey) (Figures 5 and 6).

The education infrastructure covers both primary and secondary education levels. There are 13 primary schools in the vicinity including seven in the village of Assahoun, six lower secondary schools including three in Assahoun and an upper secondary school also located in Assahoun (Figure 6).

The only village served by the national drinking water network (TDE) is Assahoun. Water supply in other villages is supplied from human-powered drilling, open pits and impoundments.

There are also communal services in the region under evaluation: two markets, three registry offices. Only the village of Assahoun benefits from public lighting.
Figure 5. Representative map of the area

Figure 6. Platforms, health services and education in the area
5.3 Local resources and energy supply

In almost all villages that make up the area, there is a small forest that is protected by the inhabitants. The largest forest is that of Ando-Kpomey with a surface area of 103 hectares and the growth and protection of this forest contributed to the village winning the Equator Prize. These forests are a resource for fuelwood. In fact, this is where the villagers gather dead wood for cooking. The inhabitants of Ando-Kpomey do not buy fuelwood and do not face supply difficulties or challenging collection conditions as wood is taken directly from the land where the farming is done. Similar situations exist in all the villages inside the area, except Assahoun, where wood and charcoal are purchased. Households do not use improved cookstoves. The usual arguments in favour of improved cookstoves (financial savings on the purchase of wood, challenging collection conditions) do not apply to the area. Health-related aspects could be a motivational factor for the use of improved cookstoves, but awareness-raising is required since the population is not currently aware of the health implications of smoke from burning wood.

To preserve these forests, the villagers do not engage in the production of charcoal, nor use it for cooking, which explains the absence of this resource in most of the villages. The lack of LPG is also noted in the area. The cost of cooking equipment and the price of butane gas is beyond the means of the population. They feel that gas burning cookstoves are dangerous compared to current cookstove methods. This is an erroneous fact.

Agricultural wastes are mainly used for cooking and consist of dry corn stalks after harvesting. Limited livestock farming is the locality means that animal waste is not used. In some parts of the country, households use dry cow dung to light the fires, especially during the humid season. In our study area, cattle-raising is negligible and as a result this type of fuel is not used.

Health centres and schools are candlelit by paraffin oil lamps and battery torches. This state of affairs limits the development of pupils who, come nightfall, no longer have the opportunity to review lessons and complete homework properly for the next day. Access to New Information and Communication Technologies is impossible due to the lack of energy infrastructure. Health centres cannot properly store most
medicines. The **lack of electric pumps for wells and public water fountains** increases human-power energy requirements.

The only area through which the **electricity grid** crosses is Assahoun. In this locality, health centres and schools are connected to the grid. No solar energy system was noted in Assahoun.

According to a study on household energy consumption in Togo, consumption per inhabitant and per year in the rural environment in the maritime region (where our study area is situated) is estimated at 264 kg for heating wood and 0.4 kg for plant waste. It was not possible to quantify other consumption (candles, batteries, paraffin oil lamp).

**Nota Bene**

The goal of a comprehensive analysis of energy resources and supply is to describe the resources available within the community and that are used or could be used in the future for the benefit of its inhabitants or for exporting to neighbouring territories.

In a comprehensive analysis, the standard questions to ask about resources are the following.
- Do controlled forests exist? Size? Who manages them? Indicate how the community manages this resource; for their own use or for export to other territories?
- What are the locally available wood resources? Collected? Bought? What is its price?
- Are there any charcoal farms? Who manages them (local business, cooperative etc.)? Production amount? Is charcoal sold? To whom? At what price? Indicate how the community manages this resource: for their own use or for export to other territories.
- Solar and wind resources: have studies been conducted? Results?
- Hydraulic resources: available?
- Agricultural waste: quantities and kind? Are they used, how?
- Animal waste: quantities and kind? Are they used (biogas, briquetting, others)?

In a comprehensive analysis, standard questions to ask on supply are as follows.
- Wood fuel: amount collected locally? Quantity purchased? (Indicate the purchase price if possible). Regarding collection, are the inhabitants collecting wood from the forest around the village? Up to what distance away? How long does the collection take? Who does it (women, children)? What is the frequency (daily, every other day?).
- Charcoal: Indicate whether there is an on-site market, where does the charcoal come from (made locally?) Who handles trading? Purchased externally? At what distance away?).
- LPG: Are there any LPG dealers?
- Agricultural waste: are they used? To what purpose? Free or not? Of what kind?
- Animal waste: are they used? To what purpose (biogas, briquetting, others)? Free or not?
- Existence of a central electricity grid? If so, since when? Number of connections? How has this number changed since construction of the line? What is the capacity of the line (number of possible connections?). Are community facilities (health centres, schools, boreholes, community halls, etc.) connected? Are agricultural units, craft industry workshops connected? Are households the only customers?
- Existence of generator sets? Who do they belong to? Who pays for them? Who do they serve? (production units, agricultural units, wealthier households?) Where is the fuel purchased? At what price?
- Are there any PV solar panels? For what purposes? Who installed them? Who takes care of the upkeep?
- Are there solar lamps? How are they managed? How much do they cost? What is their lifespan?
5.4 Key stakeholders at local level

The decision-making mechanism in the villages follows an exclusive process where prominent citizens assist in decisions made by the Village Chief.

Several locally based committees are in place with the responsibility to inform, educate and serve as a relay for programmes and projects:

- the Village Development Committee (VDC), whose role is to develop and deliver development programmes and projects to the chief and the community; it consists of nine members, chosen by the population;
- the Student Parent Committee (CPE), whose role is to assist the teaching body in managing schooling. This committee varies depending on the number of students and size of the school;
- the Forest Management Committee (CGF), whose role is to ensure the protection of the forest; it consists of 12 persons in Ando-Kpomey;
- Grouping of Women (GF), whose role is to create and implement income-generating activities such as the production and sale of cassava, cassava flour, soap, palm oil, etc.

The only NGO active in the area is the Togolese Association for Human Advancement (ATPH), which was involved with the case study. The goals of the ATPH are:

- Support local initiatives that achieve a sustainable development of the environment,
- Support participation of populations in the development process of their environment,
- Contribute to the increase of local capacities,
- Provide organisational support to small farmer and community organisations,
- Help communities integrate gender concerns into decision-making and the development process of their environment,
- Promote protection of the environment through actions that do not destroy nature,
- Contribute to the securing and sustainable management of land assets.

Like the majority of cantons in Togo, the local development plans of Assahoun are archaic and sometimes even non-existent for some villages in the canton. Only Ando-Kpomey has a village development plan centred on forest management.

Physical access difficulties within the area have pushed the local population to give priority to the improvement of the road between Assahoun to Ando-Kpomey. This will serve the community by increasing accessibility, thereby improving trading with
other communities living in the canton and thus advancing socio-economic development. Drilling of a borehole will provide clean drinking water that should help eradicate waterborne diseases. Electrification of the locality is important for enabling the lighting of several households and will create better student study conditions. Finally no development should be conducted prior to consideration of health facilities. Recent conversations have prioritised the construction of a health unit and a maternity point to improve access and to relieve the suffering of people who must travel a large distance to be treated.

5.5 Scenarios and Strategies

On an exploratory basis, it is proposed to evaluate modern energy service needs of the community under study by 2020. An annual population growth of 3% is assumed throughout the area.

5.5.1 Access to electricity services

General population and local committee consultation would be required to define future electricity services needs. As part of this exercise (shown for illustrative purposes) the following assumptions are made:

- **Health centres**: Once a town reaches 300 inhabitants, a health facility is required. This was observed in Bedo and Agbadjanaké. The need for additional health installations depends on the total population (1 additional installation for each 2500 inhabitants, according to the service standards of the health centres proposed by the WHO).
- **Schools**: Once a town reaches 300 inhabitants, a school is launched. The need for additional schools depends on the total population (1 school of 135 children per 300 inhabitants).
- **Boreholes**: Any village of at least 1500 Ha has the right to a water station (borehole with mechanical pump, a fountain terminal), every village of more than 2000 Ha has the right to a drinking water supply (borehole with mechanical pumping and distribution through fountain terminals).
- **Public lighting**: Every village must have street lighting. Minimum three lampposts and then one lamppost per 130 inhabitants (value used in Mali).
- **Agricultural units**: Without accurate information, we subjectively decide that number of units would increase 50% by 2020.
- **Workshops**: Without accurate information, we randomly decide that their number would increase 50% by 2020.

The resulting requirements are shown in Table 15. It is important to remember that these needs are theoretical, and that a comprehensive study would include active involvement of the population and village committees. For example, it was noted by
local officials that electrification of the school of Ando-Kpomey was not considered a priority because the school is located geographically outside the village (so as to more easily accommodate children from neighbouring villages). School use in the evening would mean that children walk back home at night, and notably through a wooded area, which is not desirable. This example illustrates the importance of having an integrated vision of modern energy services development.

