

# **Building the Climate Resilience of Children and Communities through the Education Sector (BRACE)**

## **Annex 3: Economic & Financial Analysis**

Accredited Entity: Save the Children Australia

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**Abbreviations**

BCR	Benefits Cost Ratio
CBA	Cost-Benefit Analysis
CCRI	Children’s Climate Risk Index
CF	Conversion Factor
CSSF	Comprehensive School Safety Framework
EFA	Economic and Financial Analysis
EIRR	Economic Internal Rate of Return
EMIRR	Economic Modified Internal Rate of Return
ENPV	Economic Net Present Value
EOCK	Economic Opportunity Cost of Capital
GCF	Green Climate Fund
GDP	Gross Domestic Product
GHG	Greenhouse Gas
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IRR	Internal Rate of Return
NPV	Net Present Value
PV	Present Value
RCP	Representative Concentration Pathway
SCA	Save the Children Australia
SCF	Shadow Conversion Factor
SER	Shadow Exchange Rate
SERF	Shadow Exchange Rate Factor
SWR	Shadow Wage Rate
SWRF	Shadow Wage Rate Factor
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations International Children's Emergency Fund
WBG	World Bank Group
WOP	Without Project
WP	With Project

## Glossary: Essential Terms

**Benefits Cost Ratio (BCR):** It is an indicator showing the relationship between the relative costs and benefits of a proposed project, expressed in monetary or qualitative terms. If a project has a BCR greater than 1.0, the project is expected to deliver a positive net present value to a firm and its investors.

**Cost-Benefit Analysis (CBA):** An analysis that aims to identify the economic, environmental, and social effects of a project, proposal, or program and weigh them against the situation with no project, proposal, or program in place. Consequently, the CBA helps decision makers establish which options would benefit society the most and indicate how limited public resources can be utilized and redistributed to maximize net social welfare.

**Conversion Factor (CF):** To turn financial price (used in the financial part of EFA/CBA) into economic price (used in the economic part of EFA/CBA), a conversion factor needs to be calculated. The CF is calculated to reflect the actual cost and benefit of the input used by the project, or the output produced by the project. A conversion factor is simply the ratio of the economic value of said input or output to its financial value.

**Economic and Financial Analysis (EFA):** This type of appraisal differs in content and depth. In the context of this annex, it is understood as a cost-benefit analysis (CBA). See also CBA for details.

**Economic Internal Rate of Return (EIRR):** The discount rate that makes the economic net present value (ENPV)

of a project zero. The EIRR is derived by using economic resource flows and the economic discount rate.

**Economic Modified Internal Rate of Return (EMIRR):** The EMIRR assumes that positive resource flows are reinvested at the cost of capital and that the initial outlays are financed at the economic cost. The EMIRR is derived by using economic resource flows and economic discount rates.

**Economic Net Present Value (ENPV):** An economic metric that seeks to capture the total economic value of an investment opportunity. The idea behind ENPV is to project all the future resource inflows and outflows associated with an investment, discount all those future resource flows using economic discount rate to the present day and then add them together.

**Economic Opportunity Cost of Capital (EOCK):** EOCK is understood here as the economic opportunity cost of funds obtained from the capital market. It is, then, a weighted average of the marginal productivity of capital in the private sector and the rate of time preference for consumption (Harberger, 1987).

**Greenhouse Gas (GHG):** These emissions are produced when hydrocarbons, such as natural gas and oil, are burned. GHGs include carbon dioxide (CO<sub>2</sub>), methane, nitrous oxide, and ozone, all contributing to climate change. GHG emissions (or emission savings) are quantified, priced, and included in the economic part of the CBA.

**Net Present Value (NPV):** It is the value of all future cash flows (positive and negative) over the entire life of an investment discounted to the present.

**Present Value (PV):** It is the current value of a future sum of money or stream of cash flow given a specified rate of return. Future cash flows are discounted at the discount rate, and the higher the discount rate, the lower the present value of the future cash flows.

**Shadow Exchange Rate (SER):** It is the economic price of foreign exchange. It can be defined as the ratio of the value of all traded goods and services in an economy at domestic prices in local currency to the value of all traded goods and services in an economy at world prices in foreign currency, expressed in the number of local currency units per unit of foreign currency, usually the US dollar.

**Shadow Exchange Rate Factor (SERF).** It is the ratio of shadow exchange rate (SERF) to official exchange rate.

**Shadow Wage Rate (SWR).** The economic price of labour. It captures the cost to the economy of employing an additional worker on the project.

**Shadow Wage Rate Factor (SWRF).** It is a ratio of shadow wage rate (SWR) to observed wage.

**Without Project Scenario (WOP):** This scenario shows the situation before the proposed regulation or intervention was introduced and what the case would be like if the status quo continued.

**With Project Scenario (WP):** This scenario outlines the predicted situation after the investment or intervention is introduced.

## 1. Introduction

**Project's rationale.** The project "*Building the Climate Resilience of Children and Communities through the Education Sector (BRACE)*" proposed by Save the Children Australia (SCA) for grant funding by the Green Climate Fund (GCF) is a response to the pressing need for interventions in education due to the challenges posed by a changing climate. It has been observed in numerous countries worldwide that the education sector is increasingly vulnerable to climate risks driven by climate hazards, posing a threat to children's right to quality, safe, and inclusive education. Climate change is making it more challenging for children to pursue uninterrupted education while ensuring their safety. Unfortunately, the critical role of the education sector in climate action has been overlooked, leading to limited climate finance directed towards enhancing the sector's resilience. The proposed project aims at addressing this financing and interventional gap.

**Comprehensive School Safety Framework (CSSF).** SCA is partnering with a diverse group of stakeholders to develop a framework for increased climate-responsive investment in the education sector. This framework is built upon the expanded implementation of the CSSF, with a specific focus on addressing the climate-related challenges impacting the education sector. While the climate drivers affecting the education sector vary across regions, countries, and contexts, the CSSF encompasses a range of activities that can be tailored to specific contexts and levels of impact. Consequently, the goal of the BRACE project would be:

- To explicitly implement the CSSF to enhance the climate resilience of three target countries facing diverse climate challenges and vulnerabilities (Cambodia, South Sudan, and Tonga). The aim is to assess the adaptability of the approach in various contexts and levels of engagement with the CSSF.
- To establish a concrete pathway for future investments by demonstrating how the CSSF can effectively address climate-related issues in the education sector across diverse contexts, serving as a blueprint for future projects that can benefit a wide range of stakeholders.
- To set up a coordination platform for climate-resilient education co-investments, bringing together resources from climate finance institutions (including GCF), education donors (such as the Global Partnership for Education), bilateral donors, domestic funding sources, and other finance channels focused on education.

**Project components and target countries.** The BRACE project is to be implemented in three target countries: Cambodia, South Sudan and Tonga and composed of three components:

- **Component 1:** Building Climate-Resilient School Infrastructure and Systems, target with outputs and activities leading to Outcome 1 – The education sector at national and sub-national levels in targeted countries is more resilient to the impacts of climate change.
- **Component 2:** Enhancing Access to Climate Finance for Education, with outputs and activities leading to Outcome 2 – Education ministries in climate vulnerable countries have increased capacity to access and utilise climate information and finance to increase the resilience of the sector.
- **Component 3:** Coordination and Knowledge Sharing on Climate and Education, with outputs and activities leading to Outcome 3 – Education and climate stakeholders are connecting,

coordinating, collaborating, and cross-learning for enhanced climate action in the education sector.

**Project's scaling potential.** Furthermore, the project aims to be replicated, providing support to global education and climate stakeholders in recognizing the advantages of addressing climate risks in the education sector. It also intends to facilitate the implementation of the necessary tools to achieve this goal.

