ENI IMPACT TOOL

Measuring the benefits of the Centrale Électrique du Congo in Pointe-Noire

MESSAGE TO OUR STAKEHOLDERS

Energy is a central element for almost all the significant challenges and opportunities for development that the world is facing today. Access to energy is a prerequisite for guaranteeing primary needs, providing community services and enhancing the socio-economic diversification. The key challenge the energy sector is facing today is to find a balance between maximizing access to energy and fighting climate change.

Eni has based its "cooperation model" to support the development of local communities, contribute to reducing inequalities and ensuring the involvement of all stakeholders. In this perspective, we firmly believe that facilitating access to energy efficiently and sustainably for everyone, allows not only the promotion of the countries resources but also guarantees the provision of practical support for local sustainable development.

Today, with two gas turbines and a capacity of 314 MW, the Centrale Électrique du Congo (CEC) covers three-quarters of the energy demand of the local population. The station, which started to operate in 2010, allows the promotion of the country energy resources in economic terms, maximizing the use of gas for electricity generation and the development of local markets. The project also guarantees environmental and social benefits by reducing emissions from gas flaring and improving the living conditions of the local population. The power station is part of Eni's broader strategy to increase access to energy in the country. The project is still in progress, and will provide an additional capacity of 170 MW thanks to the new third turbine.

With this report, we aim at presenting how the CEC has contributed so far to local development in the city of Pointe-Noire, by looking at improvements on access to energy and livelihoods. We believe that these results give us significant insights on the impact it has had on the community and will help us to define our strategy to reduce social and economic gaps and promote sustainable development better.

Marco Rotondi
Managing Director Eni Congo

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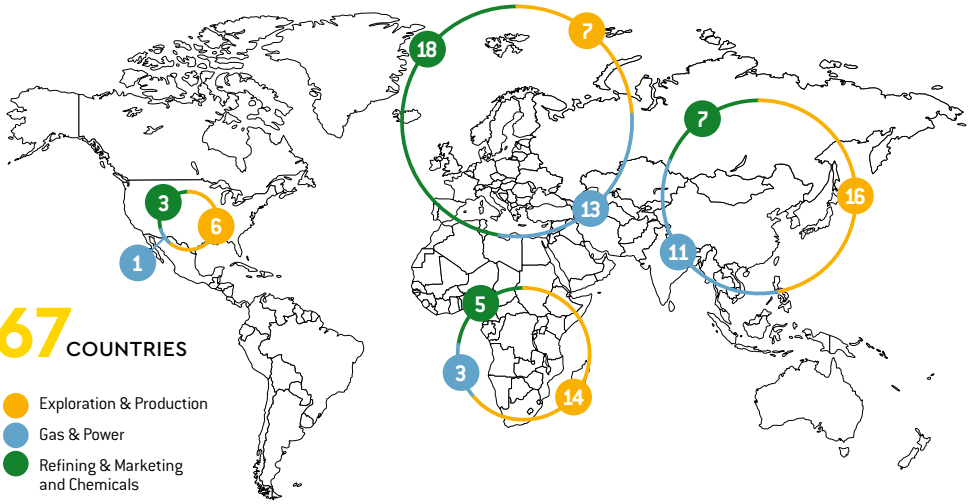
GLOBAL SCENARIO

Eni in the world

Eni is an integrated energy company that operates on a global scale in 67 countries and in a crucial sector for achieving the sustainable development goals set by the UN 2030 Agenda. Therefore, it is called to tackle the ongoing macro trends and participate in the global challenges that the world is facing in the incoming years.

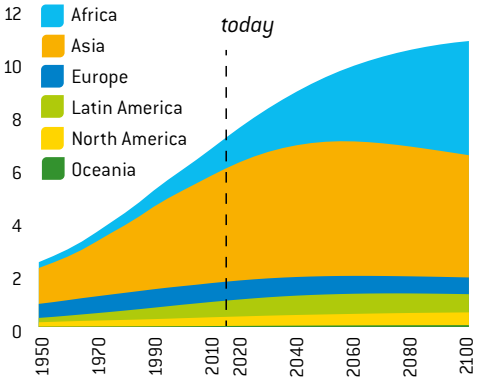


The energy challenge

Today the world population has exceeded 7.5 billion and 83% of it lives in less developed areas, although rich in resources. According to UN forecasts, by 2040, the population will reach 9 billion individuals. As a result, global energy demand is also expected to grow by 27% by 2040 compared to 2017 levels, driven mainly by non-OECD countries (+45%)[1].

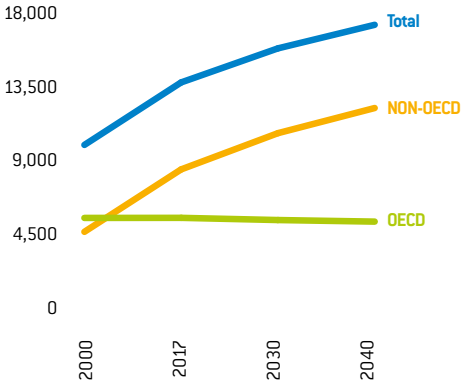
(1) Source: International Energy Agency - New Policies Scenario within the World Energy Outlook 2018.

World population
(Billions of people)



Source: United Nations, Department of Economic and Social Affairs, Population Division (2017).
World Population Prospects: The 2017 Revision, custom data acquired via website.

Total primary energy demand
(Mtoe)



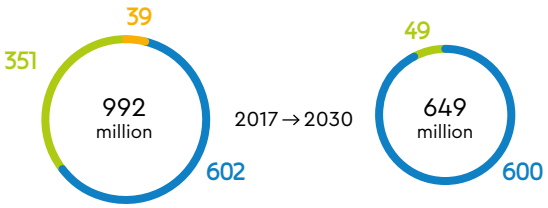
Source: IEA (2018) World Energy Outlook. All rights reserved.

Within these global challenges, energy plays an essential role in achieving basic needs, for the social and economic development of countries, environmental protection, and international security. The centrality of energy within sustainable development is increasingly considered: energy is an essential element to trigger a fair and sustainable development that brings access to primary goods, improves community services such as health and education, supports local enterprises, and provides opportunities to create new jobs.

ACCESS TO ENERGY

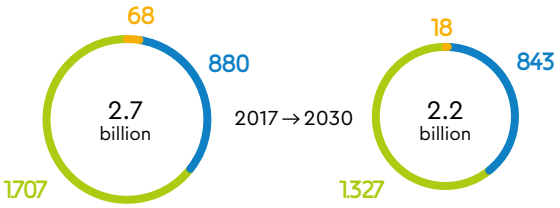
People without electricity
(Millions of people)

By 2030 there will still be about 649 million people without access to electricity, the vast majority of whom will be in Sub-Saharan Africa.