Table 15. Hypothetical modern energy service needs by 2020

<table>
<thead>
<tr>
<th>Village name</th>
<th>House-holds</th>
<th>Health centres</th>
<th>Primary schools, secondary schools</th>
<th>Boreholes:</th>
<th>Public lighting</th>
<th>Agricultural units</th>
<th>Workshops</th>
<th>Approximate total cost** (million CFA francs/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ando-Kpomey</td>
<td>72</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>21</td>
<td>52.7</td>
</tr>
<tr>
<td>Akpuivé</td>
<td>41</td>
<td>1</td>
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<td>0</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>15.6</td>
</tr>
<tr>
<td>Klobale</td>
<td>16</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>13.4</td>
</tr>
<tr>
<td>Bédo</td>
<td>50</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>21</td>
<td>45.6</td>
</tr>
<tr>
<td>Toyo</td>
<td>116</td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>5</td>
<td>15</td>
<td>45.8</td>
<td></td>
</tr>
<tr>
<td>Wolenou</td>
<td>39</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>15</td>
<td>33.7</td>
</tr>
<tr>
<td>Zikpé</td>
<td>29</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.6</td>
</tr>
<tr>
<td>Assahoun</td>
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<td>18</td>
<td>5</td>
<td>41</td>
<td>0</td>
<td>0</td>
<td>46.6</td>
</tr>
<tr>
<td>Agbadjanakè</td>
<td>52</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>15</td>
<td>33.6</td>
</tr>
<tr>
<td>Atti-Atovou</td>
<td>261</td>
<td>2</td>
<td>7</td>
<td>3</td>
<td>16</td>
<td>6</td>
<td>8</td>
<td>53.3</td>
</tr>
<tr>
<td>Ando-Yoto</td>
<td>104</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>23</td>
<td>59.7</td>
</tr>
<tr>
<td>Total</td>
<td>1449</td>
<td>13</td>
<td>38</td>
<td>18</td>
<td>87</td>
<td>29</td>
<td>123</td>
<td>400.6</td>
</tr>
</tbody>
</table>

* Boreholes: the boreholes currently non-operational are considered operational in 2020.
** Excluding improved cookstoves. Same calculation assumptions as in Sections 4.2 and 4.3.

It is worth noting that based on the distance between the villages and the national grid, certain villages would be good candidates for decentralised electrification projects, while others should be electrified by the grid. Assahoun is served by the grid, Ando-Yoto is currently being electrified, and Atti-Atovou is on the list of villages to be electrified. Other villages in the study area are good candidates for decentralised projects.

The possibility of a multifunctional platform common to several villages (Ando-Kpomey, Wolénou, Zikpé and Atti-Toyo, Figure 6) has been mentioned and could be formulated within the National Development Programme of the Multifunctional Platform framework, by the Ministry of Grassroots Development. To participate in this framework analysis, the eligibility criteria are:

- Population estimated between 500 and 2000 inhabitants;
- Have a well organised group;
- Present an application;
• Located at more than 5 km of the grid;
• Social cohesion that results in a community commitment to construct the building that houses the platform;
• High agricultural productivity in the locality, allowing the platform to be profitable.

**Figure 6. Possibility of a common platform (Ando-Kpomey, Wolénou, Zikpé and Atti-Toyo Akpuivé)**

<table>
<thead>
<tr>
<th>Language Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centres de santé</td>
<td>Health centres</td>
</tr>
<tr>
<td>Écoles</td>
<td>Schools</td>
</tr>
<tr>
<td>Village électrifié (réseau)</td>
<td>Electrified village (grid)</td>
</tr>
<tr>
<td>Village en cours d’électrification (réseau)</td>
<td>Village in the process of being electrified (grid)</td>
</tr>
<tr>
<td>Plateforme multifonctionnelle disponible</td>
<td>Multifunctional platform available</td>
</tr>
<tr>
<td>Route nationale 2</td>
<td>National road 2</td>
</tr>
<tr>
<td>Ligne 20 kV</td>
<td>20kV line</td>
</tr>
<tr>
<td>Possibilité d’une plateforme multifonctionnelle commune</td>
<td>Possibility of a shared multifunctional platform</td>
</tr>
</tbody>
</table>

### 5.5.2 Access to more efficient cooking

Households in the area use three stone and wood stoves for cooking and currently do not face fuel supply shortages. Cooking techniques are not believed to be problematic.
by the population given the availability of fuelwood. Moreover, the general population remains unaware of the health impacts of smoke from wood combustion. An awareness programme should be considered, and could be associated with sanitation teaching activities organised in the area.

5.6 Conclusion of the case study

As part of the case study, the local team proceeded with data collection on the eleven villages in the chosen area around Ando-Kpomey. The main findings were as follows:

• In almost all the villages that make up the area, a small forest exists and is protected by the inhabitants
• Population does not buy fuelwood and do not face supply problems because wood is taken directly from the land where farming is done
• Households do not use improved cookstoves
• The few health centres and schools that do exist are candlelit with paraffin oil lamps and battery torches. This situation limits student learning and study to sunshine hours and limits the usage of new information and communication technologies. Similarly, health centres do not have the possibility of storing medicine.
• Only two localities in the area (Assahoun and Ando-Yoto) are situated in or near the electricity grid.
• The decision-making mechanism in the villages follows a process involving the village chief assisted by his prominent citizens and active local committees in the villages.
The case study was conducted for methodological purposes and remains, in its present form, a theoretical case illustrating the issues to be considered in a SEP decision-making framework. Ideally, next steps would seek to implement key recommendations identified, such as the establishment of a multifunctional platform shared by several villages, and awareness-raising on the effective uses of fuelwood.

An action plan that goes beyond these two opportunities would require the identification of a stakeholder responsible for the energy services access project management in the Ando-Kpomey area (entity that takes initiative, plans and organises the programme) and ensuring financial support for the project. The selected project manager must establish the detailed technical and economic determinants, define the elements of the energy system (energy resources, technologies) available to meet the population’s use requirements (cooking, motive force, other uses), involve a broad base of local stakeholders including such as beneficiaries (households, farmers, entrepreneurs, teachers, etc.) and the management bodies of social infrastructures. A steering committee would support the project and would invite members of the Ministry of Energy, the ATPH association, and local representatives to participate.
CONCLUSION

This Technical Note defines the general framework for the definition and application of a smart energy path (SEP) in Togo. It shows that the energy system, at national or local level, can be assessed "by the demand side" as proposed in SEP. Gradual improvements to energy service needs will significantly help in achieving the economic and social goals of the population in a given area (local, national, regional) in a manner consistent with environmental viability and participatory governance.

The energy strategy is therefore closely connected to, or even incorporated within, the economic strategy and should actively engage all stakeholders (health, education, development, etc.) beyond the energy sector.

This proposed analysis is a first step in the implementation of a SEP for Togo. It is expected that local partners, ministry officials, NGO workers, academics, businesses, will take this framework and launch further project work through active participation of representatives from the different energy service user sectors. It is recommended that the Liaison Committee, set up in Togo under the EERA project, work to strengthen the mobilisation efforts of the various stakeholders.
ANNEXES

Annex 1. Main results of the TIPEE analysis

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Parameters</th>
<th>Value 2005</th>
<th>Value 2008</th>
<th>Value 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Greenhouse gas emissions (CO2)</td>
<td>Greenhouse gas emission (CO2) from the energy sector</td>
<td>-0.18</td>
<td>-0.19</td>
</tr>
<tr>
<td>2</td>
<td>Major local energy pollutant</td>
<td>Concentration or emission level of a significant energy-related local pollutant (CO, NOx, or SOx particulates) per capita</td>
<td>2.6</td>
<td>2.81</td>
</tr>
<tr>
<td>3</td>
<td>Deforestation</td>
<td>Number of hectares of deforestation or loss of forest vegetation (biodiversity) used for energy purposes</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Social</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Electricity access</td>
<td>Number of households with access to electricity</td>
<td>0.81</td>
<td>0.88</td>
</tr>
<tr>
<td>5</td>
<td>Household energy burden</td>
<td>Proportion of household income spent on energy services</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Economy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Fossil fuel imports</td>
<td>External energy dependence</td>
<td>0.24</td>
<td>0.23</td>
</tr>
<tr>
<td>7</td>
<td>Non-renewable energy reserves</td>
<td>Number of days of stock of non-renewable energy supplies</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Technology</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Renewable energy</td>
<td>Deployment of modern, local renewable energy</td>
<td>0.99</td>
<td>0.94</td>
</tr>
<tr>
<td>9</td>
<td>Energy efficiency</td>
<td>Energy intensity of industry; GHG emissions per unit of production; or energy intensity of the economy</td>
<td>2.42</td>
<td>2.5</td>
</tr>
<tr>
<td>10</td>
<td>Quality of electricity supply</td>
<td>Length and recurrence of power cuts and variations in voltage</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Governance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Income control</td>
<td>Reduction in the share of energy revenues that escape taxation</td>
<td>0.5</td>
<td>0.66</td>
</tr>
<tr>
<td>12</td>
<td>Informed consultation</td>
<td>Public hearings and consultations on the impact evaluations of proposed energy projects</td>
<td>0.75</td>
<td>0.33</td>
</tr>
<tr>
<td>13</td>
<td>Women participation</td>
<td>Active participation of civil society (particularly women) in the energy sector</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>Balanced governance</td>
<td>Balanced representation of energy demand and supply stakeholders as well as transparency in the decision-making process</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Vulnerability</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Vulnerability of thermal power supply</td>
<td>Vulnerability of power plants (and refineries if applicable) to flooding</td>
<td>0.66</td>
<td>0.66</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Vulnerability of renewable power systems</th>
<th>Vulnerability of renewable energy systems to climatic variations</th>
<th>0,5</th>
<th>0,5</th>
<th>0,5</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Vulnerability of transmission lines</td>
<td>Length of transmission lines/distribution networks threatened by extreme weather events</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

