

## CEMIG'S SOCIAL AND ENVIRONMENTAL IMPACT ASSESSMENT

Cemig's vision is to provide integrated solutions of clean and accessible energy to society, in an innovative, sustainable and competitive manner. Thus, it is clear that sustainability plays a central role in our organization, and it is necessary to balance economic, social and environmental aspects and be aware of them throughout the life cycle of our services.

Because our services reach more than 8 million customers in one of the largest states in Brazil, and we deal with a service that, although fundamental to our quality of life, carries with it social and environmental impacts and risks, we need to understand very well how we affect the society in which we operate.

Generating, transmitting and distributing electricity is an immense responsibility and fundamental to the development of a nation. Aware of this, we increasingly seek to generate clean energy, transmit with confidence and guarantee the availability of energy to society.

Therefore, the following text aims to demonstrate how, in a collective effort of reflection with our main stakeholders, we have increasingly sought to understand, quantify and monetize all the impact that our service chain brings with it.

By demonstrating these impacts in monetary terms, we can better compare the financial, social and environmental effects of our processes, which allows us to make decisions efficiently, bringing a broad view of our risks and opportunities.

The following text seeks to demonstrate the methodology, variables and steps necessary to determine the impacts of our activities.

### 1. METHODOLOGY

The methodological approach adopted in this project is based on the Theory of Change, as a guiding method for the definition and prioritization of external impacts resulting from the operation.

The Theory of Change is a flexible instrument, with practical application for the planning and evaluation actions of organizations, programs and projects. It explains the logical model that connects business processes to their short, medium and long-term results. It captures the causal relationships that exist between the problems addressed by the organization, the goals defined for its treatment, the activities defined to reach it and the results actually achieved or planned. The visualization of these relationships allows the identification of deviations in the organizational trajectory or opportunities to enhance the desired results. This logical chain enables the structuring of a manageable metrics matrix that is more adherent to the organizational reality.

Regarding the social and environmental externalities resulting from the business operation, the causal chain of Theory of Change was established in the light of the organizational legacy. This means that the articulation and dynamics existing between the actions of the businesses and their results are evaluated based on the social, environmental and economic impacts to be achieved in the last instance, that is, the social transformation effectively generated by the business. This approach allows the identification, measurement and evaluation of the positive and negative impacts generated, constituting an adequate methodology to explain the impact chain of CEMIG, focusing on the identification and measurement of the main externalities resulting from its operational axes, Generation, Transmission and Distribution.

The construction of the Theory of Change must be participatory, in order to guarantee, at least, the representativeness of the internal groups of stakeholders involved directly in the strategic decision-making processes and operation. This collective construction is essential to explain a logical chain that effectively represents the elements and relationships established in practice.

The development of the process of construction of the Theory of Change for CEMIG began with the diagnosis of the business axes and their main economic, environmental and social results. This stage involved internal research and document analysis. The analysis started from the Materiality Matrix, covering the understanding of

the thirteen most relevant material aspects indicated and their relationship with the company's stakeholders.

## 2. DETAILING THE IMPACTS OF THE ACTIVITIES

Below, we highlight the main activities, the indicators defined to measure them, the externalities, the references used to monetize the impacts and the estimated costs.

Business Axis	Externality	Impact Indicator	
		Description	Type
Generation	1. Changes in the health and well-being of the population, due to the worsening of air quality and climate change.	Social cost of greenhouse gas emissions.	Monetary
	2. Reduction in the volume of fish caught, with a consequent reduction in fishermen's income and local income.	Amount taken from the local economy due to the affected biomass (VR).	Monetary
		Socioeconomic impact due to the affected biomass.	Quantitative
Distribution	3. Expansion of public spending by SUS and Social Security as a result of accidents with the population.	Social cost of accidents with the population.	Monetary
	4. Expansion of household income in the rural region from the arrival of electricity.	Socio-economic impact of electrification of rural areas.	Monetary

### 2.1 ENVIRONMENTAL IMPACTS

#### 2.1.1 Greenhouse gas emissions

Activity description: Cemig quantifies and discloses its emissions through the Greenhouse Gas Inventory (IGEE, *Inventário de Gases de Efeito Estufa*), recognizing its share of responsibility in the subject and identifying opportunities to reduce emissions and costs, adequately managing its risks related to climate changes. For the calculation of GHG emissions, the "GHG Protocol Tool", Brazilian version, "Tool\_GHG\_Protocol\_V2018.1.4" was used to calculate greenhouse gases for intersectoral sources.

