NACHTIGAL HYDRO-ELECTRIC DAM: UNDERESTIMATE OF GREENHOUSE GAS EMISSIONS

Briefing Note

Josiane TEDONGMO SONKWA
Jean Henri TSOGO AWONA

May 2022

TABLE OF CONTENT

Introduction

Climate change (CC) is a phenomenon which affects countries around the world. As a matter of fact, many countries became aware of the importance and necessity of preserving the environment at the Earth Summit held in Rio de Janeiro in 1992, by adopting, among others, the United Nations Framework Convention on Climate Change (UNFCCC) with the objective of « stabilizing greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system « (UNFCCC, 1992). The 2014 report of the Intergovernmental Panel on Climate Change (IPCC) raises the warming of reducing anthropogenic CO2 emissions to 45% by 2030 from 2010 levels to reach net zero emissions around 2050, in order to stabilize the average temperature below 2°C. As a result of this report, the Party countries agreed in a consensual manner at the end of COP 21 to revise thenceforth their mitigation commitments.

Cameroon, a Party country to the UNFCCC, has thus committed itself in its Nationally Determined Contributions (NDC) to reducing its greenhouse gas (GHG) emissions by 35% compared to 2010, by 2030. Considering the development of projects undertaken by Cameroon in the implementation of its National Development Strategy (NDS30), that is: the construction of the Kribi deep seaport, the 2nd bridge over the Wouri, the construction of the Yaounde-Douala motorway, the construction of hydro-electric dams (Mékin, Lom Pangar, Mevemle, Nachtigal), the development of agro-industries and that of the mining and metallurgical sector, etc.,,it is therefore necessary to question the achievement of Cameroon's objectives in terms of reducing GHG emissions. Furthermore, national regulations on environmental impact assessment and some sectoral policies do not sufficiently integrate or take into account the climate risk. The conventional practice of Environmental and Social Impact Assessment (ESIA) focuses more on biodiversity and socio-economic aspects, rather than on climate aspects. Inevitably, these major projects could lead to an increase in GHG emissions as the mitigation measures recommended in the environmental and social management plans are not sufficiently adequate to the scale of the climate risk involved.

In the case of the Nachtigal hydro-electric dam construction project, the non-exhaustive emissions are estimated at approximately 559,682.31 tCO2e.year-1 instead of 186,800 tCO2/year as estimated in the ESIA (2011), a difference of 373,682.31 tCO2/year. This project, currently underway in the Central Region, especially in the Mfoundi (Nkolondom II), Lékié (Obala and Batchenga), Upper Sanaga (Mbandjock), and Mbam et Kim (Ntui) Divisions, aims to develop, build and operate a 420 MW hydro-electric power plant in Cameroon, and is therefore of particular concern in terms of its impact on the climate. This document presents the greenhouse gas emissions generated by the construction of the Nachtigal hydro-electric dam and highlights the inadequacies in the consideration of the climate aspect observed in the environmental and social impact assessment report.

Quantity of greenhouse gases generated by the Nachtigal dam construction project

The construction of the Nachtigal hydro-electric dam not only generates direct emissions but also indirect emissions from various sources.

Direct emission rates generated by the Nachtigal hydro-electric dam

Direct emissions are emissions that result directly from the project activities, amongst others emissions from reservoir flooding and land clearing.

- **Emissions from reservoir flooding**

Only carbon dioxide (CO_2) and methane (CH_4) emissions were assessed using the IPCC (2006) Level 1 approach, which estimates diffusion emissions using the equations:

$$CO_2\ Emissions_{THInondées} = PxE(CO_2)_{diff} x_{Sinondées,surface\_totale} xf_s x10^{-6}$$

$$CH_4 Emission_{HHInondées} = P\ E(CH_4)_{diff}\ S_{Inondées\_surface\_totale}$$

Thus, GHG emissions due to reservoir flooding are estimated at 20623,78 $tCO_2e\ yr^{-1}$, i.e