People without clean cooking
(Millions of people)

By 2030 there will still be about 2.2 billion people without access to clean cooking, the majority of whom will be in developing countries in Asia and Sub-Saharan Africa.



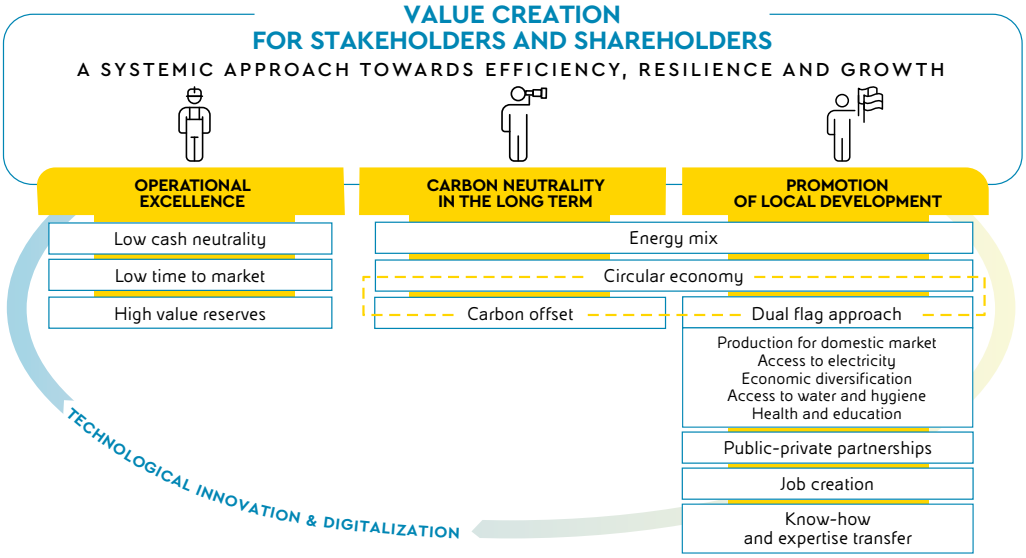
Sub-Saharan Africa | Developing countries in Asia | Rest of the World

Source: Based on IEA data (2018) World Energy Outlook. All rights reserved; as amended by Eni.

Despite the relevance of energy in the context of development, today, almost 1 billion people do not have access to electricity, and around 2.7 billion depend on traditional biomass for their domestic use. These numbers are not likely to change significantly in the near-decade, as shown in the scenario elaborated by the IEA in the most recent World Energy Outlook.

Eni business model

Eni recognizes that the main challenge in the energy sector is providing local communities with efficient and sustainable access to energy resources while combating climate change.
In this framework, Eni has adopted a systemic approach to pursue efficiency, resilience, and growth, which organically integrates sustainability for its business, adopting a business model, fuelled by the application of its innovative technologies and the digitalization process. The following leverages influence the model: 1 operational excellence, 2 carbon neutrality in the long term, 3 promotion of local development.



To promote local development, we supply our gas production to the local market, expanding access to electricity and by developing an extensive portfolio of initiatives addressed to local communities: from the diversification of local economies to projects for health, education, and access to water and hygiene. This "Dual Flag" approach leverages on the collaboration with institutions, cooperation agencies and local stakeholders to identify actions to satisfy the needs of communities according to the national development plans and the 2030 UN Agenda. Eni is also committed to creating job opportunities and transferring its know-how and expertise to the local partners.

ENI IMPACT TOOL

Assessment of the impact of energy projects

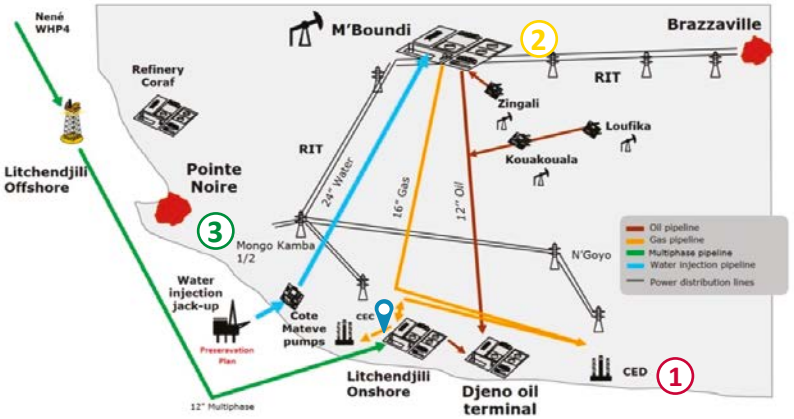
Given this energy scenario, an evaluation metric that enables to address the interconnection of current global challenges has become necessary.
Starting from this perspective Eni, in collaboration with **Politecnico di Milano,** has developed and validated an evaluation tool (**Eni Impact Tool**) to measure the impact on a twofold perspective:

→ IN TERMS OF ACCOUNTABILITY, ASSESSING PROJECT PERFORMANCE, WITH THE AIM OF IDENTIFYING RELATIONS BETWEEN COSTS AND EFFECTS OR NEEDS;

→ IN TERMS OF STRATEGIC PLANNING, IN ORDER TO ASSESS THE CHANGES MADE TO THE LIVELIHOOD OF COMMUNITIES IN ORDER TO SET PRIORITIES AND TO GUIDE AND BETTER ADDRESS FUTURE INTERVENTIONS.

As first application, the Eni Impact Tool was applied to a project in Congo in the Access to Energy sector.
The project refers to the Centrale Électrique du Congo (CEC), a power plant installed in 2010, close to the city of Pointe-Noire.
The objectives were the analysis of the impact of Centrale Électrique du Congo and the assessment of changes in the social, environmental, economic dimensions, on the local, national and global scale.

Perimeter of study and background scenario



The Centrale Électrique du Congo (CEC) is a result of an agreement between Eni and the Republic of Congo and represent the Country's leading producer of electricity. Following the acquisition of the onshore M'Boundi gas field in Congo in 2007, Eni developed a large-scale energy access model, by concurrently optimizing the extraction and recovery of hydrocarbons through the reduction of flaring: the Congo Integrated Gas Power Generation Project. The CEC, which is part of the vast project, has been supplying electricity to the cities of Pointe-Noire and Brazzaville since 2010, thanks to the upgrading of the transmission network to Brazzaville and the expansion of the distribution network in Pointe-Noire.