### Resilience

<table>
<thead>
<tr>
<th></th>
<th>Investment assets</th>
<th>Rate of domestic savings/GDP</th>
<th>0,99</th>
<th>0,99</th>
<th>0,98</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Mobilisation of renewable energy potential</td>
<td>Proportion of national investment earmarked for renewable energy and energy efficiency</td>
<td>0,95</td>
<td>0,96</td>
<td>0,97</td>
</tr>
<tr>
<td>20</td>
<td>Local technical capacity</td>
<td>Annual number of science and engineering graduates per total population</td>
<td>0,75</td>
<td>1</td>
<td>0,75</td>
</tr>
<tr>
<td>21</td>
<td>Scientific information</td>
<td>Availability of risk maps (flooding, desertification, contamination)</td>
<td>1</td>
<td>0,5</td>
<td>0,75</td>
</tr>
<tr>
<td>22</td>
<td>Sitting guidelines</td>
<td>Climate-proofing guidelines for power plant sitting and building</td>
<td>0,5</td>
<td>0,5</td>
<td>0,75</td>
</tr>
<tr>
<td>23</td>
<td>Crisis management</td>
<td>Emergency plans for power plants</td>
<td>0,5</td>
<td>0,5</td>
<td>0,5</td>
</tr>
<tr>
<td>24</td>
<td>Insurance</td>
<td>Availability of domestic insurance policies that account for climate change-related damages</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
REPRESENTATION OF INDICATORS 1-14.

(The 0 value is the target value. Values higher than 1: very bad; values lower than 0: better than the target proposed in the definition of the indicator)


Scale: 0 = good; 0.5 = average; 1 = bad.
Annex 2. Evaluation of the Millennium Development Goals

The Ministry of Planning, Development, and Land Management led the preparation of the fourth MDG monitoring report (in the process of being finalised) with the technical and financial support of the UNDP. The data used to update the indicators for monitoring the progress of the MDGs are primarily from the General Directorate of Statistics and National Accounts (DGSCN) including MICS, CWIQ and RGPH 4 as well as sector administrations.

The incidence of poverty, 58.7% in 2011, remains high even though efforts undertaken have lower the level 3 points compared to 61.7% in 2006. In contrast, the prevalence of malnutrition was almost halved, from 32.8% in 1990 to 16.6% in 2010.

Improving the business environment allows for better success of the employment promotion programmes already under way in the country.

Constraints relating to agricultural modernisation, inadequate and expensive credit for the agricultural sector, lack of training curricula, low financial capacity, adverse effects of international crises and low implementation rate of investments continue to hold back progress. Measures should be taken to remove these constraints and other important factors like clean up the land sector, promotion of agricultural mechanisation and improvement of water management systems by increasing water retention infrastructures.

Progress has been noted in primary education. The Net Enrolment Rate (NER) stood at 83.9% in 2012 (down slightly compared to 2011 and 2010), the completion rate stood at 75.7% in 2012, and the literacy rate among 15-24 year olds stood at 79.7% in 2011 (CWIQ). These advances are in thanks to the government's efforts in support of PTFs and NGOs and the abolishment of school fees. Repetition rates and abandonment rates remain high yet are steadily declining, 25.1% in 2006 to 21% in 2012 and from 11% in 2007 to 5.4% in 2012 (MEPSA) respectively. To improve the efficiency of the education system, resources must be mobilised for quality human resources, infrastructures, furniture, and teaching materials.

The evolution of girl/boy ratios in primary education (98% in 2012, MEPSA) broadly offers the prospect of 100% by 2015. Moreover, the share of seats held by women in the National Assembly improved after the last parliamentary elections in 2013 (15.38% against 11.11% at the end of those of 2007) but is still far from the targeted gender parity goal. Very few women have a salaried employment in the modern non-agricultural sector mainly due to the low level of education among women and the lack of the basic infrastructures to assist in daily family chores. Despite the strong involvement of women promotion associations on gender issues, public opinions on the traditional role of women persist. Further awareness-raising actions should be pursued.

The health care performance results remain mixed. Child mortality (124‰ in 2010) and infant mortality (78‰ in 2010) increased by one point compared to their 2006 values. The proportion of children under one year of age that are vaccinated against measles improved by 4 points over the last four years to 68.3% (2010), yet this...
remains below the 100% target for 2015. The percentage of births attended by skilled personnel was only 59.4% in 2010 compared to 62.9% in 2006. The proportion of mothers who received antenatal care improved in 2010 (88.8%) and continuing efforts in maternal health care management helped lower the maternal mortality rate by 50 per cent per thousand live births between 2008 and 2011, that is from 350% to 300%. Despite this progress, much remains to be done to achieve the target of 143% in 2015.

The fight for mother and child health is unfortunately hampered by the persistence of unfavourable socio-cultural factors, which calls for the intensification of awareness-raising campaigns. On the other hand, insufficient funding and poor maternity services provision are veritable handicaps. The incorporation of reproductive health into maternal health priorities is important. Financing provisions for women to access maternal health care are required.

In fight against HIV, malaria and tuberculosis, the results are strongly encouraging. HIV prevalence has stabilised since 2006 at 3.2% (UNAIDS) within the whole population, down from 6% in 1990. Homosexuals and sex workers are the most affected (20% and 13% respectively in 2011). At the same time, despite offering free antiretroviral (ARV) medication, taken in 2008, coverage was only 59.8% in 2012 compared to 41.2% in 2008. In the fight against malaria, the focus has been on prevention. In 2010, more than one in two children slept under an treated mosquito net. However, during the same year, 12.3% of the population suffered from the disease of which 48% were children under five years of age. Malaria remains the leading cause of morbidity and mortality (5% nationally) among children under five years recorded in the health facilities. Particular attention has been focused on the care of children with malaria, which reached 87% in 2011. Moreover, the efforts made in the fight against tuberculosis has allowed a greater number of cases to be diagnosed, reducing lethality and enhancing the cure rate of treated patients to 85% in 2011.

The main barriers in the fight against these diseases concern harmful traditional healing practices, dependence vis-à-vis the outside world for the financing of essential products, high cost of medicine and disruptions in the supply of medicine. In addition to the continued efforts in the fight against HIV, a sustainable funding mechanism should be established for priority diseases.

Despite recent preservation efforts, the country's forest coverage continued to deteriorate and was only 5% of land in 2010. The surface area of the protected ecosystems was 14.2% in 1992 (NEAP 1998) and has fallen to 7.1% as of 2005. The government actions undertaken with the support of partners has improved sanitation rates (34.9% in 2010 v.s. 31.7% in 2006) and the availability of clean drinking water (56% in 2010 against 47.6% in 2006). These indicators remain alarming high leading to a further call for the acceleration of initiatives to improve quality of life.

The absence of sufficiently planned management actions and the low level of citizen involvement hampers living environment improvements. It is necessary to strengthen managerial capacities of the ministerial personnel, and to develop and implement a policy on housing and urban development.

The ratio of public aid for development in terms of GDP was 10.9% in 2012 more than doubled its 2007 value and slowly approaching its level desired by 2015. In
parallel, reaching the completion point of the HIPC Initiative in 2010 allowed the country to benefit from a significant reduction of its external debt, which was only valued at 1.5% of its exports in 2011. Moreover, the penetration of new information and communication technologies has significantly increased. The number of mobile phones per hundred people (50.6% in 2012 versus 21.7% in 2008) has more than doubled in the past five years. Mobile customer have benefited from lower rates and improved quality and diversification of the services offered during this time period. For landlines, however, penetration in the country increased slightly from 1.82% in 2008 to 4.01% in 2012.

The difficulties facing the country in its economic relations with the rest of the world include, among others, deteriorating trade terms, low absorptive capacity for resources from development aid, and non-diversification of products designed for export and lack of competitiveness. It will therefore be necessary, in addition to continuing to improve the business climate, to ensure a strategic initiative to increase presence in world trade exchanges.

This overall MDGs situation in Togo is characterised by wide disparities related to regional locations. The indicators are therefore often far from their targets in rural areas where the incidence of poverty is often high. The Savannah region has highest incidence of poverty.
Annex 3. The "Sustainable Energy for All" initiative

The UNDP report (2012), through its Energy-Poverty Regional Programme, provides a quick evaluation of the current situation and provides the gap analysis for the achievement of sustainable energy for all by 2030, namely:

- universal access to modern energy services;
- doubling of the share of renewable energies (excluding biomass) in mixed energies;
- doubling of the overall rate of energy efficiency

Ministry responsible

The study was conducted by the Ministry of Mines and Energy with the support of UNDP.

Results

- Overall energy efficiency is very low: losses between crude supply and the energy delivered to the door of the end users is 25.9%.
- A major source of energy saving exists through improvement in the energy efficiency of inter-energy processing centres (notably for the production of charcoal and thermal origin electricity).
- The electricity access rate is slowly improving and shows enormous disparities between urban (access rate = 50%) and rural (access rate = 3%) areas.
- New and renewable energies (solar, wind, etc.) are not present in the country's electricity production pool.
- Over 90% of Togolese households do not have access to the modern kitchen that uses butane gas or electricity for cooking food and domestic heating water. Butane gas supply chains are insufficiently decentralised (very few outlets even in the largest town of Lomé). The price of gas and the equipment cost (stove, gas rings) severely limits modern cooking fuel (butane gas) access by the majority of the population.
- In 2008, Togo’s population was 5,596,324 inhabitants. The forecasted population for 2030 is around 9.5 million, with strongest growth expected in the urban population. Thus, the universal access to electricity by 2030 would result in the multiplication by 7 of the level of total end electricity consumption of 2008 or 4.15 times the average end consumption of electricity per capita (113.8 kWh/year/person to 472.33 kwh/year/person). The capacity required to meet such a demand, including the hypothesis of improving energy efficiency in the electricity sector, would be in the range of 700 MW, i.e. 13 times the installed national capacity in 2008 (54 MW).
- Combined actions of electrification and promotion of butane gas for domestic use would reduce the demand for ligneous fuels due to the impact of inter-energy substitutions.