**Organization of the EFA report.** The EFA report is structured into eight sections to provide a comprehensive analysis. The first section introduces the project and its rationale. Section two delves into the contextual specifics of the three target countries: Cambodia, South Sudan, and Tonga and historical climate financing in these countries. Section three justifies the project's concessionality and additionality. Section four outlines the EFA methodology and necessary customizations tailored to the project. Section five addresses crucial assumptions, while section six presents EFA results. In section seven, potential modelling limitations are discussed, and section eight concludes and summarizes the analysis.

## 2. Country Context

### 2.1. Cambodia

**Cambodia's natural and economic situation.** Between 1995 and 2019, Cambodia experienced significant economic growth, with an average annual GDP growth of around 7.6%. The GDP growth was driven by various sectors, including tourism, manufacturing exports, real estate, and construction, which led Cambodia to achieve lower-middle-income country status in 2015.<sup>1</sup> However, the COVID-19 pandemic slowed down this growth, with GDP growth decreasing to 3.2% in 2020. Although there has been a gradual recovery, the country has not yet reached its pre-pandemic levels. In 2023, Cambodia's GDP growth was 5.4%, and it is projected to reach 5.8% in 2024.<sup>2</sup> Currently, Cambodia aims to become a middle-income country by 2030 and a high-income country by 2050.

**Development challenges.** Cambodia's impressive economic growth before the pandemic did not solve all its development issues. The poverty rate in Cambodia in 2023 was estimated at 16.6%, a significant decrease over the last decade but still noteworthy.<sup>3</sup> The COVID-19 pandemic has led to increased unemployment rates, affecting the most vulnerable Cambodians. The ongoing war in Ukraine has raised food and energy prices, placing financial strain on households. Policymakers in Cambodia face several risks, such as households experiencing a heightened risk of falling back into poverty despite economic recovery, regional disparities in poverty and unemployment, overall low human development, moderate productivity growth, and an economy that lacks diversification. Regarding health and education, Cambodia has made significant progress, particularly in improving early childhood development and primary education in rural areas, as well as reducing infant mortality rates. However, it was estimated that a children born in Cambodia in 2020 would be only 49% as productive when grown as they could be with access to quality education, good health, and nutrition in childhood.<sup>4</sup> Therefore, there are significant potential gains in productivity and the economy if the education, health, and nutrition of Cambodian children improve. These human development-related issues need to be addressed if Cambodia wants to transition from a middle-income country to a higher-income status.

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<sup>1</sup> Source: <https://datatopics.worldbank.org/world-development-indicators/the-world-by-income-and-region.html>

<sup>2</sup> Source: <https://www.worldbank.org/en/country/cambodia/overview>

<sup>3</sup> Source: <https://hdr.undp.org/system/files/documents/hdp-document/2023mpireporten.pdf>

<sup>4</sup> Source: <https://www.worldbank.org/en/country/cambodia/overview>

**Climate vulnerability context.** Cambodia has a moist tropical monsoon climate with subtropical characteristics at higher elevations and two distinct seasons: dry (November-April) and wet (May-October). It has been estimated that between 1971-2020, the mean temperature in Cambodia increased by 0.29°C. Furthermore, the climate projections suggest that Cambodia's temperatures are set to increase by 0.57°C from the reference period to 28.34°C for 2020-2039 and even more so for 2040-2059. In recent years, Cambodia has also been experiencing a higher number of extreme heat days (> than 35°C), and it is predicted that the number of extreme heat days will continue to increase as the century progresses. Climate predictions also suggest that as the 21<sup>st</sup> century goes on, Cambodia will experience more erratic precipitation patterns, including floods, storms, and droughts. All these climate-related events are set to influence the livelihoods of Cambodia's inhabitants, making them more vulnerable to climate change. Children and youth are especially susceptible to climate change as their schooling and, later, their income potential can be significantly influenced by the climate.<sup>5</sup> Cambodia is listed in the Children's Climate Risk Index (CCRI) of UNICEF as "high" in CCRI, "extremely high" in climate and environmental shocks, and "high" in child vulnerability.<sup>6</sup>

**Changing climate versus education sector.** The impact of climate change extends beyond Cambodia's economy to its education sector, which directly influences human development and the country's productivity. Cambodia's education sector is highly susceptible to the effects of climate change in several ways: (i) infrastructure is adversely affected by storms, floods, and heat waves, creating hazardous learning environments, disrupting regular school schedules, and destroying teaching/learning material. (ii) climate events, such as prolonged heatwaves or erratic rain patterns leading to droughts or floods, have a negative impact on students' performance, resulting in shortened school days and reduced learning time. (iii) students' health is compromised due to food shortages caused by erratic climate patterns, reduced food accessibility, and climate-related physical and emotional stress.

## 2.2. South Sudan

**South Sudan's natural and economic situation.** South Sudan, a young nation established in 2011, is classified as a lower-income country.<sup>7</sup> It is one of the poorest, most volatile and undeveloped countries in the world. Despite signing the Revitalized Agreement on the Resolution of the Conflict in the Republic of South Sudan (R-ARCSS) in 2018, the country continues to grapple with instability, fragility, and high poverty rates. Its heavy reliance on oil production (around 98% of GDP comes from oil sales)<sup>8</sup> and limited economic diversification contribute to its slow recovery and bleak development prospects. South Sudan's export routes for oil, its main export commodity, are heavily dependent on its conflicted neighbor, Sudan, adding further volatility to its economic outlook. In 2015, when the latest available estimates were made, the country experienced a negative GDP growth of -10.8%, with an estimated GDP of 12 billion USD.<sup>9</sup> Agricultural production and pastoralism, mainly at the subsistence level remains the core activities of South Sudanese bringing them basic level livelihood income opportunities. The poverty rate in 2016 was estimated at 67.3%.<sup>10</sup>

**Development challenges.** South Sudan continues to struggle with a severe humanitarian crisis. Even though, the country has one of the best agricultural areas in Africa with high soil fertility, and relatively abundant water supply of the White Nile, by 2024, an estimated 7.1 million people in South Sudan will be

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<sup>5</sup> Source: <https://climateknowledgeportal.worldbank.org/country/cambodia>

<sup>6</sup> Source: [https://experience.arcgis.com/experience/0d9d2209bf104584a65e012b03b6d3f8/#data\\_s=id%3AdataSource\\_2-17b3a7be4c5-layer-1\\_427%3A93](https://experience.arcgis.com/experience/0d9d2209bf104584a65e012b03b6d3f8/#data_s=id%3AdataSource_2-17b3a7be4c5-layer-1_427%3A93)

<sup>7</sup> Source: <https://datatopics.worldbank.org/world-development-indicators/the-world-by-income-and-region.html>

<sup>8</sup> Source: <https://unfccc.int/sites/default/files/resource/South-Sudan-First-NAP%20.pdf>

<sup>9</sup> Source: <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD?locations=SS>

<sup>10</sup> Source: <https://data.worldbank.org/country/south-sudan>



in dire need of food assistance. Over 85% of the country's 12 million inhabitants reside in sparsely populated areas, facing significant challenges in accessing essentials such as water, food, housing, and healthcare. Women and children are particularly vulnerable, bearing the brunt of these hardships. The ongoing conflict between Sudan and South Sudan, coupled with internal conflicts within Sudan, has led to an influx of around 650,000 Sudanese refugees into South Sudan, further exacerbating the country's struggles. Adding to this, South Sudan is highly susceptible to climate change, making it more vulnerable to various shocks that can impede its efforts toward peace and stability.