→ **Centrale Électrique du Congo (CEC)**
- Eni share 20%, State share 80%
- Commissioning 3/2010 and 11/2010
- Installed capacity @2018: 314 MW
- Powered by the gas from the M'Boundi and Litchendjili fields

The integrated project is not limited to power generation, but also involves the downstream factors (i.e. the transport of gas and the electric distribution network)

1

→ **Centrale Électrique du Djéno (CED)**
- Commissioning 12/2008
- Installed capacity 50 MW
- Powered by the natural gas from the M'Boundi and Litchendjili field

2

→ Revamping and reconstruction of the **national high-voltage transmission network Pointe-Noire - Brazzaville** (510 km)
- Commissioning 11/2012

3

→ Extension of the **electric distribution network in the city of Pointe-Noire** (DEPN)
- Commissioning 12/2013
- Supply to 350,000 people (40% of Pointe-Noire population in 2016)
- more than 6,500 street lamps

Eni Impact Tool and Sustainable Development Goals

The Eni Impact Tool has been defined in close relation with the paradigm currently proposed in the 2030 Agenda, where sustainable development embraces complex systems such as global economy, social interactions, environmental preservation, and where interlinkages are embedded within the framework of the 17 Sustainable Development Goals.

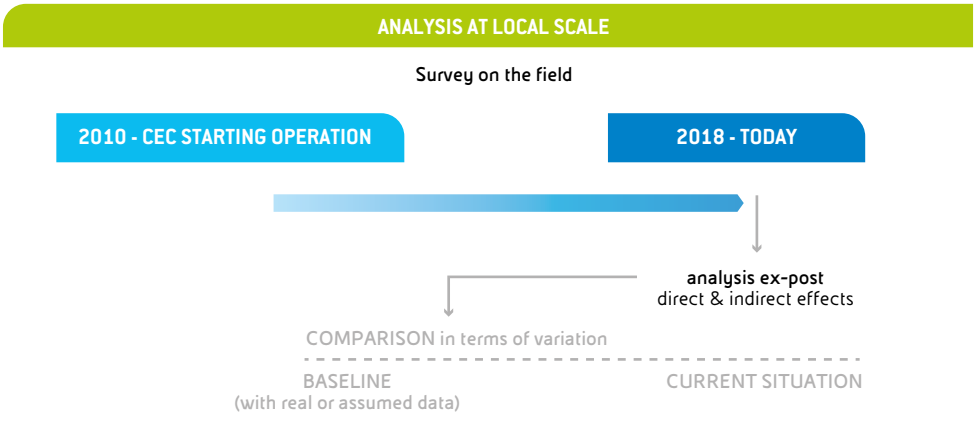
In the first application, the impact evaluation model tackled 13 of the 17 Goals, showing how energy, with the related Goal 7, affects other sectors.

A twofold approach

Eni Impact Tool has been defined with a twofold approach:

→ an **analysis at the local scale**, based on a survey carried out on the field and that is aimed at providing an ex-post evaluation on the changes made in the community;

→ an **analysis at the national and global scale,** based on a quantitative Industrial Ecology model, which may be applied in an ex-ante phase or during the project implementation, with the aim of assessing project performance.



In this report the analysis is focused at local level on the Pointe-Noire area. A field survey, through the submission of questionnaires, has allowed to assess:

→ **direct effects** in terms of access to energy to households, education, health centres

→ **indirect effects** in terms of changes in the livelihoods within the community.

ANALYSIS AT THE LOCAL SCALE

Reference frameworks

When dealing with evaluation of energy projects and impact assessment, a wide range of frameworks may be found in literature related to the energy and development sector, which tackles a broad range of complementary aspects. However, it is difficult to identify a unique standardized and shared approach. Some frameworks are at the level of the global development agendas, promoted by international institutions and agencies; others constitute tools of the project cycle management; other metrics are used for measuring the level of access to energy services or the level of development of community livelihoods.
Based on an extensive literature review, 5 different frameworks have been analysed as potential reference.

From international stakeholders:

→ **Multi-Tier Framework** of the Energy Sector Management Assistance Program (ESMAP) of The World Bank (under Sustainable Energy for All – SE4All initiative);

→ **Multiple Energy Poverty Index** by Oxford Poverty and Human Development Initiative (OPHI);

→ **Service Availability and Readiness Assessment** by World Health Organization.

From national stakeholders:

→ **Guidelines for Project in Energy and Development** by Italian Agency for Cooperation and Development;

→ **Impact Evaluation Framework** developed by Politecnico di Milano.

Data from the fields

THE AREA COVERED BY THE SURVEY

The identification of the appropriate spatial resolution is the first important aspect to consider for the definition of the interviewed sample. Indeed, evaluating the impact of multiple areas helps increase the level of precision and the conclusion that can be derived from the study.
Questionnaires have been submitted in Pointe-Noire in:

→ **5 districts**

→ **38 neighbourhoods**

The **area covered** was identified to meet two concurrent needs:

- **security**, to guarantee safe conditions for the interviewer in submitting the survey;
- **relevance**, selecting districts whose data is important for the analysis and in line with the objective.

Area of analysis

PREPARATION STEPS

The preparation of the survey, which took 6 months, was a very crucial point and included the following steps:

1. **Authorization** from the Ministry of Energy and Hydraulics to conduct the study.
2. **Preparation of the questionnaires.**
3. **Recruitment** by Eni Congo of the personnel (10 people) for the field work.
4. **Involvement of the Société Nationale d'Électricité** (SNE) as facilitator on the field.
5. Information campaign by radio and television to sensitize Pointe Noire inhabitants to the upcoming survey (see the document in the following page).

The survey was implemented after a two-day training session, during which the selected personnel was informed on:

→ the purpose of the survey;
→ the survey method;
→ data compilation.

Throughout the period required to do the survey, **daily debriefing meetings** were held to discuss difficulties and results.

→ IN THIS PHASE, THE AREA OF CITÉ WAS NOT INCLUDED IN THE SURVEY. OTHER AREAS MAY BE OBJECT OF FURTHER STUDIES ON THE FIELD.