To achieve the goals of the "Energy for All Initiative" in Togo, it is necessary to increase by 14 times the current level of investment for access to modern energy services (electricity, motive force and modern fuels), improve overall energy efficiency and improve the share of renewable energies (biomass/traditional energy). Investment capacity would need to increase from 87.73 million USD of investment to 1 234.39 million USD accumulative by 2015.

The three main obstacles are:

- Low national financing capacity (public and private) and high dependence on public and private external financing (Financial obstacle);
- Enormous technological backlog in energy efficiency, energy conservation and enhancement of new and renewable energy sources and heavy reliance on technology and know-how transfer (Technological obstacle)
- Poverty of the populations, particularly in rural areas and its impact on purchasing power (poverty and economic accessibility of modern energy services).

For Togo to achieve the "Energy for All Initiative" goals more support is required at the institutional, political and financial levels. Sub-regional, regional and international technical and financial cooperation is needed to fill the energy gap due to insufficient national resources. All this would require a strong long term political commitment.
Annex 4. Policies and strategies in place

5.1 Economic development and fight against poverty

5.1.1 Strategy for Accelerated Growth and Employment Promotion (SCAPE)

The Strategy for Accelerated Growth and Employment Promotion (SCAPE) of Togo offers a development framework for the medium term to achieve the General Policy Statement (DPG) of the Government, the Millennium Development Goals (MDGs) and the vision of moving Togo into an emerging country in 15-20 years, respectful of human rights and promoting the rule of law. SCAPE is the revised version of the Poverty Reduction Strategy Paper (PRSP-C).

Overall goal
The Strategy for Accelerated Growth and Employment Promotion aims to accelerate growth in order create jobs, reduce poverty and inequality, improve income levels and quality of life and meet the Millennium Development Goals.

Specific goals
Over the period 2013-2017, the specific goals of the SCAPE, from its baseline scenario are

(i) Increase the average rate of real growth to 5.9% over the time period, starting from 5.6% in 2012 to 6% in 2015 and 6.1% in 2017; this should lead to a growth in per capita GDP of about 3% per year;
(ii) Raise the overall gross investment rate to 20.9% on average per year, starting from an average level of 18.6% over the last three years (2009-2011);
(iii) Reduce the incidence of income poverty from 58.7% in 2011 to 50.9% in 2015 and 47.3% in 2017, a significant drop of 11.4 points in five years;
(iv) Reduce underemployment from 29.1% in 2011 to 26.1% in 2015 and 24.5% in 2017.

Strategic focus
Five strategic focuses have been selected. Collectively these strategic initiatives will achieve the vision of an accelerated, inclusive and employment-generating growth. These strategic focuses are

Focus 1 develop sectors with high growth potential
Focus 2 strengthen economic infrastructures
Focus 3 develop human capital, social protection and employment
Focus 4 strengthen governance
Focus 5 promote a participatory, balanced and sustainable development

The sectors with high growth potential are the agricultural sectors (agriculture, livestock, fisheries), tourism, craft industry, small business and the industries channel (mining, manufacturing and food processing).

Ministry responsible
The Ministry of Planning, Development and Land Management led the development of this document and monitored its implementation.

Institutional mechanism for coordination, implementation and monitoring-evaluation
The development of the SCAPE followed a long process of consultation with stakeholders, first at local, regional and national level through meetings of local, regional and sector committees.

Since 2010, the Togolese government has implemented an institutional coordination mechanism for the monitoring and evaluation of development policies hereinafter named "DIPD". This is also the mechanism for coordinating and supervising the implementation of the SCAPE. The institutional steering mechanism must reflect the effective leadership of the Government and create the conditions for a greater synergy of actions and a dynamic partnership with funders, the private sector and civil society, while taking into account data relating to decentralisation and de-concentration.

The institutional mechanism for coordinating, monitoring and evaluating development policies (DIPD) that applies only to the SCAPE includes the following groups;
   (i) National Steering Board for Development Policy (CNPPD);
   (ii) Technical Secretariat of the PRSP;
   (iii) Sectoral committees (CS);
   (iv) State-funders committee (CED);
   (v) Regional and local committees of participatory monitoring.

Participatory monitoring is done at regional and municipal level. Monitoring efforts involve representatives from key local and development stakeholders. The overall mission is to ensure the proper implementation of the SCAPE in local authorities. In particular, it oversees monitoring of the effective implementation of the Public Investment Programme (PIP) projects in regions and towns, specific monitoring of poverty and employment issues, health and education, development of regional and local production and growth potentialities.

31 [http://www.dsrptogo.tg/IMG/pdf/2dispositif_dipd_.pdf](http://www.dsrptogo.tg/IMG/pdf/2dispositif_dipd_.pdf)
Link to energy services

The implementation of the SCAPE will address energy sector challenges, which consists of ensuring, in a stable manner, both a better access and a substantial national autonomy of supply at a reasonable cost, while diversifying energy sources to include clean and renewable energies, reinforcement of energy production capacities (increasing the country's energy generation capacities from 161 MW in 2010 to 300 MW in 2015 and 500MW in 2020) and reinforcement of energy distribution capacities (cross-border electrification steps I and II, rural electrification phase I, construction of natural supplies so as to make the most reliable electrical energy available to users in the country's interior).

5.1.2 Support Programme for Grassroots Development (PRADEB)

The Support Programme for Grassroots Development (PRADEB), implemented with the financial support of the WADB, aims to address poverty reduction and this, through support for grassroots development and the promotion of youth employment. PRADEB work will: (i) contribution to the reduction of poverty and improvement of living conditions; (ii) contribution to the integration of women and young people into economic life, and (iii) contribution to the reduction of geographical imbalances and to social cohesion.

Overall goal

The overall goal of the programme is to contribute to poverty reduction through support for grassroots development and the promotion of youth employment.

Specific goals

The specific goals of the programme are

- consolidating institutional foundations and professionalising Economic Interest Groups (EIG);
- facilitating the access of the rural population to modern energy services;
- reducing youth unemployment.

The programme targets the following stakeholders that have project ideas: Economic Interest Groups (EIG), rural localities with 500 to 2,000 inhabitants that likely will not be connect to the traditional electricity grid within ten (10) years, graduates and artisans aged 18 to 40 years.

Ministry responsible

The ministry in charge is the Ministry for Grassroots Development, Craft Industry Youth and Youth Employment.
**Operationalisation**

The PRADEB operations include; (i) support for the economic activities of Economic Interest Groups (EIG), (ii) installation of multifunctional platforms (PTFM) and (iii) promotion of youth employment. These three components are supported by two transverse components; i) the monitoring, evaluation and guidance and ii) the operation and management of the programme.

As part of the support for income-generating activities, the programme will facilitate access to credit for the members of the over 500 economic interest groups that have introduced income-generating projects and for young people aged from 18 to 40 years with business ideas for the creation of 1,500 micro-projects. Moreover, during the five years of the programme, it plans to install 200 multifunctional platforms for poor rural communities without access to modern energy sources.

The programme is managed by the National Agency for Support to Grassroots Development (ANADEB), which is the supervisory structure and the Programme Management Unit (PMU/PRADEB), which is the implementation structure.

**Link to energy services**

The programme facilitates access to electricity in rural intervention areas through the provision of multifunctional platforms.

### 5.1.3 National Agriculture Investment and Food Security Programme (PNIASA)

In 2003, the African Heads of State through the adoption of the Comprehensive Africa Agriculture Development Programme (CAADP), the agricultural component of NEPAD, committed themselves to allocating at least 10% of their national budgets to agriculture growth to improve overall economic growth. The first national implementation stage of this programme was completed on 30 July by the adoption of the National Agriculture Investment Programme (NAIP). This involved the agreement and signatures of different partners, listing the mutual responsibilities of each stakeholder in the implementation of this programme.

To implement ECOWAP/CAADP/NEPAD, Togo developed the NAIP operations plan offering a hierarchical framework of actions to be undertaken in the agricultural sector to achieve the goals of poverty reduction and improvement in food safety by 2015.

**Goals**

The National Agriculture Investment and Food Security Programme (PNIASA) is tasked with increasing agricultural growth to at least 6% by 2015. It is divided into five sub-programmes, of which the first three focus on vital sub-sectors, notably
agriculture, livestock and fishery. The fourth sub-programme concerns agricultural
research and advice, and the fifth considers institutional reinforcement and sectoral
coordination.

The programme will concentrate on sustainable investments for achieving an
estimated 6% annual growth in plant production, 4.1% for livestock production and
4.3% for fish production by 2012. Estimates for 2015 are higher with growth rates
rising to 7.1% for agriculture, 6.4% for livestock and 6.7% for fishing. The effects of
this growth will improve food security and improve the gross agricultural domestic
product, the trade balance and population income level. The programme will promote
strategic channels focused on the sources of growth and the priorities defined by Togo
with the aim of increasing food production, promoting exports, developing traditional
livestock-rearing and promoting agribusiness, developing aquaculture, inland and
marine fishing.