External impact: GHG emissions from operations cause changes in the population's health and well-being, worsening air quality and climate change. It is also considered

the reduction of water resources, deaths from cardiovascular diseases, the flooding of productive areas, deaths from diseases resulting from floods and the impact on biodiversity.

Researched sources: EPS (Environmental Priority Strategies), based on the LCA methodology, ISO 14040 and 14044.

Base price applied:

Social cost per kilogram of gas: CO<sub>2</sub> (0.13 euros); N<sub>2</sub>O (35.84 euros); SF<sub>6</sub> (3,457.77 euros) CH<sub>4</sub> (3.82 euros).

### **2.1.2 Socioeconomic Impact with Affected Biomass**

Description of the activity: The construction of hydroelectric plants can put the fish that inhabit the rivers at risk, due to several changes caused to the aquatic environment by the use of dams.

External impact: Economic impact of the withdrawal of a large volume of fish from hydrographic basins in regions where fishing is one of the sources of income generation.

Researched sources: Average value of the kilogram of fish found in Cemig's main plants. Municipal Livestock Research (PPM), from the Brazilian Institute of Geography and Statistics (IBGE, 2017). Value moved by aquaculture activity in the municipalities. Municipal Human Development Index (MHDI) of the main cities in the facilities' basins. Value moved by aquaculture activity in the municipality. Representativeness (%) of the activity in the local Gross Domestic Product (GDP). Population of each municipality.

Base price applied:

BRL 7.67, the average kilogram of fish found in the basins of Cemig's main plants (2017), adjusted for inflation.

## **2.2 SOCIAL IMPACTS**

### **2.2.1 Social Cost of Accidents with the Population**

Description of the activity: The company's services, in their three main business areas, generate direct risks to the health and physical integrity of the population, materialized, mainly, in accidents resulting from externalities of their own activities and behavior of the population.

External impact: Among the main consequences of accidents involving the population, burns have the largest share, with 46% of all accidents recorded in the last three years. Among accidents without death, burns represent 65%. Out of the main activities responsible for accidents, building maintenance corresponds to 32.14% of the records. Telephone and internet services represent 14.29% and locomotion and rural services together add up to 19.64%.

Researched sources: Table of Procedures, Medicines and OPM of SUS (Unified Health System). Open data portal of Brazilian Social Security. Social Security Statistical Bulletins.

Base price applied: Social cost of accidents with death: BRL 113,299.46 per injured person. Social cost of accidents without death BRL 1,049.76 per injured person.

## **2.3 FINANCIAL IMPACTS**

### **2.3.1 Socio-economic impact of electrification of rural areas**

Description of the activity: Cemig has the duty to bring quality electricity to the entire rural area of the 774 municipalities in its concession area. This work also has a social function, contributing to the fight against poverty in the inland cities. In addition to assisting the user with the installation of the electric network, Cemig also offers, free of charge, a basic kit for internal installation, which contains an input standard, connection branch, lamps and socket-outlets. Therefore, the beneficiary must be in the Federal Government's Single Registry.

External impact: Positive effects of access to electricity in rural households: nightly work activities that complement the family's income, use of tools and equipment, increased productivity and generation of new business opportunities, better food conservation, maintaining the freshest and healthiest to consume and perform school tasks at night.

Researched Sources: National Household Sample Survey (PNAD), from the Brazilian Institute of Geography and Statistics (IBGE).

Base price applied: Each new electrical connection in a rural household increases the household's income by BRL 758.92.