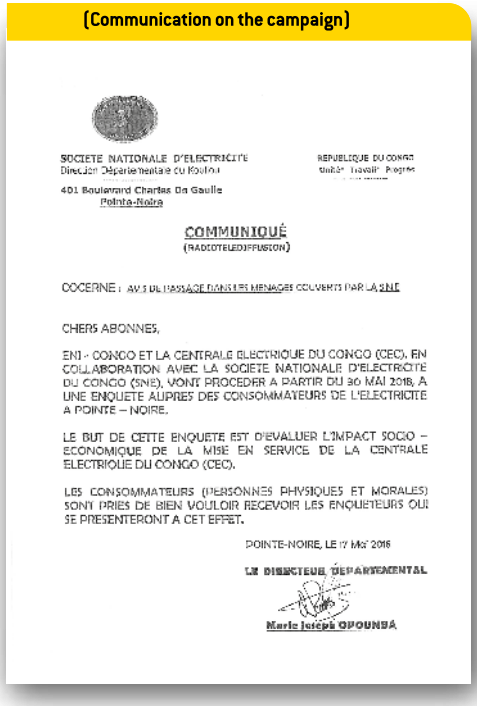
PROCESS TIMELINE

December | January | February | March | April | May | June

PREPARATION OF THE SURVEY
December 2017 - May 2018

FIELD SURVEY
May 2018 - June 2018

(Communication on the campaign)



SOCIETE NATIONALE D'ELECTRICITE
Direction Départementale du Kouilou
401 Boulevard Charles De Gaulle
Pointe-Noire

REPUBLIQUE DU CONGO
Unité Travail Progrès

COMMUNIQUÉ
(RADIOTELEDIFFUSION)

COCERNE : AVIS DE PASSAGE DANS LES MENAGES COUVERTS PAR LA ENE

CHERS ABONNES,

ENI - CONGO ET LA CENTRALE ELECTRIQUE DU CONGO (CEC), EN COLLABORATION AVEC LA SOCIETE NATIONALE D'ELECTRICITE DU CONGO (SNE), VONT PROCEDER A PARTIR DU 30 MAI 2018, A UNE ENQUETE AUPRES DES CONSOMMATEURS DE L'ELECTRICITE A POINTE – NOIRE.

LE BUT DE CETTE ENQUETE EST D'EVALUER L'IMPACT SOCIO – ECONOMIQUE DE LA MISE EN SERVICE DE LA CENTRALE ELECTRIQUE DU CONGO (CEC).

LES CONSOMMATEURS (PERSONNES PHYSIQUES ET MORALES) SONT PRIES DE BIEN VOULOIR RECEVOIR LES ENQUETEURS QUI SE PRESENTERONT A CET EFFET.

POINTE-NOIRE, LE 17 Mai 2018

LE DIRECTEUR DÉPARTEMENTAL

Marie Joseph OPOUNDA

TOPICS OF THE QUESTIONS AND TYPOLOGY OF USERS INTERVIEWED

TOPICS OF THE QUESTIONS

→ ACCESS TO ELECTRICITY
→ LIGHTING
→ COOKING
→ COMMUNITY LIVELIHOODS
- Natural capital
- Physical capital
- Human capital
- Social capital
- Financial capital

TYPOLOGY OF USERS INTERVIEWED

→ HOUSEHOLD
→ SCHOOLS
→ HEALTH CENTERS
→ PRODUCTIVE SITES

SAMPLE OF USERS

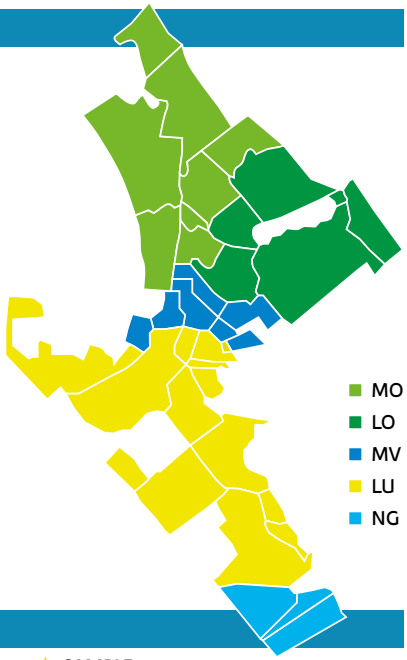
The **determination of the sample** of households should be based on a trade-off between an appropriate statistical approach and practical and logistic requirements. In fact, the appropriate size for survey research depends on four factors:

→ the population size;
→ the acceptable margin of error;
→ the confidence level;
→ the standard deviation of the data collected.

HOUSEHOLD SAMPLE

DISTRICT	SAMPLE	POPULATION
Loandjili -**LO**	293	260,927**
Lumumba -**LU**	243	109,456**
Mongo Mpoukou -**MO**	235	n/a
Mvoumvou -**MV**	174	87,696**
Ngoyo -**NG**	51	n/a
Total	**996***	**969,000*****

(*) 996 households corresponding to around 6,200 people.
(**) Data from RGPH-2007 (General census of the population).
(***) Data 2015.



Samples of all districts keep acceptable errors and confidence levels (Ngoyo on lower extent). Considering the aggregated data ('TOTAL') at city level, the sample reaches higher representativeness.

SAMPLE OF OTHER USERS

DISTRICT	SAMPLE SCHOOLS	SAMPLE HEALTH CENTRES	SAMPLE PRODUCTIVE SITE
Loandjili -**LO**	5	4	110
Lumumba -**LU**	15	11	85
Mongo Mpoukou -**MO**	8	7	85
Mvoumvou -**MV**	11	6	71
Ngoyo -**NG**	3	0	29
Total	**42***	**28**	**380**

(*) 42 schools corresponding to approximately 18,500 students.

The **sample size** for other typologies of users (**schools, health centres, productive sites**) was not defined ex ante, due to the smaller and unknown number of population. Therefore, the survey team was asked to intercept the highest number of sites.

The final **sample covered almost all the existing centres**, thus providing a good confidence level.

Impact on communities: changes in livelihood

A methodology developed by Politecnico di Milano has been adopted to evaluate the impact that the Centrale Électrique du Congo has had on the community of Pointe-Noire. The methodology, named Impact Evaluation Framework, starts from the Sustainable Livelihood Framework (developed by the British Department for International Development, DfID) and aims at defining a comprehensive metrics based on changes in livelihood.

It is structured by a hierarchy, which identifies 3 main areas of critical importance, Planet, People and Prosperity, each one made up of different dimensions. The hierarchy refers to the framework proposed by the Agenda 2030 and provides a standard structure that may be applied to different projects.

→ **Planet.** This area includes the cluster of SDGs related to the Natural Capital, in order to assess the perceived pressure that a project can have on the environment in 2 main selected dimensions: Water, Air. The referring SDGs are SDG 6, SDG 13, SDG 15.