Ministry responsible
The Ministry of Agriculture, Livestock and Fisheries is responsible for the
development and implementation of the programme.

5.2 Education and health

5.2.1 Health

the Republic of Togo) defines the rights and duties essential in the protection and
promotion of the population's health. Every natural person has the inalienable right to
health without distinction of origin, sex, age, class, race and religion. Protecting and
promoting the population's health and providing associated care and services are the
State's responsibility.

Overall goal
The goal of the code as legislation is to structure the health sector by defining
material, human and regulatory mechanisms in the supply of health services.

Ministry responsible
The Ministry responsible is the Ministry of Health.

Link with energy services
All health centres, whatever their size, need energy services to operate. The UNDP report (2011) summarised the rural and peri-urban health facilities and their access to modern energy services.

The main conclusions are:

- In total 516 health facilities, a limited number of which have access to energy services: 59 in Maritime region (11.4%), 58 in Highlands region (11.2%), 27 in Central Region (5.2%), 59 in Kara region (11.4%), and 23 in Savannah region (4.5%), for an average of 8.7%. This low rate of energy services access exists due to the remoteness of rural communities from the CEET grid and the poor integration of modern alternative energies (solar in particular).
- Barriers to electricity generation operations are: lack of and high cost of maintenance; high cost of fuel supply; low financing opportunities to manage facilities, repeated failures; lack of maintenance.
- For solar panels, the barriers to operation are: non-adaptation of system batteries; low energy output relative to needs; poor quality of facilities.
- Recommendations for sustainable access to energy services include an extension of the CEET grid, usage of solar energy in rural areas, subsidisation of connection and billing costs, recruitment training of technicians for preventive and corrective maintenance.

5.2.2 Education

Over the past five years, Togo made great efforts to improve the quality of education, teaching and learning. Notably, at the beginning of the school year 2008/2009, tuition fees in public primary education were abolished, which resulted in a significant growth in pupil enrolment to of 22% between 2007-2008 and 2009-2010 with a net increase in enrolment of girls of 42% over the two years as against 41.5% for boys (UNDP, 2011).

Ministries

- Ministry of Primary and Secondary Education and Literacy (MEPSA) for the teaching primary, secondary and tertiary degrees (pre-school to upper secondary school)
- Ministry of Higher Education and Research (MoR) for higher education.

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Link with energy services
According to the UNDP report (2011\(^{33}\)), upper secondary schools are the most electrified on the national level with a rate of around 80% in the urban environment and 24% in the rural environment, while primary schools electrification is lower at 10% and 2.5% respectively.

In an effort to improve and harmonise school infrastructures especially in primary education, MEPSA prepared a document titled "National strategy of primary school constructions". This document describes the required school model framework (accessible classrooms, play area, water point, latrines, office and shop).

5.3 Energy

5.3.1 Basic laws governing the energy sector

Electricity sub-sector
Faced with institutional and technical developments in the electricity sub-sector on the one hand, and the lack of capital and the constraints of neoliberalism, characterised by a general trend of disengagement of states from the productive sectors of the economy on the other hand, it had become necessary and imperative to evolve the institutional framework of this sub-sector in Togo, which today is governed by the following main legislation:

- International Agreement and the Benin-Togo Electrical Code (the Code) arising from the bilateral agreement signed between Togo and Benin in 1968 creating a community of interest between the two countries in the field of electrical energy and revised in August 2006.
- Law 2000-012 of 18 July 2000 on the electricity sector (the Act) passed and enacted in the wake of major reforms undertaken in this sector by the government from 1996 onwards as part of the disengagement process of the State from the productive sector;
- Decree No. 2000-89/PR of 8 November 2000 defining the terms of exercise of regulated activities in accordance with Act No. 2000-012;
- Decree No. 2000-90/PR of 8 November 2000 on the organisation and operation of the Authority regulating the electricity sector.

The Code confers on the Benin Electrical Community (CEB), the role of sole buyer in the production segment. It takes care of the transmission and importing/exporting of electrical energy over the entire territory of Benin and Togo.

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The Act, meanwhile, liberalises the production of electrical energy throughout the territory. However, when production activities are performed for the purpose of electrical energy provision, they are operated as part of a public service mission. So, production is subject to the requirements of the public service and operation must go through the signing of a concession agreement between the State and the public and private individual(s) operating these activities.

It is clear from this provision that any independent producer wishing to sell electrical energy must first sign a concession agreement with the State. The transmission and distribution of electrical energy are, according to the Act, a national public service placed under the State's responsibility. The operation of transmission and distribution activities may be entrusted by the State to one or more public or private entities, notably through the signing of one or more franchise agreements.

Whether in the production field for supply, transmission or distribution, the method of granting management delegation under the Act is the public invitation to tender, and the type of partnership, the concession.

The Code and the Act all provide the advantage of submitting the production segment to competition and ensuring third party access to transmission grids; creating an environment propitious for attracting investors into the production segment for the purpose of meeting the goals of securing provision, reducing the dependence of Togo on electrical energy and optimising costs.

The Act does not provide flexibility in the choice of type of partnership, which prevents an exploration of other forms of management delegation, including governance and farming, in order to see which one is best for any given situation. In addition, strategic partners are today diverting concessions.

There is an urgent need to revise the Act to allow for adaptability and flexibility, given the type and manner of granting management delegation.

Hydrocarbons sub-sector
This sector is governed by Law No. 99-003 on the Code of Hydrocarbons of the Togolese Republic, which defines the national policy in terms of hydrocarbons, and which consists of encouraging the exploration and operation of oil and natural gas, and promotes the investments needed for the development of the oil sector. However, this code does not cover the distribution and marketing area of these hydrocarbons.

The ministry in charge of mining and energy intervenes through the Directorate General of Energy for energy policy and the General Directorate of Mining and Geology for the exploration and control on hydrocarbons. The ministry responsible for trade deals with issues related to the commercialisation of hydrocarbons in Togo.
The Group of Petroleum Professionals (GPP), consisting of in-situ oil companies such as TotalFinaElf, Shell, Texaco, Sun-Agip, Cap Esso, Mobil Oil, etc., ensure the distribution of petroleum products onto the national market.

Sub-sector of traditional energies or biomass
The legislative and regulatory framework is generally insufficient and poorly operational.

At political level, there is a political will to reclaim control of the environment in a comprehensive way. Nationally, the enactment of Law No. 98/006 of 11 February 1998 on decentralisation and the implementation of the principle of accountability should lead the populations to fully assume their responsibilities in the management of traditional energies.

In terms of natural resources, Togo, although rather short on forest resources, has a significant potential for fuelwood that is able to meet the needs of the population.

The legislation that governs the resources and the organisation of the territory's forestry system dates from the colonial era. It provides protection of forest resources, including regulation for bush fires and prescribes special measures for protected species. It also provides criminal provisions concerning the definition of offences, related sanctions, as well as judicial procedure and powers. The regulatory framework regarding the commercialisation of the fuelwood sold is not respected. This situation has resulted in the inefficiency of the forest revenue system and constitutes an obstacle to the mobilisation of internal resources for the healthy management of the sub-sector.

The ministry in charge of energy through the Directorate General for Energy (DGE) is involved in defining the strategy and planning of the sub-sector. Administrative and technical supervision is ensured by the Ministry for the Environment and Forest Resources through the Directorates for the Protection and Control of the Exploitation of Flora (DPCEF) Forestry Production (DPF), the Office of Forestry Development and Exploitation (ODEF). These groups also ensure the supply of ligneous fuel.

In addition to the state institutions, NGOs, associations and the private sector generally consisting of women and industrialists are involved.

5.3.2 Traditional energies support and promotion of renewable energies programme
This programme was the foundation for the preparation of the POLEN. It is the manifestation of Togo’s awareness to reduce human pressure on ligneous forestry resources and the impact of these pressures on the environment. It has two main components;
- "Control of traditional energies in Togo";
- "Improvement of energy conservation and efficiency and the promotion of new and renewable energies in Togo". The programme for supporting control of traditional energies and promotion of renewable energies has served as the base-line document for the development of the national energy policy.

Research on the desertification problem in Togo concludes:
- as a sub-Saharan country, Togo enjoys, in its entirety, a humid tropical climate that gradually dries northwards where it becomes sub-Saharan and thus favourable to desertification;
- desertification has intensified in recent years due to drying of the climate and anthropic activity;
- among the anthropic activities inducing desertification and loss of biodiversity, deforestation has been identified as the principal cause. This activity has experienced a revival due to the increased demand for ligneous fuels;
- consumption increase is due to growth in the Togolese population that will reach nine million in 2020. The urban fringe where demand for charcoal will rapidly reach a crescendo is the driving force and exhibits a high incidence of poverty (61.7%). Fuel wood consequently accounts for 67% of the national energy balance and it contributes 97% of fuel resources in more than 80% of Togolese households. Unfortunately, the burning of heating wood and charcoal by almost every household is the source of 43% of direct GHG emissions and 89% of CO emissions. The greenhouse effect phenomenon inducing climate changes; in addition, deforestation in Togo reduces the absorption capacity of CO₂ and capability of carbon storage, thereby increasing the risk of the irreversible alteration of the climate.