**Climate vulnerability context.** South Sudan is characterized by tropical climate with average temperatures above 25°C and elevated temperatures in the dry season exceeding 35°C. The hottest month is March; the coldest is August. The rainy season occurs between April-November. The rainfall patterns are seasonal and differ by location with the Eastern Equatoria receiving the lowest rainfall (200 mm annually) and Western Equatoria and highland parts of Eastern Equatoria receiving 1200-2200 mm of rain per year. Most of the country experiences monsoons between June and September during its long rainy season. The extreme south region has a longer rainy season that extends from May to October with two distinct peaks occurring in May and July.<sup>11</sup> South Sudan is one of the most vulnerable countries to climate change and over the last 30 years it has been among the most rapidly warming countries in the world. The patterns in rainy and dry seasons tend to show wetter rainy seasons and drier dry seasons. The seasonal patterns are also shifting with wet season occurring now one month earlier. Climate extremes like flood or drought have become more frequent in South Sudan in recent years.<sup>12</sup> South Sudan is listed in the CCRI of UNICEF as “extremely high” in CCRI with “high” child vulnerability and “extremely high” climate and environmental shocks.<sup>13</sup>

**Changing climate versus education sector.** South Sudan is facing significant challenges in education and infrastructure. The country struggles with one of the lowest literacy rates in Africa, with only an estimated four out of ten people able to read, and limited access to water and sanitation services, as only one in eight people has access to these basic amenities. Furthermore, South Sudan has the highest number of primary school-aged children out of school.<sup>14</sup> The human capital index in 2020 was estimated at 0.3.<sup>15</sup> The education infrastructure in many parts of South Sudan is woefully inadequate, lacking essential sanitary facilities, proper classrooms, and qualified teaching staff. Additionally, there are areas where schools are simply not accessible within a reasonable distance. These challenges are compounded by the looming impact of climate change, which is expected to further intensify the vulnerabilities of the education sector. Unpredictable rain patterns, floods, droughts, extreme temperatures, and heat waves are poised to have detrimental effects on school infrastructure, student health, and school attendance. Addressing these critical issues is imperative for the well-being of the Sudanese people and the future of South Sudan as an independent nation.

### 2.3. Tonga

**Tonga's natural and economic situation.** The Kingdom of Tonga, an archipelago of 172 coral and volcanic islands in the Central South Pacific Ocean, is home to a population of 104.12 thousand people (2024 est.).<sup>16</sup> Most of the population resides on Tongatapu, the main island of the archipelago. Tonga, an upper middle-income country, heavily relies on sectors vulnerable to climate change, such as fisheries, agriculture, and

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<sup>11</sup> Source: <https://unfccc.int/sites/default/files/resource/South-Sudan-First-NAP%20.pdf>

<sup>12</sup> Source: <https://unfccc.int/sites/default/files/resource/South-Sudan-First-NAP%20.pdf>

<sup>13</sup> Source: [https://experience.arcgis.com/experience/0d9d2209bf104584a65e012b03b6d3f8/#data\\_s=id%3AdataSource\\_2-17b3a7be4c5-layer-1\\_427%3A193](https://experience.arcgis.com/experience/0d9d2209bf104584a65e012b03b6d3f8/#data_s=id%3AdataSource_2-17b3a7be4c5-layer-1_427%3A193)

<sup>14</sup> Source: <https://uis.unesco.org/>

<sup>15</sup> Source: <https://data.worldbank.org/country/south-sudan>

<sup>16</sup> Source: <https://worldpopulationreview.com/countries/tonga>

tourism. Roughly 50% of the country's export income comes from agriculture, which occupies 40% of Tonga's total area.<sup>17</sup> In 2022, Tonga's GDP per capita was 4,356.8 USD (in constant 2015 \$), with a negative growth rate of -2.8%.<sup>18</sup> The country is highly dependent on remittances and foreign aid and is highly vulnerable to the impacts of climate change, including more frequent and severe cyclones. For instance, tropical cyclone Gita, which struck Tonga during the 2017-2018 South Pacific cyclone season, caused damage estimated at USD 356.1 million, equivalent to 37.8% of Tonga's GDP.

**Development challenges.** The population of Tongatapu is expected to increase over the next decade as Tongans commonly move from the outlying islands to Tongatapu seeking better opportunities such as employment, education, and healthcare. Additionally, the impact of climate change is expected to drive relocation as communities on smaller, low-lying islands face increasing challenges from meteorological-ocean hazards. The 2022 tsunami and other natural disasters have also led to displacement, requiring a coordinated multi-stakeholder response to address long-term community needs. Additionally, climate-induced slow onset processes like coastal erosion and ocean acidification are expected to drive both forced and voluntary internal movements in Tonga.<sup>19</sup> According to Tonga's Third National Communication to the UNFCCC, the country has already witnessed a general sea level rise of 6.4 mm per annum, and the 2021 IPCC 6th Assessment Report indicates an approximate 20cm global mean sea level rise since 1901, with accelerating rates in recent years.<sup>20</sup>

**Climate vulnerability context.** Tonga is one of the world's most climate change-vulnerable and disaster-prone countries. In the past, the country has experienced severe cyclones, tsunamis, and volcanic eruptions. It is also highly susceptible to increasing sea levels and coral bleaching. Tonga's climate is tropical, with a wet period between November and April and a dry season between May and October. The average temperatures oscillate between 23°C-26°C. However, there has been an increase in temperatures of around 0.4-0.7°C since 1970. The annual rainfall in Tonga is significant and ranges between 1,619 and 2,453 mm per annum. Tonga is also susceptible to tropical cyclones prevalent in the wet season and vary in magnitude. The country is already strongly impacted by climate change, and it is predicted to continue to feel the effects of climate change, including the rise in sea level. Furthermore, the temperatures are expected to keep increasing between 0.9°C (RCP 4.5) and 2.6°C (RCP 8.5). The anticipated risks to human well-being associated with changing climate include heat waves, intensified cyclones, saline intrusion, wave-driven flooding and inundation.<sup>21</sup>

**Changing climate versus education sector.** In the case of Tonga climate stressors including cyclones, floods and inundations and extreme heat waves impact the national education sector, including students. The damage to schools has been observed during the cyclone Gita (2017-2018 cyclone season) that significantly destroyed 109 of 150 schools leaving around twenty-three thousand children without access to schooling. In the coming years, the impacts of climate change are projected to increasingly highlight the weaknesses of the Tongan education system. Anticipated climate-related challenges such as prolonged heatwaves and floods are likely to detrimentally affect school infrastructure and attendance, posing a threat to the future prosperity of Tonga's children and youth.

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<sup>17</sup> Source: <https://climateknowledgeportal.worldbank.org/country/tonga>

<sup>18</sup> Source: <https://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG?locations=TO>

<sup>19</sup> Source: <https://crisisresponse.iom.int/sites/g/files/tmzbd11481/files/appeal/documents/Tonga%20Migration%20and%20Sustainable%20Development%20Policy.pdf>

<sup>20</sup> Source: [https://www.ipcc.ch/report/ar6/wg1/downloads/factsheets/IPCC\\_AR6\\_WGI\\_Regional\\_Fact\\_Sheet\\_Small\\_Islands.pdf](https://www.ipcc.ch/report/ar6/wg1/downloads/factsheets/IPCC_AR6_WGI_Regional_Fact_Sheet_Small_Islands.pdf)

<sup>21</sup> Source: [https://climateknowledgeportal.worldbank.org/sites/default/files/country-profiles/15823-WB\\_Tonga%20Country%20Profile-WEB.pdf](https://climateknowledgeportal.worldbank.org/sites/default/files/country-profiles/15823-WB_Tonga%20Country%20Profile-WEB.pdf)

## 2.4. Historical Climate Financing in target Countries

**Past climate-related financing delivered to Cambodia, South Sudan, and Tonga.** According to the OECD DAC data<sup>22</sup>, the following climate financing was delivered to these three countries between 2000-2021 (adaptation and mitigation, as specified in Table 1):

**Table 1. Past climate financing in Cambodia, South Sudan, and Tonga.**

	Adaptation (in USD 2021 constant \$)			Mitigation (in USD 2021 constant \$)		
	Concessional and developmental: Grants only	Private concessional: Grants only	Other	Concessional and developmental: Grants only	Private concessional: Grants only	Other
<b>Cambodia</b>	3,527,009,222	4,701,864	88,514,914 (other not concessional, not primarily developmental)	1,116,551,514	622,725	16,651,765 (other not concessional, not primarily developmental)
<b>South Sudan</b>	1,576,127,720	563,475	n/a	229,837,578	n/a	n/a
<b>Tonga</b>	273,392,804	n/a	n/a	256,444,713	n/a	n/a

The financing for climate adaptation and mitigation in the three target countries has mostly depended on grant funding, as shown in Table 1. This heavy reliance on grant funding may be attributed to the substantial risks associated with climate financing in these nations. These risks could be connected to internal instability in Sudan and the heightened vulnerability to climate-related disasters like tsunamis and cyclones in Tonga, as well as floods in Cambodia.