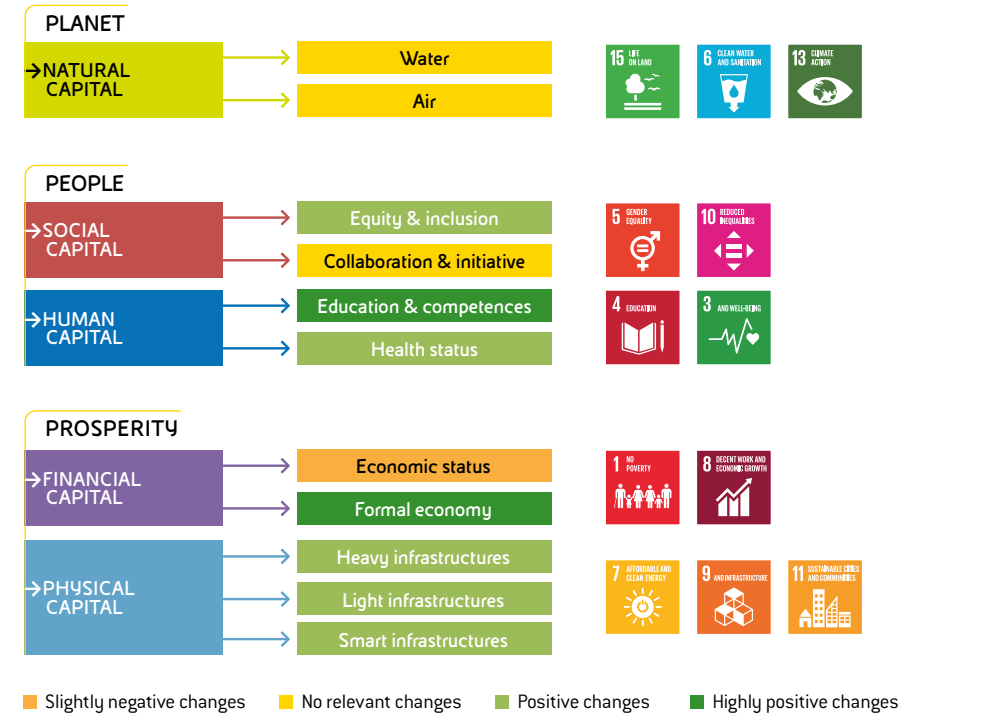
→ **People.** This area includes two clusters of SDGs related to Social Capital and Human Capital. In terms of Social Capital, equity is one of the central values underlying sustainable development and involves the degree of fairness with which opportunities are accessible and free in terms of gender, income, class equity, and time. Another important aspect of this dimension is inclusiveness, which indicates the community's accessibility to infrastructures and services and the affordability thereof. Social inclusion also assesses possible improvements in social networks (e.g. collective representations, industrial aggregation, research groups) and initiatives (e.g. new start-up, working groups, trademarks and patents) through which people support each other. The referring SDGs are: SDG 5 and SDG 10.

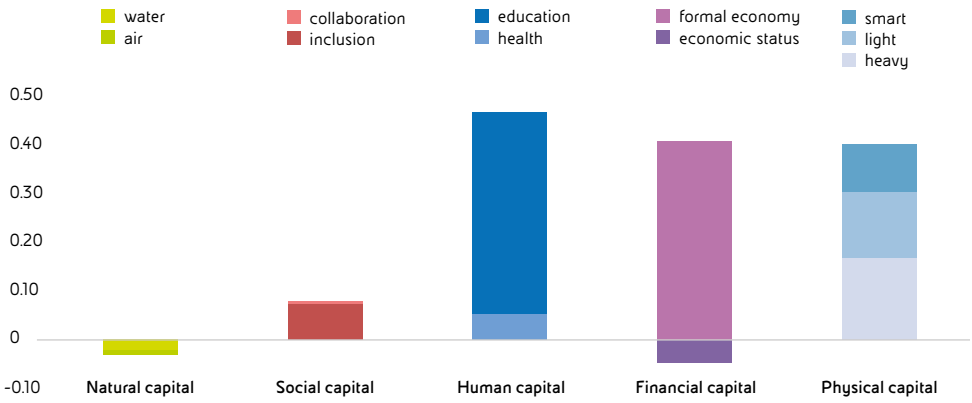
The Human Capital includes knowledge, aptitudes, labour skills and good health which allow people to take on different activities and achieve their objectives in terms of wellbeing. Two main dimensions are considered in this capital: Education & Competencies and Health Status. The referring SDGs are: SDG 3 and SDG 4.

→ **Prosperity.** This area includes two clusters of SDGs related to Financial Capital and Physical Capital. The Financial Capital considers the economic resources used by people to improve their poverty status, fulfil their objectives in terms of livelihoods, as well as employment, economic development, and new working activities. The two dimensions are: Economic Status and Formal Economy. The referring SDGs are: SDG 1 and SDG 8. The Physical Capital includes infrastructures, services, and production of goods that help people meet their basic needs and be more productive. Three dimensions are investigated: Heavy Infrastructures, Light Infrastructures, and Smart Infrastructures. The referring SDGs are: SDG 7, SDG 9, SDG 11.

The results shown in the following diagram show that the main benefits were obtained in the area related to Prosperity, mostly due to the development of the Formal Economy, and in the area related to People, with regards to Education and Health Dimensions.

LIVELIHOOD CHANGES: MAIN RESULTS





NOTE: Results are calculated on a normalized scale from -1 to +1. Values higher than 0 represent positive changes, value lower than 0 represent negative changes.

Results may be also seen through the disaggregation of the Areas into their Dimensions, in order to observe where the most important achievements were obtained. **Economic status** does not increase, despite the development of new productive sites and income generating activities. According to the responses of the people interviewed, this was likely **due to the recent economic situation** affecting Pointe-Noire.

Impact on communities: variation of access to energy

ACCESS TO ENERGY IN HOUSEHOLDS

Different metrics exist to track and trace access to energy and the sustainable dimension in achieving it. In this work two complementary approaches have been used, one identified by the Multidimensional Energy Poverty Index (MEPI), another related to the Multi-Tier Framework (MTF) of the ESMAP programme of The World Bank.

The Multidimensional Energy Poverty Index (MEPI)

The MEPI is a composite index designed to shed light on energy poverty by assessing the services that modern energy provides. The index focuses on modern energy deprivation and captures both the incidence and intensity of energy poverty.