**Overall goals**
This programme aims to control traditional fuels (heating wood and charcoal) and promote renewable energies (solar energy, wind energy and biofuels). The ultimate goal of this programme has two key aspects;
- the socio-economic aspect due to its contribution to poverty reduction through the improvement of energy efficiency and access to energy at affordable prices, with positive impacts on household incomes;
- the environmental aspect as it concerns the limitation of anthropic pressures on forest resources, contributing to the fight against desertification and climate change.

**Specific goals**
More specifically, it concerns:
- Controlling the forest contribution to ligneous energy through
  (i) improving the availability of fuelwood through reforestation actions;
(ii) promoting more energy-efficient and more ecologically-rational carbonisation processes;

• Control demand in traditional energies through the widespread use of improved cookstoves;

• Popularise the use of butane gas in urban areas by improving access to gas stoves adapted to local cooking practices by;
  (i) Increasing availability of gas and gas cookstoves in the territory;
  (ii) Bringing supply points nearer to consumers;
  (iii) Access to gas operated equipment.

• Develop and promote a greater use of renewable energies (RE);
  (i) through the encouragement of research in the RE field;
  (ii) by capitalising on national experiences and those of other countries;
  (iii) by initiating pilot projects for each type of RE.

• Improving the institutional and regulatory framework for managing energy sources and governance in the energy sector by
  (i) improving energy management;
  (ii) updating and developing energy policy;
  (iii) raising the awareness and informing stakeholders on the regulatory framework for energy management and the major energy issues;
  (iv) professionalization of the heating wood and charcoal industry;
  (v) forest inventory and the promotion of participatory forestry management.

Action principles of the programme
The programme for supporting the control of the supply and demand for fuelwood and charcoal, and the promotion of alternative energies comes under the new world perspective of viable energy development. This type of energy development targets economic growth by boosting production activities without obscuring the imperative necessity to take both the environmental and social aspects into account.

Ministry or institution in charge of the programme
This programme was developed by the Ministry of Environment and Forestry Resources in collaboration with the Ministry of Energy and with the technical support of the FAO.

5.4 Climate

5.4.1 Second National Communication on Climate Change (SNCCC)

Goal
Togo ratified the United Nations Framework Convention on Climate Change (UNFCCC) on 8 March 1995 and the Kyoto Protocol on 2 July 2004. Togo prepared and submitted its Initial National Communication on Climate Change (INCCC) in
2001. Since December 2007, it launched the process of preparing its Second National Communication (SNC)\(^{34}\).

**Ministry responsible**
The Ministry of Environment and Forestry Resources leads the process of developing the Second National Communication on Climate Change, with funding from the Global Environment Fund (GEF) and UNDP.

**Main results - summary**
It is estimated that by 2050, temperatures variations will range from 1.46°C in the South-west to 1.76°C in North-eastern Togo, while rainfall will decrease in the South of the country (-3%) and increase in the North (2%). The highest temperatures will be recorded in the Savannah Region and the most severe rainfall deficits will be recorded in the Maritime region and a part of the Highlands. The Savannah Region will be the wettest. The temperature increase is expected to continue through to 2100, while the decline in rainfall will be 8% in the South and the extreme North will expect an increase between 1% and 5%.

The potential impacts on four sub-sectors of essential energy provision have been considered:

- biomass energy: strong decrease of potential;
- hydropower: little impact on the Oti basin, decrease in the Mono River basin;
- renewable energies: increase in the yield from photovoltaic installations;
- hydrocarbons: indirect impacts (Reduction of the energy supply of biomass and hydropower is expected to increase the consumption of hydrocarbons).

**Main results - details**

- **Climate variations in Togo**
Togo generally experiences two main tropical climate types (Guinean type to the South and Sudan type to the North) that is subject to change over time. Data analysis provided by the National Meteorology Service over a period of 45 years shows not only a periodic variation linked to natural climate vagaries, but also a trend of rising temperatures and a gradual decline in rainfall in the country. The trend is continuing and suggests the likelihood of further climate changes. Simulations confirm that more or less significant changes (depending on future dates considered) will occur.

- **Togo Climate scenarios by 2025, 2050, 2075 and 2100**
According to IPCC recommendations, in order to improve climate knowledge, the following three models were selected: (i) CSIRO-30 for decreasing the trend in annual rainfall; (ii) ECHO-G for the flat trend in annual rainfall and (iii) UKHADCM3 for the increasing trend in annual rainfall with average climate sensitivity of 3°C for the A2 - ASF emission scenario. The choice of these climate change models was based on

\(^{34}\) [http://unfccc.int/resource/docs/natc/tognc2.pdf](http://unfccc.int/resource/docs/natc/tognc2.pdf)
the similarity of their internal parameters and the applicability to the West-African sub-region.

- State of climate changes by 2025
  Variations in temperature and annual precipitations were compared to the variations observed from 1971 to 2000. Scenario analysis reveals that climate change will already be visible in 2025, both in terms of temperatures and precipitations. Indeed, a variation in rainfall will be observed of 1% in the North near 11°N and -1.5% in the south (latitude 5°N) of the country. The Savannah Region will experience a slight increase in rainfall while the other areas (Maritime, Highlands, Central and Kara) will be marked by a decrease (0 to -1.5%). The average annual temperature will have a variation of 0.66°C in the South to 0.80°C in the extreme North. On average, the high temperatures are recorded in the Savannah during the month of April (32.6°C)

- State of climate changes by 2050
  Scenarios results show that the variations will become more significant compared to the variations observed from 1971-2000. Variations in temperatures will be +1.46°C in the South-west to +1.76°C in the north-east of Togo, while precipitations will decrease in the south of the country (-3%) and increase (+2%) in the North. The highest temperatures will be noted in the Savannah Region and the most severe rainfall deficits will be recorded in the Maritime region and a section of the Highlands. The Savannah Region will be the wettest.

- State of climate changes by 2075
  The temperature variations will be very significant in both the North and South of the country. The rainfall reductions in the South will experience significant amplitudes going up to $\Delta P = -5\%$ compared to the average from 1971-2000.

- State of climate changes by 2100
  In the years 2100, the impact of climate change will be noticeable throughout the country. Climate warming will be felt at country-wide scale. Compared to the current climate it will be very hot in the South as well as in the North. The decline in rainfall will be -8% in the South while the extreme North will see an increase between 1% and 5%.

- Vulnerability of the energy sector
  Four essential energy supply sub-sectors were considered: biomass energy; hydropower; renewable energies and hydrocarbons.

  The potential of each of these energy sub-sectors remains limited by the impact of possible variation in one or more climate’s parameters. The analysis of each sub-sector’s vulnerability are presented with the use of likely scenarios of climate
variations, perception of climate changes by the population and a "non-climate scenario". The biophysical and socio-economic impacts that could occur have been evaluated.

To analyse the energy sector’s vulnerability, three specific scenarios were generated using analysis results obtained with MAGICC - SCENGEN and a cross section of climate parameter values (low scenario, medium scenario and high scenario). High and low scenarios are sometimes referred to as "extreme scenarios".

**Biomass energy**

By 2025, natural formations and plantations will provide significantly less biomass energy. This decline could vary between 18.3% and 27% for the worst scenario (high scenario). A situation moving towards scenarios that could be described as "extreme" even before the 2050s. Projections show that this biomass energy decline could reach 46.4% for the extreme scenario, i.e. almost half of the potential. The occurrence of vagaries such as extreme droughts and floods will increase the vulnerability of this energy sub-sector. Yields from plantations and natural plant formations will decrease. This will have a negative impact on the total wood reserves needed to meet the population’s demand in traditional energies. In the extreme North of the country (Savannah Region), the situation would rapidly become alarming starting from 2025, for the extreme climate scenario. The temperature increase of 0.20°C/decade, higher than the increase in other regions, will result in a deficit in biomass energy greater than in other regions of the country prior to 2050 due to higher evapo-transpiration. The Central Region is the most vulnerable and the Highlands Region is the least vulnerable. Using a specific scenario that considers demographic growth and uses 2000 as the base-line year, we note a decrease of biomass energy in the range of 20% by 2015. If we consider the population growth rate and their energy requirements, the situation could become critical prior 2034. As an example, this year potential is expected to be 12 000 m³ of fuelwood versus the estimated demand of 52 000 m³. The effect of climate changes in the demographic specific scenario highlights the prominence of the decreased energy capabilities creating an alarming situation by 2025. Expanding forest plantations considered under the forestry policy parameter would help to slow the decline of fuelwood for biomass energy. These figures confirm the current trend of the worrying deforestation rate in Togo essentially for needs in energy biomass. The consequences would be an increase in fuelwood market prices, conflicts between governments and populations for the implementation of international conventions on biodiversity and a decline in the standard of living, both rural and partly urban, due to a higher vulnerability;

**Hydropower**

The Oti basin in Northern Togo would see an increase in rainfall of 120 mm by 2025. This slight increase albeit low, could help offset some losses by evaporation. In 2025 and 2050, the hydropower energy potential of Oti will remain extremely sensitive to climate variations. The increase of precipitations could provoke serious flooding in
the case of an extreme scenario. Increasing recurrence of floods in the Oti plain over recent years confirm the trend towards increasing precipitations. This vagary could in certain cases be a handicap (silting) to the optimal functioning of the hydrology structures (spillways, bottom outlet) and could partially limit their operating efficiency.