<sup>22</sup> Source: <https://oe.cd/development-climate>

### 3. Project's Concessionality and Additionality

**Budgetary constraints of target countries.** Based on the International Monetary Fund (IMF) intelligence, in the coming years, the three target countries are expected to observe the following internal funding constraints:

**Cambodia:** The country's fiscal deficit widened in 2023 due to extended support to households and firms affected by the COVID-19 pandemic and increased spending associated with the elections and the 2023 South-East Asia Games. The public debt ratio to GDP is expected to increase moderately in the next ten years.<sup>23</sup> This, in turn, will narrow down the funding options for public goods, including climate change adaptation of the education system.

**South Sudan:** South Sudan continues to experience severe humanitarian and economic challenges resulting from several shocks, including the Red Sea crisis, the war in Sudan, domestic policy deficiencies, and climate change calamities (e.g., flooding). South Sudan has significant financing needs, including social and development spending needs, debt service obligations on a large stock of non-concessional external debt, reserve coverage of below one month of imports against a background of a projected decline in oil prices, and a continued downward global trend for international aid.<sup>24</sup> The public resources for education and climate adaptation remain scarce.

**Tonga:** While Tonga's economy has been recovering well from the COVID-19 pandemic, it is a subject of strong uncertainties. The tourism sector, which remains important for Tonga's economy, is in the process of rebuilding after the pandemic and climate-related shocks. However, tourism revenues will remain limited, especially due to the necessity of rebuilding some infrastructure. Agriculture's recovery is also expected to be slow due to labour shortages. Tonga's long-term growth is projected at 1.2 percent, given its exposure to increasingly frequent natural disasters, persistent loss of workers to emigration, and limited economies of scale due to geographical barriers.<sup>25</sup> The public resources for education and climate adaptation remain uncertain as they depend on the overall economic growth.

**Project's additionality.** The proposed interventions of the BRACE project are expected to offer substantial economic benefits, bolstering the future economic growth of Cambodia, South Sudan, and Tonga. These interventions tackle market deficiencies stemming from limited education funding. The customized grant funding aims to equip the education systems in these countries for climate change adaptation. Notably, this funding is anticipated to sustain private investment, bridging the private sector's typical lack of interest in such initiatives. By utilizing highly concessional grant financing, these countries can overcome obstacles that impede investment and restrict the impact of development on education. Lastly, the grant funding accessible to the BRACE project is projected to elevate development impact by spurring behavioural change in education systems, encouraging stakeholders to refine their climate adaptation approach, and serving as a proven model for other nations.

**Rationale behind the proposed BRACE project's concessionality.** The BRACE project seeks to secure grant financing from the GCF to support its proposed activities. This type of financing is vital for implementing interventions that will enhance the educational environment for students in public schools in three target countries. These countries are particularly vulnerable to the impacts of climate change and require increased public investment to adapt their education systems accordingly. Since basic education shows

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<sup>23</sup> Source: <https://www.imf.org/en/Publications/CR/Issues/2024/01/29/Cambodia-2023-Article-IV-Consultation-Press-Release-and-Staff-Report-544276>

<sup>24</sup> Source: <https://www.imf.org/en/Publications/CR/Issues/2024/06/10/Republic-of-South-Sudan-2023-Article-IV-Consultation-and-First-and-Second-Reviews-under-the-550191>

<sup>25</sup> Source: <https://www.imf.org/en/Publications/CR/Issues/2023/11/03/Tonga-2023-Article-IV-Consultation-Press-Release-and-Staff-Report-541117>

qualities of public good<sup>26</sup>, it is typically funded by governments using national taxes or other grant funding, as the public good attributes make it difficult or costly for private firms to appropriate rents<sup>27</sup>. As a result, the displacement of the private sector is not expected to be a concern in these target countries once the BRACE project is underway. Consequently, taking under consideration: (i) significant climate-related vulnerabilities of these target countries that require urgent adaptation measures to be implemented in their education systems, (ii). the nature of the project with its public good type of interventions, and (iv). being aware that target countries suffer from serious budgetary pressures, the proposed grant financing for the BRAEC project is justified.

## 4. Methodology

### 4.1. EFA: Methodological Basis

**Scientific EFA basis.** Whenever possible, because of data availability and accessibility, the EFA methodology, a GCF prescribed analytical framework for project appraisals, was constructed using the well-established cost-benefit analysis (CBA) principles. The modelling and analytical approach was primarily influenced by the “*Manual on Cost Benefit Analysis for Investment Decisions*” by Glenn P. Jenkins, Chun-Yan Kuo, and Arnold Harberger, 2011, and the *Asian Development Bank- Guidelines for the economic analysis of projects. Mandaluyong City, Philippines, ADB, 2017*. The BRACE EFA was additionally tailored to align with the GCF EFA guidelines, which was achieved through careful methodological calibration based on the GCF Annex VI: *Economic and Financial Analysis (EFA) guidance*.<sup>28</sup>

**Chosen modelling approach.** Due to the nature of the BRACE project that shows public good characteristics as it concerns interventions in national education systems in connection to changing climate, the EFA was pursued in economic terms only.<sup>29</sup> The general modelling approach used in this EFA is visualized in Figure 1 below.

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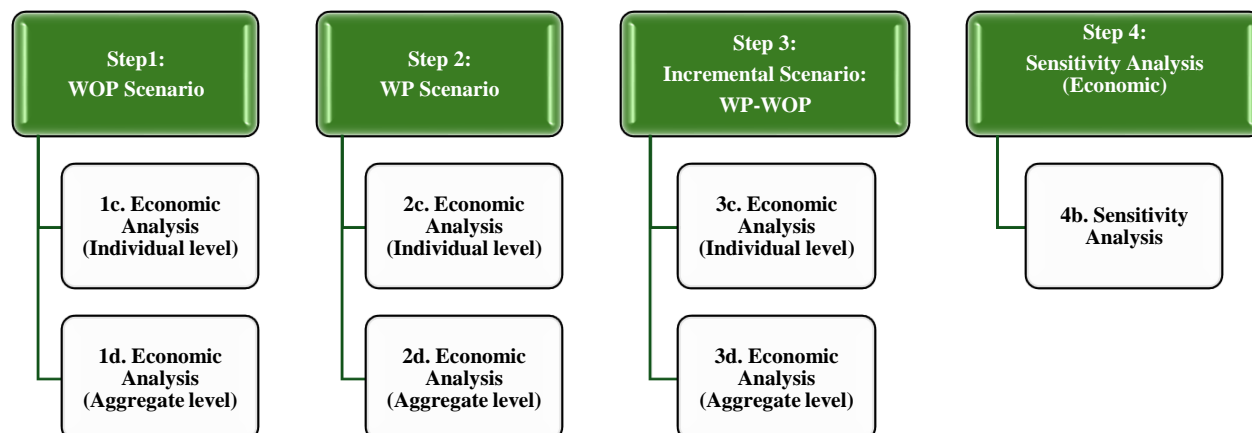
<sup>26</sup> The concept of public good encompasses goods that are non-rivalrous and non-excludable. While some may argue that there exists private basic education or higher education that may not fit this definition due to the existence of private schools or universities, basic schooling is considered a public good. Education benefits every member of society, making it essential for all of us to contribute to its funding through taxes. This investment in education is crucial as it leads to a more educated population, benefiting the entire society.