$CH_4\ Emission_{HHInondées}$= 6392,61$tCO_2e.\ an^{-1}$ et $CO_2\ Emission_{THInondées}$= 14231,17 $tCO_2e\ yr^{-1}$

- **Emissions from land clearing**

From the analysis of satellite images of the area, 09 land use categories were identified. They include: Wooded Savannah, Adult Secondary Forest (ASF), Young Secondary Forest (YSF), cultivated areas, cocoa-based agro-forests, Shrubby savannah, built-up areas, bare soil and water. The carbon stocks per stratum and the emissions from clearing caused by the construction of the Nachtigal hydro-electric dam are outlined in Table 1 below.

Carbon stocks per hectare and CO_2 emissions from land clearing.

Strata	Carbon stock (tC/ha)	Strata areas (ha)	Emission per stratum ($tC.yr^{-1}$)	Emission per stratum ($tCO_2e.\ year^{-1}$)
Ag	11.13	36.19	402.77	1476.91
C	0.20	136	27.38	100.24
ASF	45.43	481.03	21855.26	80135.96
YSF	72.16	516.5	37273.08	136667.97
SA	9.04	100.77	910.80	3339.59
Sa.	3.24	1.26	4.08	14.98
Total	**141.21**		**60473.36**	**221735.66**

Indirect emission rates generated by the Nachtigal hydro-electric dam

Indirect emissions refer to the emissions stemming from the implementation of the Resettlement Action Plan for people affected by the project (RAP) and the Livelihoods Restoration Plan (LRP). A literature review of these different reports enabled us to evaluate these emissions based on the offset measures recommended.

• **GHG emissions generated by the implementation of the Resettlement Action Plan (RAP)**
The Nachtigal hydro-electric dam project will result in the economic displacement of 148 people for the hydro-electric development component (1), and 206 people for the housing development component (2) (NHPC, 2011). The compensation measure recommended for this purpose is the granting of 3 ha for 1 ha of expropriated food crops and 1.5 ha for 1 ha of lost permanent (perennial) plantation.
Thus, for a total of 145 ha of expropriated fields, 435 ha of new land will be granted as compensation to the affected populations identified in component 1. Considering that these new lands granted for resettlement are young secondary forests, the carbon footprint of this compensation measure is 31389,6 $tC.yr^{-1}$ or **115095,2 $tCO_2e.yr^{-1}$**.

• **GHG emissions from the implementation of Livelihood Restoration Plan (LRP)**
The LRP report shows that: the construction of the Nachtigal dam will affect 117 fishermen and 83 fishmongers and 908 sandblasters.
According to LRP, if half of all these affected people are not followed up in accordance with the NHPC's process of reintegration of sandblasters and fishermen, 500 people are likely to be converted to agriculture, which is the main activity that is readily available in the area. Consequently, about 450 men will create cocoa plantations of at least 2 ha and 50 women will create food fields in the savannah of about 0.5 ha. Thus, 900 ha of young secondary forest are likely to be converted into cocoa plantations and 25 ha of wooded savannah into food fields. The associated GHG emissions are estimated at **55 153tC. yr^{-1}**, i.e **202 227,67 $tCO_2.yr^{-1}$** where EF=61,03 tC/ha for the conversion of YSF to agroforest.

Total summary of indirect and direct emissions related to the construction of the dam

Source of emissions	GHG emissions (t $CO_2e.yr^{-1}$)
Site clearing	221.735.66
Reservoir flooding	20.623.78
RAP implementation	115.095.2
LRP implementation	202.227.67
Total	**559.682.31**

Les émissions émises par le projet de construction de Nachtigal s'estiment à environ **559682,31$tCO_2e.yr^{-1}$** as opposed to **186 800 tCO_2/yr** estimated in the ESIA (2011), a gap of **373 682,31 tCO_2/yr**.