Other parts of the country, namely those around the Mono River, will observe a decrease in precipitation in the order of 294 mm. Precipitation reductions by 2025 could reach 1.4% for the worst scenario. The resulting impact on the potential would be 7.2% for the same scenario. A significant shortfall in hydropower energy could be possible and vary between 27 and 36% by 2050. The situation could worsen with vagaries such as extreme droughts. In fact, while the probability of occurrence of vagaries such as flooding remains low in this area, the appearance of longer droughts by 2050 may further affect the hydraulic energy potential of this basin. The correlation between electrical energy losses in transmission available (data over less than 10 years) and the increase in temperatures indicates that the electricity grid could face increased line losses due to climate warming. By 2025, assuming that the increase of line losses is entirely due to climate warming, the evaluation of losses following the lowest scenario of climate warming, would lead to losses increases of more than 8%. This value would be almost double (15.12%) by 2040. Electrical energy available for distribution will then undergo a marked reduction during transmission outages. These energy losses would become more significant during the hottest days of the year, during which energy demands are generally higher due to heat waves.

**Renewable energies.**

Projections of future climate change scenarios show an increase in sunlight due to the decrease in the number of rainy days and an increase in temperature. The analysis of the decoupled effect of these parameters would create an increase in the efficiency of photovoltaic installations, which constitutes a de facto positive impact on the potential for solar energy. By 2050, a significant increase in temperatures levels could reduce the solar equipment performance due to the appearance of phenomena such as increase of the resistivity of the conductors and separation of the weld plates, etc.

**Hydrocarbons**

Contrary to other sub-sectors that are directly impacted by climate change, analysis shows that the hydrocarbon sub-sector impact would remain indirect. Decreased biomass and hydropower energy supply is expected to increase the hydrocarbon consumption. Soaring prices could become a consequence of the growing imbalance between hydrocarbon supply and demand.

**Review: impacts of climate change on the Energy sector**

In general, the most vulnerable sub-sectors are biomass energy (heating wood and charcoal), hydropower and hydrocarbons. According to the poverty index, the Savannah Region purports to be the poorest, with a poverty incidence of 90.5%..
followed by the Central (77.7%), Kara (75.0%), Maritime (69.4%), Highlands (56.2%) and Lomé (24.5%) regions. Both the craft industry and industrial activity sectors have significant energy requirements to maintain operating levels. For poor households in the rural and urban environment, the availability in biomass energy, which is their main source of energy, could be seriously compromised in the decades to come. Women will be more vulnerable as they are the ones who are generally responsible for collecting heating wood and charcoal.

The commercialisation activities sector requires electricity for many services including storage management. Food industries will remain highly vulnerable. Moreover, the entire catering industry will be exposed following a shortage of ligneous biomass.

The slowdown in growth and the phenomenon of plant transpiration due to the extreme drought will lead to the reduction of the energy potential of ligneous origin. The disruption of the hydrological cycle due to the extreme droughts and floods presents itself as the main impact of climate change on waterways. As these waterways are upstream from the electricity production systems, energy production and capacity availability will be affected. This will result in a slowdown in several electricity-dependent economic activities. At territory-wide level, the financial losses of energy biomass sector will be in the range of 4.44 billion CFA francs by 2025 for the medium scenario. With this medium scenario by 2050, the losses will be approximately 8 billion CFA francs. For the hydropower sector, an overall loss of between 1.13 and 4.3 billion CFA francs in 2025 would be expected. By 2050, the losses would be 2-5.6 CFA francs.

5.4.2 The National Action Plan for Adaptation to Climate Change (NAPA)

Overall goal
The vision of NAPA-Togo is to establish an optimal adaptability within communities to the adverse impacts of climate change by identifying urgent and immediate adaptation needs and response options, and developing strategies for the knowledge based capacity building of stakeholders and grassroots communities.

Ministry responsible
The Ministry of the Environment and Forestry Resources leads the development process of NAPA-Togo.

Results
The environmental impacts associated with climate risks are significant in land poverty through loss of biodiversity. The socio-economic and cultural impacts are: declining crop yields, livestock deaths, river drought, lower revenue, increased rural exodus, destruction of crops, higher production costs, decrease of income and

35 http://unfccc.int/resource/docs/napa/tgo01f.pdf
purchasing power, increase in famine, resurgence of communicable disease, change in diet, etc.

**Link to energy services**
NAPA-Togo did not consider the energy sector directly as a study theme, but rather the protection and adaptation measures of the coastal zone. This coastal area contains almost all Togo’s energy infrastructure. Construction of the Akosombo dam has contributed to increased coastal erosion by reducing sediment input into the Volta River. The phenomenon of coastal erosion, which originally was a dynamic reaction of the shoreline to the construction of hydroelectric and port infrastructures is further increased by rising sea levels consequent to global warming.

5.4.3 Evaluation of investment and financial flows for mitigation in the energy sector in Togo (IFF).

The UNDP study (201036) presents the additional costs from including mitigation measures in Togo’s energy sector programmes and projects by 2030. The main conclusions are:

**Biomass sub-sector**
Investment flows were significant in the first year i.e. in 2005. This trend dropped over the first five years. In 2010, there was no investment, but between 2011 and 2014, investments resumed. From 2015 to 2024, there will be no incremental investments.
Concerning financial flows, they were very high in the first year but are showing a significant decline thought to 2027, when they become negative. Operation and maintenance costs also very high in the first years and then become steadily lower through 2020.

In general, throughout the project period, investment flows are largely negative whereas financial flows are positive, as well as operation and maintenance costs, although they are still very much less significant than in the case of financial flows.

Togo is technically and financially supported through programmes such as ESMAP (Energy Sector Management Assistance Programme) and RPTES (Regional Program for the Traditional Energy Sector 1997) of the World Bank as well as various programmes implemented by CILSS (Permanent Interstates Committee for Drought Control in the Sahel). Partners such as GTZ (German Federal Enterprise for International Cooperation), the FAO (United Nations Food and Agriculture Organisation) and UNDP (United Nations Development Programme) through programmes related to biomass energy and natural resource management have also participated in the traditional energies sub-sector.

**Electricity sub-sector**

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Concerning investment flows, they are high in the first years and decline until becoming negative in 2011. It should be noted that as of 2025, investment gains related to the implementation of mitigation measures are very high. As well as investments, financial flows are quite significant in the first years i.e. from 2005 to 2009 when they gradually decrease. From 2010, flows become negative and increasingly significant until the end of the period studied. This signifies important gains in financial flows linked to the mitigation made. The same trend is observed in operation and maintenance costs, except that the first year does not require costs, but from 2006 to 2010 there are need for costs. On the other hand, in 2011, the costs are negative and this is more and more pronounced, even very pronounced towards the end of the study period. Overall, the investment flows as well as the financial flows are positive. By contrast, operation and maintenance costs are negative.

**Petroleum products sub-sector**

Investment flows were high but experience a slight drop over the entire study period and currently remain positive. Financial flows were high in the first years and decrease until 2011. From 2012, they are negative and this downward trend is maintained until the end of the study period. For operation and maintenance costs, they are also high in the first years but gradually fall through to 2030. This is mainly due to the fact that the projects identified as part of the mitigation measures have targeted road and railway infrastructures that are strongly reliant on heavy financing.

5.4.4 **Evaluation report of the national potential to be involved in the CDM in the energy and forestry sectors in Togo**

**Goal**

This study seeks to find relevant information for project supporters and carbon market stakeholders to focus on the opportunities available in Togo in terms of the Clean Development Mechanism (CDM). The United Nations Development Programme (UNDP) has decided to support the NDA in order to evaluate the national potential of projects eligible for CDM. This support is situated within the framework of the Environmental Management Capacity Building Programme (PRCGE). The emphasis is placed on the forestry and energy sectors, which are respectively responsible for 84% and 13% of CO2 emissions in 2000 (according to the Second National Communication (SNC)). These two sectors are also of major importance for the country's development due to electrification needs and consumption of fuelwood by households and its impact on deforestation.

**Ministry in charge**

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This study was prepared by the Ministry of Environment and Forestry Resources with technical and financial support from UNDP.

**Results**

The study targeted the energy sector, which is the largest contributor to greenhouse gas (GHG) emissions. It established a link between energy services projects, the development and implementation energy services access and the reduction of businesses and households energy bills.

Several CDM project initiatives have been undertaken in the past, particularly by CF Assist, the African Fund for Biofuels and Renewable Energy (FABER) of the ECOWAS Bank for Investment and Development (EBID) and the West African Development Bank (WADB). Project identification has relied in particular on these earlier studies and on information gathered from project sponsors. All these projects are still in the development stage. To date, no study on the national potential has been conducted. This study has allowed potential projects to be discussed by the energy and forestry sub-sector.

The main results are as follows.

- **Institutional and financial framework:** Institutionally, Togo has a favourable framework for the development of CDM projects, including the existence of a AND within the Ministry of Environment and Forest Resources (MERF). The energy and forestry sectors are organised by functional structures such as the Directorate General of Energy (DGE), the Electrical Energy Company of Togo (CEET), the General Directorate of Environment, Forestry Inspection, the Department of Water and Forests (DEF) Office of Development and Forestry (ODEF). Several programmes already exist and provide foundation for the development of CDM project. The implementation of an investment code and a free zone offer significant advantages to national and foreign investors. Exemption from Value Added Tax (VAT) over the first 10 years to exemption from import custom tax duties, the free zone offers attractive incentives compared to many other countries in the sub-region.