- 27 Stiglitz, J. (1989). "The Economic Role of the Government in Education." *Handbook of Public Economics*.
- Besley, T., & Ghatak, M. (2005). "Competition and Incentives with Motivated Agents." *American Economic Review*, 95(3), 616-636.

<sup>28</sup> Source: <https://www.greenclimate.fund/document/annex-vi-economic-and-financial-analysis-efa-guidance>

<sup>29</sup> Please note: In the case of the BRACE project if financial cash flows were constructed, we would have financial outflows (costs) only and no financial inflows as schools are not business facilities and they operate on annual budget delivered from public resources. Therefore, constructing financial cash flows does not make sense in the case of this type of a project where proposed interventions have a public good nature. Consequently, only economic part was pursued. For scientific justification, please refer to the Asian Development Bank EFA Guidelines (<https://www.adb.org/documents/guidelines-economic-analysis-projects>) or Harberger, Arnold C. and Glenn P. Jenkins, “Manual on Cost Benefit Analysis for Investment Decisions” Queen’s University, Kingston, Canada, 2011 (Chapter Ch 7), or similar.

**Figure 1. EFA methodology.**



**EFA modelling perspectives.** The quantitative EFA analysis of the BRACE project was based on Components 1 and 2 for which quantification of economic benefits at the ex-ante was feasible. Furthermore, the EFA modelling was pursued from two separate yet complementary perspectives:

1. First, the school-level modelling from the perspective of the individual average & indicative type of school and respective intervention packages to be delivered to each of these schools was developed. In this context, individual EFA modelling was pursued applying in Package 1, Package 2, and Package 3 to individual school-types in the three targeted countries. Then, each school level EFA in each country was aggregated by the expected number of similar schools to receive one of the three proposed packages of interventions (Package 1, 2, or 3). Hence, the individual and aggregate indicative economic modelling for an average type of school in each country of interest was prepared.
2. Then, the modelling from the entire project perspective was also developed to show the overall and expected project impacts.

Lastly, each of the two modelling perspectives, as mentioned above was created taking under consideration two different climatic scenarios: RCP 4.5 and RCP 8.5, respectively. The complete EFA analysis is comprehensively discussed in the following sections of this report.

#### 4.2. EFA: Developing School-Level Analysis

**Direct beneficiaries'-based EFA modelling.** It is widely recognized that EFA can be constructed from different perspectives based on analytical interests and requirements. In the case of the BRACE project, EFA was firstly conducted with the perspective of direct beneficiaries in mind. The goal was to demonstrate the potential economic benefits that will accrue to average type of indicative public school and its students in each target country, through the implementation of the BRACE project. This perspective differed from the "overall project EFA modelling," which was also pursued. While project-targeted schools will not be responsible for costs associated with proposed interventions as they will not need to repay these costs or use their school budgets to fund proposed interventions, they will experience the benefits upon project implementation.

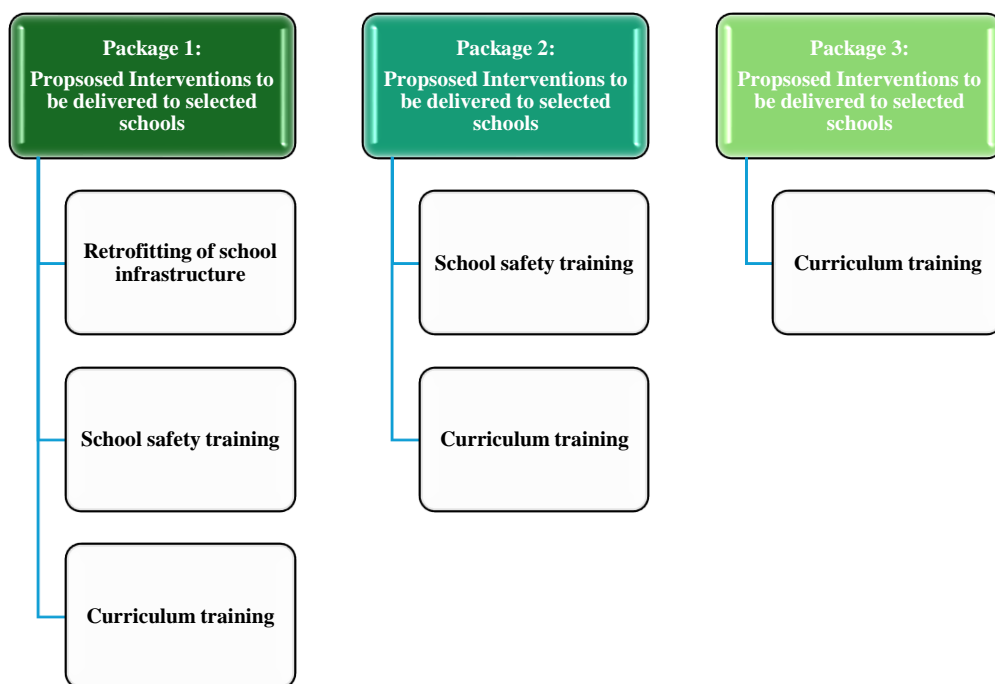
Given that the BRACE project involves three different sets of interventions to be delivered to schools in three target countries, the direct beneficiaries' EFA modelling was separately pursued for each of the three intervention packages: Package 1, Package 2, and Package 3, which are discussed in the following

sections, outlined in Table 2 and visualized in Figure 2 below. For more details, please see sections 4.2.1-4.2.2. below.

#### 4.2.1. EFA Intervention Packages

**BRACE intervention packages.** The project envisions three types of intervention packages to be delivered separately to selected number of schools in three target countries, respectively. Figure 2 and Table 2 below provide more details regarding these packages of interventions at the school level.

**Figure 2. Specifics of BRACE Intervention Packages.**



**Table 2. EFA models specifics for various intervention packages.**

Target country	Intervention Package Type	Expected # of Schools to Receive Proposed Interventions	"Without Project" (WOP) Scenario	"With Project" (WP) Scenario
Cambodia	<b>Package 1:</b> Infrastructure + school safety training + curriculum training	40	<b>WOP description:</b> <ol style="list-style-type: none"> <li>1. Indicative, average primary school in each target country, respectively was used as a benchmark in creating the WOP scenario. This representative school differed in the number of students and other variables like school funding because of country specifics.</li> <li>2. One WOP scenario under each RCP: RCP 4.5 and RCP 8.5, respectively was created for each target country (hence 3 WOPs in total for RCP 4.5 and 3 WOPs in total for RCP 8.5).</li> <li>3. The WOP created for each target country was used as a counterfactual for each of the three proposed packages of interventions in each target country and under each of the</li> </ol>	<b>WP description:</b> In Package 1, the average indicative school modelled separately for each country receives a set of interventions that will include: <ol style="list-style-type: none"> <li>1. Improving/retrofitting the infrastructure. Infra retrofitting might include "greening" the school infrastructure (e.g., providing lower energy usage through efficient lighting and cooling, rainwater harvesting, green maintenance of school infrastructure, rainwater harvesting and efficient water use solutions, and similar). <u>Retrofitting infrastructure will be demand -based and customized to the school actual needs.</u></li> <li>2. Delivery of training related to school safety and education continuity management system (e.g., school-based risk assessment, contingency plans for schools in the event of climate disaster, etc).</li> </ol>