It is composed of 6 indicators, divided into five dimensions, encompassing essential energy services of cooling, lighting, appliances, entertainment/education and communication, within the household users. The indicator enables to capture the set of energy deprivations affecting a household and assign energy poverty when the sum of deprivations exceeds a specific value. MEPI is calculated

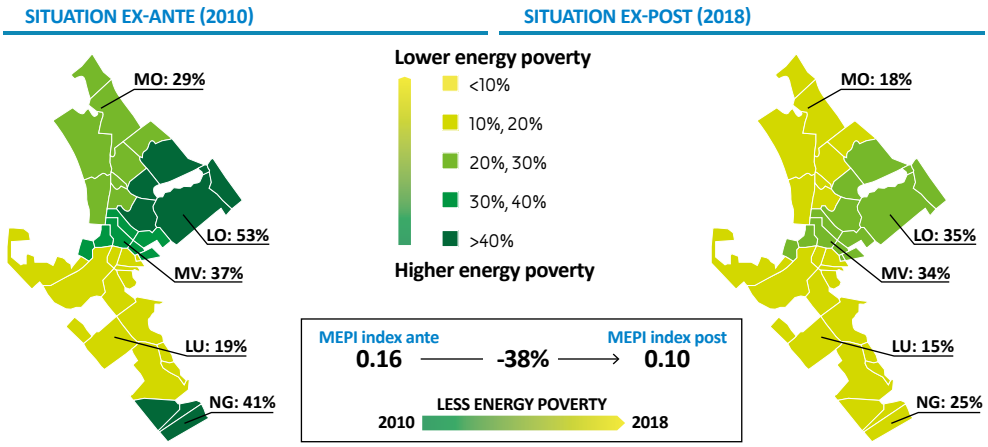
as the product of the ratio of people defined as energy poor and the average intensity of deprivation. Hence, the index intends to provide a measure of the energy poverty in relation to the energy requirements of the household.
The MEPI calculation enables to quantify the headcount ratio, or rather, the share of people identified as energy poor.

In all the districts the **headcount ratio decrease**, showing a decrease in the number of households that experience a situation of energy deprivation.
At the overall level, the index decrease of 38%, confirming the reduction of energy deprivation in the area.

Range (0.1) - The higher the value, the higher the energy deprivation

Dimension	Indicator (weight)	Variable	Deprivation cut-off (poor if...)
Cooking	Modern cooking fuel (0.2)	Type of cooking fuel	use any fuel beside electricity, LPG, natural gas, or biogas
	Indoor pollution (0.2)	Food cooked on stove or open fire (no hood/chimney) if using any fuel beside electricity, LPG, natural gas, or biogas	true
Lighting	Electricity access (0.2)	Has access to electricity	false
Services provided by means of household appliances	Household appliance ownership (0.13)	Has a fridge	false
Entertainment/ education	Entertainment/education appliance ownership (0.13)	Has a radio OR television	false
Communication	Telecomunnication means (0.13)	Has a phone land line OR a mobile phone	false

VARIATION OF ENERGY POVERTY



District: Loandjili - LO; Lumumba - LU; Mongo Mpoukou - MO; Mvoumvou - MV; Ngoyo - NG

The Multi-Tier Framework (MTF)

Energy access is usually defined and measured in a binary way. This typically leads to the quantification of "having / not having" an electricity connection or non-solid fuels. The advantage of this mode of tracking is that it is simple, but can also be misleading. Focusing on the only access attribute may provide a distorted picture since it does not take into account other features that determine if this access can offer a reliable, affordable, and modern service.

The MTF (developed by the World Bank acting in the role of the SE4ALL Knowledge Hub, with the support of the Energy Sector Management Assistance Program ESMAP) redefines energy access, introducing an approach that goes beyond the binary access. The methodology is designed to be technology and fuel neutral when evaluating the performance of the electricity supply.

Key **attributes** determine the "usability" of service and provide a range of criteria for measuring the access in terms of quantity and quality, tracking all aspects of SDG7 definition of energy access, including reliability and affordability.

In the perspective that energy access is a spectrum of service **levels**, MTF classifies energy services in tiers, from Tier 0 (no service) to Tier 5 (full service).

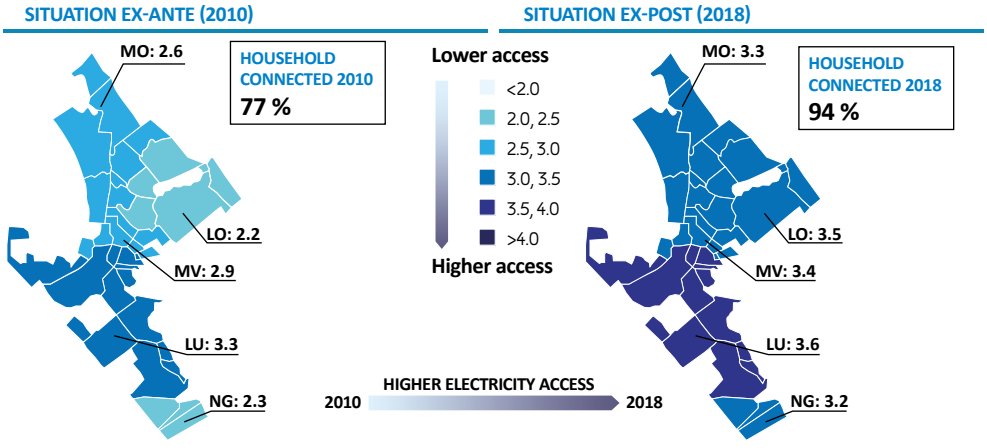
For electricity, Tier 1 corresponds to a basic service level, with lighting and cell phone charging. Higher tiers have higher capacity and service duration, allowing households to acquire more domestic appliances and using power for productive purposes.

SET OF ATTRIBUTES ↑	HIGHER LEVEL OF ACCESS →					
	TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
CAPACITY	Ability of the system to provide electricity (associated to the source of supply)					
DURATION	Amount of time during which electricity is available					
RELIABILITY	Frequency of disruption and duration of disruption					
QUALITY	Voltage and effects of fluctuations on the use of appliances					
AFFORDABILITY	Ability to pay for the electricity needed to use					
LEGALITY	Connection to the grid under legal terms					
↓ HEALTH & SAFETY	Absence of accident and perception of future risk					

Based on the MTF framework, the index of electricity access of all households has been calculated for each district, comparing the ex-ante and ex-post situations. The index includes all the aspects identified by the attributes and synthesizes them in a composite value.

The maps of Pointe-Noire below show the variation of access to electricity since the starting operation of the CEC, highlighting the specificities of the districts that have been analysed: Loandjili (LO), Lumumba (LU), Mongo Mpoukou (MO), Mvoumvou (MV), and Ngoyo (NG). In the whole area, an increase of access to electricity has occurred for the last eight years, with more significant improvements in the neighbourhoods where the conditions were initially worst.