Limitations on the consideration of the climate aspect contained in the environmental and social impact assessment report

The analysis of the ESIA report for the Nachtigal dam (NHPC, 2011) reveals several shortcomings in terms of taking the climate aspect into account. These include :

• **Inadequate rainfall and temperature data used**

The precipitation data used in the ESIA of the Nachtigal dam are those collected at the Nachtigal station over the periods 1944-1970 and 1961-1980. These data would not be adequate to provide information on the initial state of precipitation in the area in 2011 due to the wide range of years. Considering these data, the ESIA implies that rainfall in the locality today is the same or comparable to that observed in the 1980s, yet rainfall has varied considerably since then (ONACC, 2019).

Likewise for temperatures, the monitoring periods were not specified. Analogously, considering that the data base is that observed in the 1980s, the explanations given for precipitation remain valid for temperatures. The age of the data used will logically bias the average values obtained for temperature and rainfall.

• **A carbon footprint assessment focused solely on land clearing and the flooded area**

A study of the ESIA report for the dam construction project, revised in 2011, shows little evidence of the project's carbon print. The assessment of GHG emissions focused on land clearing and the flooded area. Emissions generated by the car fleet, equipment used for the construction of the Nachtigal Dam (cut and fill, carbon footprint of reinforced concrete, steel, etc.) and the energy consumption of the project were not taken into account..

• **Unclear methodology used during the ESIA to quantify carbon stocks**

The quantification of greenhouse gases for the Nachtigal hydro-electric dam project was based on the experience gained from dam projects such as Petit-Saut, Nam Them and Nam Leuk. In this regard, the methodology used to quantify GHG emissions is not clearly stated in the ESIA report, which legitimately leads to the reservation of the GHG emissions result of 186.800 tonnes of CO_2eq obtained in the EIA. Moreover, the assessment of GHG emissions of such a project cannot be reduced to a comparative study of emission scenarios with the case where a thermal power plant of equal capacity would have been built.

• **Absence of a Climate Action Plan (CAP)**

The measures taken with a climate connotation are buried in the biodiversity action plan, yet the climate action plan cannot be equal to the biodiversity action plan. This leads us to note the absence of a Climate Action Plan (CAP) in the ESMP, even though a range of action plans have been drawn up, such as the RAP, the LRP, the Biodiversity Action Plan, the Local Economic Development Action Plan (PADEL), etc.

Some recommendations for a better consideration of the climate aspect in the implementation of the construction of the Nachtigal hydro-electric dam

This briefing note draws the attention of the government of Cameroon to a revision of the environmental law for the integration of a detailed climate impact assessment of large-scale projects into the synoptis of ESIAs. Furthermore, for a better consideration of the climate aspect in the construction of the Nachtigal hydro-electric dam, our recommendations are the following:

• **The NHPC should:**

- Carry out a full impact assessment and climate risk assessment of the Nachtigal dam construction project;
- Develop and effectively implement a climate action plan to address the emissions generated by the dam construction and the potential impacts identified;

• **Donors should:**

- Integrate the climate aspect into their environmental and social safeguards;
- Request the development and implementation of a climate action plan for the Nachtigal hydro-electric dam.

For more informations on this publication, please contact:

Josiane TEDONGMO SONKWA, email: josianeted@gmail.com
Jean Henri TSOGO AWONA, email: tjeanhenri@yahoo.fr

Cette note est une synthèse de l'étude de **la prise en compte des changements climatiques dans les grands projets d'infrastructures au Cameroun : Cas du projet de construction du barrage hydro-electrique de Natchtigal amont** dans le cadre du projet « **Promouvoir la prise en compte des changements climatiques dans les grands projets au Cameroun, phase II** » mis en œuvre par Action for Sustainable Environment (ASE) avec l'appui financier de Global Greengrants Fund (GGF) Afrique Central. Les termes employés ne reflètent en aucun cas l'opinion des différents partenaires.

E-mail: ase.assistance@yahoo.com
Tél. +237 694 27 97 32 / 674 84 97 87