Target country	Intervention Package Type	Expected # of Schools to Receive Proposed Interventions	"Without Project" (WOP) Scenario	"With Project" (WP) Scenario
			<p>two RCPs, respectively (e.g., a counterfactual for WP scenarios; Package 1, 2 and 3, respectively).</p> <p>Note: For more details, please refer to the Excel sheet <i>"Data Sources"</i> that contains the necessary assumptions and modelling specifics for each of these representative schools and their WOP scenarios.</p> <p><b>Observed issues at the WOP scenario:</b></p> <ol style="list-style-type: none"> <li>1. The average and indicative school modelled in the WOP scenario of each target country suffers from problems with underinvestment in school infrastructure (e.g., issues with toilet facilities, water access, insufficiently developed hand washing stations, inefficient energy usage, etc.). School facilities are not necessarily eco-friendly, "green," or efficient.</li> <li>2. Such school is also unprepared in terms of school safety in relation to climate-related calamities and</li> </ol>	<ol style="list-style-type: none"> <li>3. Provision of climate-related disaster risk reduction training to be embedded into school curriculum (e.g., teacher pre-service and school staff training, developing training material for schools on climate mitigation and adaptation, etc.).</li> </ol> <p><b>Expected benefits (examples):</b> Multiple potential benefits are expected:</p> <ol style="list-style-type: none"> <li>1. Improved learning environment to students due to better school infrastructure can positively influence graduation rates and diminish school absenteeism. This in turn might deliver higher future income potential to students, hence higher economic benefits.</li> <li>2. Lower level of damage to schools in the case of climate events due to improved school facilities and training on disaster risk reduction and school safety. Economic benefits might accrue due to avoided costs of damage.</li> <li>3. Better contingency plans are executed that allow students to continue schooling and diminish</li> </ol>

Target country	Intervention Package Type	Expected # of Schools to Receive Proposed Interventions	"Without Project" (WOP) Scenario	"With Project" (WP) Scenario
			<p>disaster risk reduction. The education continuation suffers during and after the onset of climate calamities.</p> <p>3. Lastly, the school does not have properly developed curriculum that encompasses the effects of climate change and its impact on the education systems and the well-being of its students. Teachers and school staff are not trained on climate mitigation and adaptation.</p>	<p>school absenteeism. This in turn might deliver higher future income potential to students, hence higher economic benefits.</p> <p>4. Higher level of school preparedness to climate change events and better coordination. Economic benefits might accrue due to avoided costs of damage and avoided costs to students associated with lost days of schooling.</p>
	<b>Package 2:</b> School safety training + curriculum training	240		<p><b>WP description:</b> In Package 2, the following interventions are envisioned:</p> <p>1. Delivery of training related to school safety and education continuity management system (e.g., school-based risk assessment, contingency plans for schools in the event of climate disaster, etc).</p>

Target country	Intervention Package Type	Expected # of Schools to Receive Proposed Interventions	"Without Project" (WOP) Scenario	"With Project" (WP) Scenario
				<p>2. Provision of climate-related disaster risk reduction training to be embedded into school curriculum (e.g., teacher pre-service and school staff training, developing training material for schools on climate mitigation and adaptation, etc.).</p> <p><b>Expected benefits:</b></p> <ol style="list-style-type: none"> <li>1. Better contingency plans are executed that allow students to continue schooling. This in turn might deliver higher future income potential to students, hence higher economic benefits.</li> <li>2. Higher level of school preparedness to climate change events and better coordination. Economic benefits might accrue due to avoided costs of damage and avoided costs to students associated with lost days of schooling.</li> </ol>
	<b>Package 3:</b> Curriculum training	240		<p><b>WP description:</b> In Package 3, average school receives climate-related disaster risk reduction training to be embedded into school curriculum (e.g., teacher pre-service and school staff training,</p>

Target country	Intervention Package Type	Expected # of Schools to Receive Proposed Interventions	"Without Project" (WOP) Scenario	"With Project" (WP) Scenario
				<p>developing training material for schools on climate mitigation and adaptation, etc.).</p> <p><b>Expected benefits:</b> Higher level of school preparedness to climate change events and better coordination. Economic benefits might accrue due to avoided costs of damage and avoided costs to students associated with lost days of schooling.</p>
South Sudan	<b>Package 1:</b> Infrastructure + school safety training + curriculum training	30		See above descriptions for Cambodia Package 1.
	<b>Package 2:</b> School safety training + curriculum training	75		See above descriptions for Cambodia Package 2.

Target country	Intervention Package Type	Expected # of Schools to Receive Proposed Interventions	"Without Project" (WOP) Scenario	"With Project" (WP) Scenario
	<b>Package 3:</b> Curriculum training	510		See above descriptions for Cambodia Package 3.
Tonga	<b>Package 1:</b> Infrastructure + school safety training + curriculum training	7		See above descriptions for Cambodia Package 1.
	<b>Package 2:</b> School safety training + curriculum training	100		See above descriptions for Cambodia Package 2.
	<b>Package 3:</b> Curriculum training	50		See above descriptions for Cambodia Package 3.

#### 4.2.2. Construction of WOP, Indicative WP, and Incremental Scenarios

**WOP and WP scenarios.** The first step of the ex-ante BRACE EFA, constructed from the perspective of direct project beneficiaries, involved modelling from the perspective of an average and indicative type of school in each country of interest (Table 2). Therefore, the process started with constructing three distinctive “without project” (WOP) scenarios and three indicative “with project” (WP) scenarios. These WOP and WP scenarios were created separately for each of the three intervention packages (Package 1, 2 and 3), for each target country: Cambodia, South Sudan, and Tonga, and under two different RCP assumptions (RCP 4.5 versus RCP 8.5).

**The WOP scenarios** were not created in isolation but resulted from a collaborative effort. They were based on the available data obtained through various resources, including SCA consultations and interviews, knowledge and data from past projects implemented in these countries, relevant literature, and open-source data portals (e.g., UNICEF<sup>30</sup>, etc.). Consequently, each WOP scenario represents an average and logical counterfactual scenario to the indicative WP.

**The role of each WP scenario** was to model what the situation would look like once the proposed set of interventions envisioned in each of the respective packages: Package 1, Package 2 or Package 3 were introduced. Despite the complicated access to school-level data and the anticipated necessity for customization of packages of interventions for each school in each of the three countries, the WP models were constructed as indicative and average, meaning representative for each area preselected for interventions and an indicative type of school modelled. This process was not haphazard. It involved in-depth consultations with SCA field officers who gathered the relevant data and information from the field, ensuring that the WP models represented the situation on the ground well in each of these preselected intervention areas.

**Incremental Scenarios.** In each case, incremental scenarios were created also by subtracting line entries in the economic resource flows of the WOP scenario from equivalent line entries in the economic resource flows of the WP scenario (because an Incremental scenario = WP scenario minus WOP scenario---which constitutes a change observed due to the project’s implementation).

**Aggregate modelling from the direct beneficiaries’ perspective.** The aggregate models were created by multiplying individual school-level modelling by the assumed number of schools to receive each type of package of interventions (either Package 1, 2, or 3) in each target country, respectively.

**Modelling in different RCPs.** Each EFA model was created under two distinct types of climate assumptions, RCP 4.5, and RCP 8.5, respectively. This was done to ensure the inclusion of potentially worsening conditions under RCP 8.5, making us all aware of the challenges that may lie ahead.

#### 4.3. EFA: Developing Overall Project’s Perspective Analysis

**Overall project perspective EFA.** While the EFA modelled from the perspective of indicative schools described in sections 4.2.1- 4.2.2 is very important to show how these schools might individually (and in aggregate, per target country and assumed number of schools) gain from specific intervention packages, the EFA modelled from the perspective of the entire project shows whether the money budgeted and spent is worthwhile. Consequently, this modelling approach was employed to show an additional angle to the EFA analysis.

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<sup>30</sup> Source: <https://geosight.unicef.org/project/cambodia-ccri-drm-index>

In this EFA modelling approach, the economic aggregate benefits were aggregated and juxtaposed against planned budgetary expenditures during the 5 (or 4-in the case of South Sudan) years of the project implementation period. Consequently, standard project-level economic viability measures were estimated. Sensitivity analysis on the project perspective economic results was also pursued. As with direct beneficiaries -school-level EFA modelling, the entire project EFA was also prepared under two RCPs: RCP 4.5 and RCP 8.5, respectively.