VARIATION OF ACCESS TO ELECTRICITY[2]



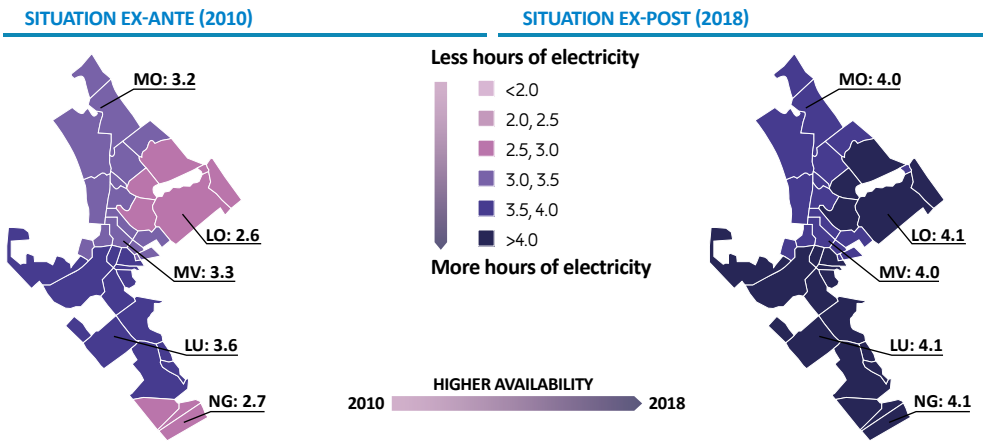
District: Loandjili - LO; Lumumba - LU; Mongo Mpoukou - MO; Mvoumvou - MV; Ngoyo - NG

(2) Index in the range 0-5.

As an example, the attribute of Duration has been analysed. The attribute refers to the amount of time in a day during which electricity is available (from a condition of no electricity in Tier 0 to a situation where electricity is available 24 hours per day in Tier 5).

As shown in the maps below the Duration level has increased. Improvements are recorded in all districts.

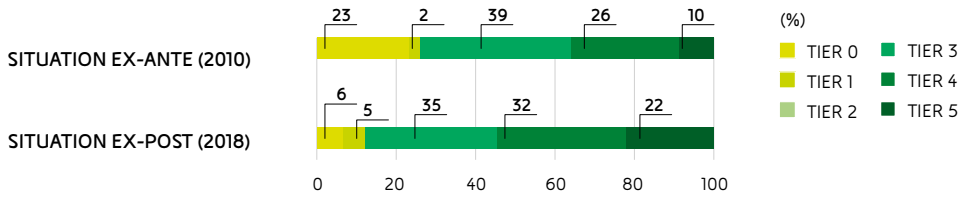
VARIATION OF ELECTRICITY AVAILABILITY[3]



District: Loandjili - LO; Lumumba - LU; Mongo Mpoukou - MO; Mvoumvou - MV; Ngoyo - NG

Considering the entire area, the distribution of households in the different Tiers can be visualized, comparing the ex-ante (2010) and the ex-post (2018) situation.

Results shows a general increase in the access to electricity, with higher proportion of household in higher Tiers.



Approximately 540 households interviewed now have access to high quality electricity (Tier 4 & Tier 5).

Considering the entire area, the distribution of households can be visualised in the various Tiers, comparing the ex-ante (2010) and the ex-post (2018) situation.

Results shows a general increase in the access to electricity, with higher proportion of household in higher Tiers.

(3) Index in the range 0-5.

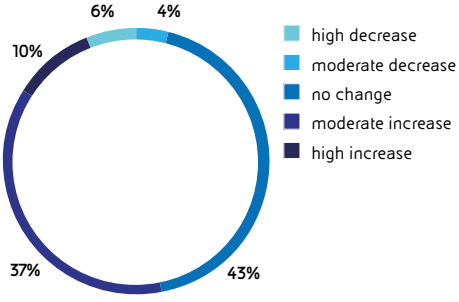
Indirect effects of access to energy: benefits on education

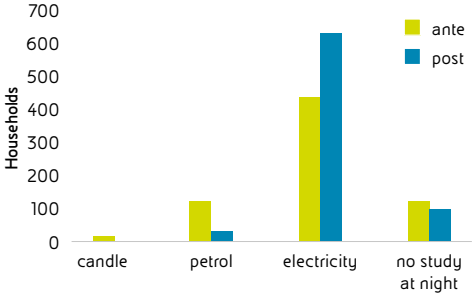
Adequate energy access is a crucial factor for increasing access to social services, such as education and health.
In this perspective, the survey has investigated how the electricity supply has enabled a better level of education in terms of quality and quantity, at the household level and in the education centres.

Households

Almost half of the households have experienced an overall increase in the hours of study since the starting of the CEC. Moreover, results from the surveys show an increase of the households where electricity is used to study at night, and a concurrent decrease in the use of other sources as candles and petrol, which may affect the quality of the indoor air.

OVERALL PERCEPTIONS FROM SURVEY DATA





HOURS OF STUDY

Question:
Have you noticed an increase in the hours of study at home compared to the past situation?

SOURCE OF STUDY

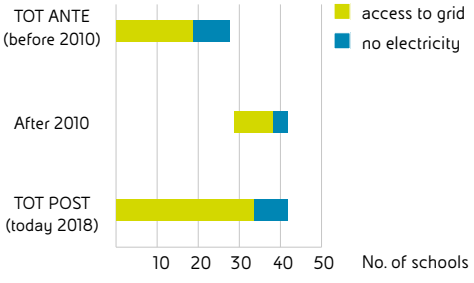
Question:
Do students study at night in the house? What light source do they use?

Education centres

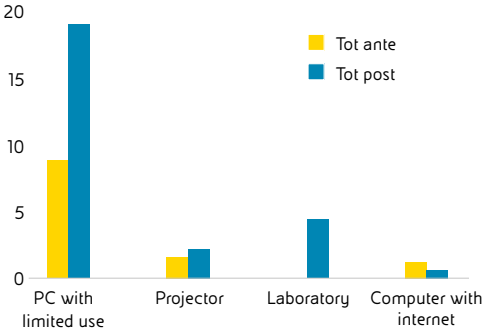
The survey submitted in the education centres shows how the majority of the schools (81%) that opened after 2010 have been connected to the grid.
Moreover, there has been in increase in teaching equipment in the last eight years, with a higher diffusion of personal computers and laboratory facilities.

→ TOTAL SCHOOLS INTERVIEWED (POST) **42**
- EXISTING BEFORE 2010 (ANTE) **26**
- OPENED AFTER 2010 **16**

ELECTRICITY SUPPLY IN EDUCATION CENTRES



TEACHING EQUIPMENT IN EDUCATION CENTRES



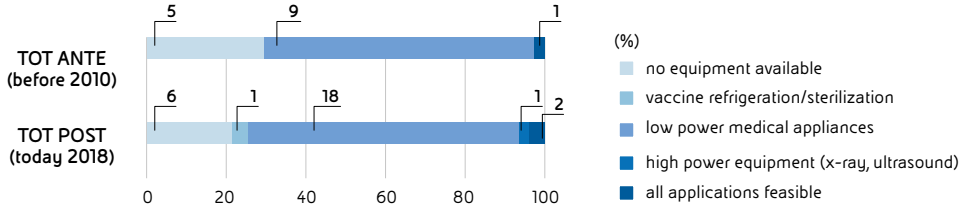
Indirect effects of access to energy: benefits on health

Access to modern forms of energy is pivotal for the provision of sanitation and healthcare. Electricity supply enables basic needs as lighting or mobile charging for communication. Also, electricity allows different types of medical equipment, from vaccines refrigeration to diagnostic appliances, and enables necessary procedures to be carried out throughout the entire day.