- **Renewable Energies:** The hydropower sub-sector is the most interesting in terms of potential growth and its importance for Togo’s energy security. Solar energy projects, especially photovoltaic ones, are a good strategy but are limited by relatively low emission offsets. By contrast, a national large-scale photovoltaic electricity programme would present certain offset advantages. There is very little potential in wind energy in Togo.

- **Energy efficiency:** Energy efficiency projects currently exist on compact fluorescent lamps, the potential MDP of which is reduced by the GEF project for promoting this kind of lighting products.
• **Municipal waste:** The recovery of landfill gas from Lomé discharge and wastewater systems present an interesting potential for the carbon market. The biogas gathered and used in an energy system would improve efficiencies and reduce methane release to the atmosphere. Composting projects are small scale, yet have the advantage of integrating a community energy and environment approach.

• **Improved cookstoves:** Togo has approximately one million households, of which the majority use wood and coal as an energy source for cooking. A small percentage are not using wood and coal but instead butane and electricity.

• **Other:** the manufacture of fuel briquettes made from agricultural waste and industrial residues, the promotion of small units of domestic biogas and biofuels also deserve development.

The following table provides details for each of these sections.

**Hydro**

The hydroelectric sub-sector provides good energy production operating flexibility and energy security for Togo. According to available data, the total potential of the identified hydroelectric sites is a total installed capacity of 224 MW or 850 GWh per year. In addition to this potential, we must include the hydroelectric development of Adjarala on the Mono River of 147 MW (3 groups of 49 MW each) which is a joint project between Togo and Benin.

Apart from the projects on the Mono River, notably the projects Adjarala, Tététou and the site downstream from Nangbéto, all the other potential projects are small (installed power not exceeding capacity of 15 MW) as defined under the CDMEB of electrical energy production projects.

The potential for CDM projects in the energy sector is dominated by hydropower, which has a total capacity of 113 MW for small projects. Potential annual energy production is 332,500 MWh providing emissions reductions of 266,000 tCO2e/year. The Ministry in charge of energy has targeted 12 sites that are immediate priorities. These projects have a total capacity of 27 MW indicating an energy potential of 66,730 MWh/year and equal to emissions reductions of 53 380 tCO2e/year.

**Solar and wind**

Solar energy projects (especially photovoltaic ones) are a good strategy but are limited by relatively low emission reductions. By contrast, a national programme of large-scale photovoltaic electricity would present some advantages.

There is negligible production opportunities for wind energy.
### Energy Efficiency

Energy efficiency projects currently focus on compact fluorescent lamps. In this CDM project, the estimated residual potential at distribution of 485,000 CFLs for reduction of the power demand of 13.8 MW and emissions reductions of approximately 20,000 tCO2e per year. Other efficient lighting technologies are available on the market and could be the subject of CDM project. These include fluorescent T5 lamps with electronic ballasts to replace T8 fluorescent lamps with magnetic ballasts currently used at more than 60% by households, government and businesses.

### Municipal waste

The recovery of landfill gases from the Lomé discharge site as well as wastewater presents interesting potential for the carbon market with respectively 96,000 tCO2e per year and 84,000 tCO2e per year for avoiding the release of methane into the atmosphere, in addition to the energy potential of biogas. Composting projects seem small scale, but have the advantage of being able to use a community approach. The challenge of some of these projects, including the Lomé discharge site, is related to the capacity of a NGO to mobilise the funding necessary for its implementation. The town of Lomé, CEET and CEB could appropriate the project for better success.

### Improved cookstoves

For a country whose energy balance is dominated by traditional biomass (over 71%), households with low consumption of wood and charcoal constitute one of the options for better managing forestry resources. Projects under development are interesting from this point of view. Both projects aim to distribute to about 68,000 homes, which will reduce the GHG emissions of 34,000 tCO2e per year. The potential may be higher when we know that Togo has approximately one (01) million households, the majority of which use wood and charcoal as an energy source for cooking.

### Recommendations

Togo has, contrary to what the country's size may suggest, the potential for CO₂ emissions reduction by avoidance or high sequestration, i.e. 18 million tons of CO₂ per year of which 17 million tons of CO₂e by sequestration. This can represent an income flow into the country of about 180 million per year for a price of USD 10 by ton of CO₂. Obviously, the eligibility of all these projects compared to the specific conditions of the methodologies must be verified.

The potential of GHG emissions reductions of projects presented in this report were evaluated by the project proponents and are at the PIN stage. These projects must be evaluated according CDM methodologies to determine their true potential. It is also important to note that most projects, due to their small sizes, benefit from simplified procedures and terms of engagement.
Combining certain projects that individually are small carbon reduction contributors, together in a portfolio can more attractive for carbon credit buyers. Micro-hydropower development, improved cookstoves or even efficient lighting programmes would allow the first successful portfolios to sell carbon credits while financing is sought for the remaining projects.

In all energy production projects, the supply and demand equation must be taken into account; i.e. that an electricity energy customer must exist prior to completion of the electricity generation project. The latest developments in the energy sector in Togo revealed a sizeable supply relative to current demand. The government's programme shows that the increase in the country's electrification rate is expected to restore an equilibrium and thus promote the development of further electrical energy projects.

Many projects have been listed in this study, but many others remain to be identified, in particular in terms of bioenergy for better controlled use of fuelwood which would improve the management and conservation of the country's forest mass. Included among bioenergy possibilities are: manufacture of fuel briquettes made from agricultural waste and industrial waste, large-scale promotion of improved cookstoves, and promotion of small units of domestic biogas. Another unexplored area is biofuels projects that could product biofuels to be used domestically or exported to neighbouring countries.

5.5 Environment

5.5.1 National Investment Programme for the Environment and Natural Resources of Togo (PNIERN)

Prepared in May 2011, the PNIERN continues the action plans of the National Action Plan for the Environment (NAPE), by setting a goal of the sustainable environment and natural resources management to improve food security, economic growth and poverty reduction.

Overall goal
The goals is to reduce land deterioration, depletion of natural resources and environmental imbalances, effectively adapt to climate change, and improve the living conditions by involvement of all stakeholders from local to national (or regional) level. Improving living conditions in Togo would include poverty reduction, improvement of the country’s food security and economic growth.

Specific goals

Grouped into three different goals

- Environmental goal: to fight against land deterioration in rural areas, loss of biodiversity and pollution in the urban and rural environment by amplifying the best practices of GERN (Environment and Natural Resource Management) in order to mitigate phenomena related to climate change;
- Development goal: to ensure food security, economic growth and sustainable development in order to contribute to reducing poverty and improving the living environment;
- Institutional goal: to ensure the proper functioning of state institutions and strengthen the technical and financial capacity of stakeholders for integrating GERN into the country's development policies.

Ministry in charge
The Ministry in charge of the programme is the Ministry of Environment and Forest Resources

Link to energy services
In strategic axes of priority investments 2. "Support for the implementation and amplification of the good practices of GERN into the rural environment", priority action 2.1 focuses on the Sustainable management of forestry ecosystems and intensification of reforestation as provided in the NFAP and focused among others on the popularisation of improved cookstoves techniques and the use of domestic gas.

5.5.2 National Forestry Action Programme (NFAP) phase 1, 2011-2019
The National Forestry Action Programme (NFAP) is the reference for the implementation of mechanisms to fight against desertification.

Goals
The overall vision stipulates that by 2035, "by strengthening the process of decentralisation, coupled with an informed accountability of stakeholders at grassroots level, by the incorporation of forestry into rural development, by an effective involvement of private stakeholders and civil society in forestry management and production systems according to an approach that maintains the equilibrium of ecosystems and respects the ecological, social and economic functions of forests.
"Togo reaches a forest cover of 20%, fully covers its needs for fuelwood, preserves its biodiversity and ensures sustainable protection of the risk areas as well as wildlife habitats".

From this perspective, the overall goal of PAFN1 (2011-2019) is enforce accountability of all state and non-state stakeholders in natural environment management goal to increase in national forestry cover. It specifically concerns;
• Strengthening the legal and regulatory framework in the forestry sector in order to formalise the various stakeholder interventions;
• Strengthening the intervention methods of the forestry sector for optimal conduct of the forestry policy;
• Revitalisation of the participatory approach and the decentralisation process in the forestry sector;
• Restructuration and protection of the forestry sector;
• Development of forestry industries;
• Development of forestry research for an adaptation of the forestry sector to climate change;
• Strengthening of partnership and communication in the forestry sector.

In order to achieve these goals, the Programme proposes, among other things, to increase the country's coverage rate from 8% to 30% as recommended by the FAO and thereby increase national wood production by developing natural vegetation and reforesting deteriorated land.

**Ministry in charge**
The Ministry in charge of the programme is the Ministry of Environment and Forest Resources

**Link to energy services**
The programme has made a linked with the energy services in its Component 1.3 Adaptation to the new energy issues and prepared a project brief entitled "Improving carbonisation techniques and the energy wood industry".

The implementation of the measures included in this component will afford a better understanding of the state of the resource at the supply basins, define and develop master supply plans for urban centres in energy wood, continue to raise awareness on the energy wood economy through the massive popularisation of improved cookstoves, the introduction and popularisation of new carbonisation technologies to promote renewable energies, for the promotion renewable energies.