#### 4.4. EFA: Description of Methods and Derivations

**The exclusion of financial cash flows from the BRACE EFA.** Since proposed BRACE project interventions per definition do not create cash inflows in a business sense to modelled schools, the financial part of the analysis was not undertaken and the whole EFA from direct beneficiaries' perspective and overall project perspective was constructed in economic terms only.<sup>31</sup>

**Developing economic prices for EFA.** Following the ADB's *"Guidelines for the economic analysis of projects"*, the economic prices used in constructed economic resource flows were defined and derived as follows: "[...] Economic prices used in the economic part of EFA reflect the economic value of goods and services and provide important guidance on the choice of public sector projects. Conceptually, economic price can be defined as the gain (or loss) in social welfare associated with consuming an additional unit of a commodity. Social welfare can be measured by the consumption of commodities or services available to a society, whether these are sold or not sold in a market. Thus, economic benefits of project output are their contribution to increasing the consumption available to society. Economic costs of project inputs reflect consumption sacrificed elsewhere by diverting the resources to the project from other uses. The value of the total net change in consumption available to the society represents the net economic impact of the project (ADB, 2017)

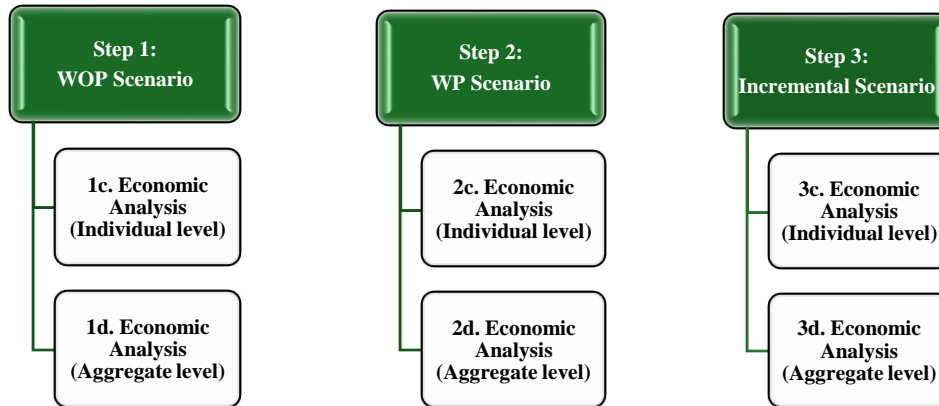
Consequently, to develop an economic analysis, the financial costs, as seen in the BRACE budget,<sup>32</sup> were adjusted to their economic values using the Shadow Exchange Rate Factor (SERF). The individual and aggregate economic resource flows were then created (Figures 3-5 below) in economic terms by adjusting financial (market) prices (if known) by SERF or using directly economic prices (e.g., estimated economic values as extracted from subject-specific scientific literature). The standard project's economic sustainability measures, the Economic Net Present Values (ENPV) were derived. The Economic Rates of Return (ERRs), Economic Modified Internal Rates of Return (EMIRRs), and Benefits Cost Ratios (BCRs) were also estimated to for information purpose. Incremental economic analysis was also pursued to show the incremental economic benefits of proposed interventions (Figure 5).

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<sup>31</sup> See footnote 27 above.

<sup>32</sup> Note: Grant funding from BRACE was treated as funding coming from outside of the economy of each country so it was not treated as a transfer within economies of the project countries.

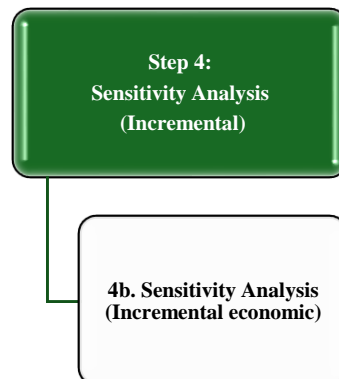
**Figure 3. WOP- Economic Part of EFA.    Figure 4. WP -Economic Part of EFA.    Figure 5. Incremental - Economic Part of EFA.**



#### 4.5. EFA: Sensitivity Analysis and “What if” Analysis

**Sensitizing EFA variables.** Additionally, a sensitivity analysis was pursued (Figure 6). The role of sensitivity analysis is not trivial, as it determines how target variables are affected based on changes in other variables known as input variables. This can predict the outcome of a decision given a specific range of variables. Sensitivity analysis is fundamental and necessary because data entries used in the EFA’s economic line entries are static by definition; hence, their likely variability over the time of the project or program is not embedded in the obtained ENPVs and ERRs. For details, please see section 6.3, below.

**Figure 6. Sensitivity Analysis Part of EFA.**





## 5. EFA Assumptions

The ex-ante specifics of the estimated EFA models which are indicative by nature required a set of assumptions that helped develop and assess the economic benefits and costs of proposed project interventions. These assumptions are divided into two sets:

1. General macroeconomic assumptions common to all BRACE EFA models (e.g., inflation rate, exchange rate, etc.,) as outlined in Table 3 below and
2. Model-specific assumptions relevant to each of the estimated EFA models (as presented in detail with basis and sources of assumptions in the accompanying EFA Excel File called *BRACE\_EFA*, specifically in the Excel sheets “*Data Sources*” and “*Calculations*.”

Both types of assumptions are briefly discussed in the next two subsections below. For details, please refer to the accompanying Annex 3 Excel file.

### 5.1. EFA: General and Macroeconomic Assumptions

The assumptions used in this EFA modelling is presented in Table 3 below.

**Table 3. General and Macroeconomic EFA Models’ Assumptions.**

Item	Value
<b>Project implementation period (for the project budget disbursement)</b>	Cambodia: 5 years Tonga: 5 years, South Sudan: 4 years
<b>Assumed ex-ante EFA analytical period for economic resource flows</b>	15 years
<b>Assumed average indicative public primary school size</b>	Cambodia: 217 students South Sudan: 456 students Tonga: 132 students
<b>Assumed number of beneficiary schools in each country (per intervention package)</b>	<b>Cambodia:</b> Package 1: 40 schools Package 2: 240 schools Package 3: 240 schools <b>South Sudan:</b> Package 1: 30 schools Package 2: 75 schools Package 3: 4510schools <b>Tonga:</b> Package 1: 7 schools Package 2: 100 schools Package 3: 50 schools
<b>Assumed# of school days in one year (assumed uniformly for all countries)</b>	180 days /year
<b>Number of primary school grades</b>	Cambodia: 6 grades

Item	Value
	South Sudan: 8 grades Tonga: 6 grades
Assumed primary school graduation rates at WOP	Cambodia: 90% <sup>33</sup> South Sudan: 14% <sup>34</sup> Tonga: 99% <sup>35</sup>
Inflation rate per target country	Cambodia: 2.1% South Sudan: 2.4% Tonga: 6.4%
US inflation rate	4.1%/year
KHR to USD exchange rate	1 USD = 4,111 KHR
SDG to USD exchange rate	1 USD = 535 SDG
TOP to USD exchange rate	1 USD = 2.36 TOP
Estimated Shadow Exchange Rate Factor (SERF)	Cambodia: 1.047 South Sudan: 1.228 Tonga: 1.030
Shadow Wage Rate Factor (SWRF)	Assumed uniformly at 1 <sup>36</sup>
Economic Discount Rate (Economic Opportunity Cost of Capital (EOCK))-assumed <sup>37</sup>	Cambodia: 9% South Sudan: 9% Tonga: 9%
Assumed private rate of investment to education (uniform)	25.4% (annually) <sup>38</sup>

## 5.2. EFA: Model-Type-Specific Assumptions

**Direct beneficiaries’-based EFA modelling assumption.** The specifics regarding the “direct beneficiaries’-based EFA modelling” can be seen in the accompanying Annex 3 Excel file and are not presented here in detail to minimize the size of this report. For specific data assumptions and sources, please refer to the Excel sheet “*Data Sources*” and “*Calculations*.” However, in the case of each of three proposed targets and their WOP and WP scenarios, specific care was taken to estimate these models using realistic assumptions on the following: (i). number of students in an average and indicative public primary school, (ii). students’ missed school days under RCP 4.5 versus RCP 8.5, (iii). returns to education, (iv). graduation rates, (v). school allocated annual budgets, (vi). assumptions on annual benefits associated with school safety training and curriculum training, etc<sup>39</sup>.