Health centres

The survey submitted in the health centres shows an overall increase in medical equipment. Centres provided of lower power medical appliances currently have higher diffusion, in comparison with the situation before the starting of the CEC. Moreover, more centres can now benefit from vaccine refrigeration and top power equipment.

MEDICAL EQUIPMENT



In addition to the analysis of how medical equipment has spread thanks to the availability of electricity, the survey also investigated the Service Availability and Readiness of health care centres . The Service Availability and Readiness Assessment (SARA), a framework developed by the World Health Organization (WHO) in collaboration with United States Agency for International Development (USAID), has been taken as reference for this purpose.

→ TOTAL HEALTH CENTRES INTERVIEWED (POST) **28**

- EXISTING BEFORE 2010 (ANTE) **15**
- OPENED AFTER 2010 **13**

The collected data has provided an understanding of the changes that occurred in terms of service availability (see the following table), recording positive variation on the aspect of 'health availability' related to the increase of inpatient beds and maternity beds.

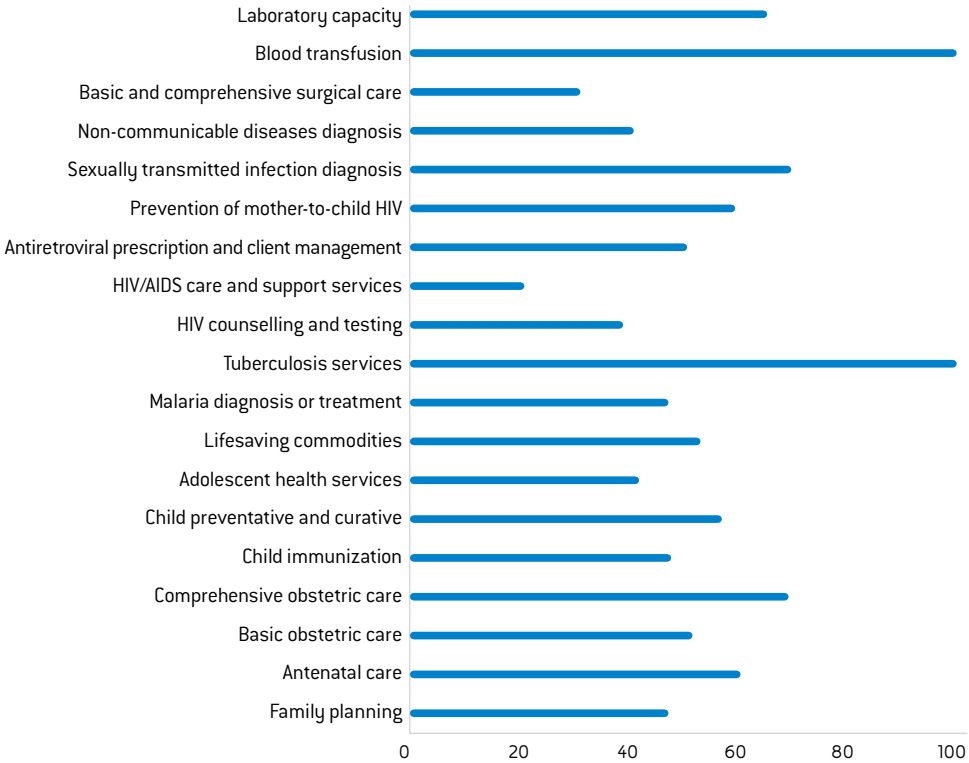
Domain	Indicators	Variation ante/post in health centres involved in the survey
Health availability	Inpatients beds	+
	Maternity beds	+
Health workforce	Employees	=
Service utilization	Outpatients visits	=
	Hospital discharges	=

The survey also allowed to measure the Service-Specific Readiness, which refers to the ability of health facilities to offer a specific service.

All registered variations show that the changes that occurred in the health sector from 2010 to 2018 are positive and demonstrate an increase in the services available in the area.

SERVICE-SPECIFIC READINESS

Ability of health facilities to offer specific services



Increase in the diffusion of services (%) from 2010 to 2018

Way forward – Possible areas of improvement

The analysis on access to electricity also provided an understanding on the limiting causes that affect the supply in Pointe-Noire. The main outcomes from the analysis of 996 households have been:

HOUSES WITH FULL ELECTRICITY ACCESS

215

households do not have any issues related to electricity and experience high quality access

HOUSES WITH ISSUES OF QUALITY – VOLTAGE INSTABILITY

182

households encounter quality issues, with voltage instability that may affect the use of appliances

HOUSES WITH ISSUES OF RELIABILITY – DISRUPTIONS

148

households face reliability issues due to the number of disruptions that varies from 3 to 14 times per week

HOUSES WITH ISSUES OF DURATION – HOURS OF SUPPLY

96

households experience electricity supply problems since it is available less than 12 hours a day

These results give a first insight of the main areas of improvement and may help to better address future interventions in the city.

Public Private Partnership for an innovative evaluation tool

POLITECNICO MILANO 1863

Eni Impact Tool is an evaluation model which aims at measuring the changes generated by a project on living conditions of local communities. The model has been first applied to the sector of access to energy and has been based on recognized methodologies used by institutions such as the World Bank and in initiatives linked to the UN Agenda 2030.
This model is the result of a mutual collaboration between Eni and the Department of Energy of Politecnico di Milano. Models of this type find the most fertile ground when they can count on multi-stakeholder participation, where the research is able to provide innovative tools capable of grasping the multidimensionality of development, while the private sectors, characterized by consolidated operational skills and on-field experience, may guarantee different case studies with the opportunity to test and apply the innovative methodologies and scale up at industrial scale positive outputs of these pilots.
In the international context characterized by a renewed focus on sustainable development, the knowledge of long-term impact of specific interventions, innovative projects and political strategies, and the ability to monitor them become essential to plan future investments and to ensure their adjustment over time. In this perspective, impact analysis models are currently under the spotlight: among others, survey-based methods are relevant for developing countries, often characterized by fragmented and low-quality data. These methods allow to evaluate direct and indirect implications of a specific project, such as the construction of a power plant for the production of electricity within the industrial and economic structure of a country, and to understand over time the effects on a set of economic, environmental and social indicators. Moreover, this assessment allows to identify the most appropriate complementary activities that may enable the sustainable development of local communities.

Department of Energy
Politecnico di Milano

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