<sup>33</sup> Source: [https://www.epdc.org/sites/default/files/documents/EPDC\\_NEP\\_2018\\_Cambodia.pdf](https://www.epdc.org/sites/default/files/documents/EPDC_NEP_2018_Cambodia.pdf)

<sup>34</sup> Source: <https://www.unicef.org/southsudan/stories/desire-enjoys-her-new-school>

<sup>35</sup> Source: <https://data.uis.unesco.org/index.aspx?queryid=3694>

<sup>36</sup> The SWRF is assumed at 1 as it is expected that the project funding will not influence internal labour markets in the project countries. Hence the project will not have influence on wage rates.

<sup>37</sup> This EOCK was assumed uniformly at 9% based on Asian Development Bank- *Guidelines for the economic analysis of projects*. Mandaluyong City, Philippines, ADB, 2017.

<sup>38</sup> Source: <https://www.sciencedirect.com/science/article/abs/pii/B9780128153918000045>

**39 Annual Economic Returns to Primary Education:** This represents the benefits derived from regular and full attendance in primary education. It includes the positive outcomes such as

**Building realistic scenarios.** A particular care was taken to establish types of scenarios that are realistic in their nature and are not overoptimistic knowing the selected countries' geopolitical and climatic situation. This task was achieved via using country-specific knowledge obtained from a desktop review of available data and publications relevant to specific interventions (as per **Bibliography** section of this report). Combining all these information sources was used in the EFA modelling process to input necessary values in developing economic resource flows.

**Monetizing benefits from education and training.** The BRACE project is expected to deliver a wide range of interventions that are anticipated to yield economic benefits through:

1. Enhancements in human capital:
  - a. reduced disruptions in children's education, hence lower absenteeism,
  - b. improved expertise among school staff and teachers to ensure continuity in teaching during extreme weather events, and more.
2. Avoided costs of damage to school infrastructure.
3. Benefits associated with using schools as shelters.

**Pricing benefits that do not have clear market prices and accrue in time.** Assessing the monetary value of benefits from improvements in human capital can be complex due to the challenges in pricing such interventions and reliance on external data. Gathering extensive longitudinal data at the country level for human capital and education can also be time-consuming and expensive, hence prohibitive for the ex-ante EFA analysis. Similarly, assessing economic benefits from avoided damage costs presents challenges due to inter-school differences and the potential for varying levels of damage after each climate event. To address these issues, a strategic approach was implemented to bundle school-level interventions, ensuring better appraisal of economic benefits, and preventing double-counting (e.g., by bundling intervention in Package 1, 2 or 3 and setting assumptions on potential levels of benefits across target countries). This approach allowed for the estimation of economic values used in the analysis.

**Estimating the project's benefits through the appraisal of primary school education.** The BRACE EFA was developed using examples of indicative primary schools in three target countries: Cambodia, South Sudan, and Tonga. Providing interventions to primary schools is of utmost importance, as primary school education serves as the cornerstone in low- and middle-income countries. While the rates of return (private and social) on investments in education differ across education levels and various publications, it is widely acknowledged that the highest returns on education investment are achieved at the primary school level.<sup>40</sup> In the BRACE EFA modelling it was assumed uniformly for all three target countries that private returns to primary education are at 25.4% per annum.<sup>41</sup> Additionally, it was assumed that children

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increased future earnings, improved health, and overall societal benefits that result from a well-educated population. These returns are calculated based on the assumption that students attend school regularly and receive the full benefits of their education.

**Estimated Cost of Missed Student School Days:** This represents the costs associated with students missing school. It includes the loss of potential educational opportunities and future income due to educational disruption. This cost is calculated based on the number of missed school days and the associated loss in educational value and future earnings.

<sup>40</sup> Source: <https://openknowledge.worldbank.org/entities/publication/604f36b2-3890-5f8e-929c-6576f29dd109>

<sup>41</sup> Source: See table 4.3 from: <https://www.sciencedirect.com/science/article/abs/pii/B9780128153918000045>

in these target countries could be employed from age 12-15 years old at 50% work effort (aka part-time) and from years 15-on at 100% work effort (aka full-time).<sup>42</sup> These two assumptions together with estimating the number of school cohorts that will graduate during 15 years which is an assumed analytical timeframe in this EFA helped develop potential school-level benefits coming from returns to education.

## 6. Results

### 6.1. EFA: Direct Beneficiaries Perspective Results

**Economic analysis results for direct beneficiaries.** The ex-ante economic EFA was pursued over 15 years, in individual and in aggregate terms (per assumed number of indicative public primary schools to be included in the BRACE project-as per Tables 2 and 3 above) using economic discount rate of 9%. The obtained results (individual and aggregate) of each target country indicate that proposed intervention packages: Package 1, 2 and 3, respectively will bring incremental benefits to the education systems and the economy of target countries. The incremental ENPVs can be seen in Table 4 below.

**Table 4. Incremental Results per Target Country from Direct Beneficiaries' (Schools) Perspective  
(with average per school GCF funding accounted for)**

PACKAGE 1							
Individual results				Aggregate results			
RCP 4.5 Assumed				RCP 4.5 Assumed			
Cambodia -Package 1				Cambodia -Package 1			
Individual results	WOP Scenario	WP Scenario	Incremental Scenario	Aggregate results	WOP Scenario	WP Scenario	Incremental Scenario
ENPV(KHR)	-KHR 1,513,189	KHR 125,456,598	KHR 126,969,787	ENPV(KHR)	-KHR 60,527,550	KHR 5,018,263,932	KHR 5,078,791,482
ENPV(USD)	-\$ 368	\$ 30,517	\$ 30,885	ENPV(USD)	-\$ 14,723	\$ 1,220,692	\$ 1,235,415
EIRR (%)	8%	24%	29%	EIRR (%)	8%	24%	29%
EMIRR (%)	9%	15%	17%	EMIRR (%)	9%	15%	17%
South Sudan -Package 1				South Sudan -Package 1			
Individual results	WOP Scenario	WP Scenario	Incremental Scenario	Aggregate results	WOP Scenario	WP Scenario	Incremental Scenario
ENPV(SDG)	-SDG 1,033,387	SDG 29,917,943	SDG 30,951,330	ENPV(SDG)	-SDG 31,001,620	SDG 897,538,288	SDG 928,539,908
ENPV(USD)	-\$ 1,931.57	\$ 55,921.39	\$ 57,852.95	ENPV(USD)	-\$ 57,946.95	\$ 1,677,641.66	\$ 1,735,588.61
EIRR (%)	-2%	34%	37%	ERR (%)	-2%	34%	37%
EMIRR (%)	1%	19%	20%	EMIRR (%)	1%	19%	20%
Tonga -Package 1				Tonga -Package 1			
Individual results	WOP Scenario	WP Scenario	Incremental Scenario	Aggregate results	WOP Scenario	WP Scenario	Incremental Scenario

<sup>42</sup> Based on: <https://www.usemultiplier.com/cambodia/employment-laws#:~:text=The%20Cambodia%20Labor%20Law%20also,part%2Dtime%20for%20lightweight%20work>  
<https://ago.gov.to/cms/images/LEGISLATION/BILLS/2020/2020-0003/EmploymentRelationsBill2020.pdf>

ENPV(TOP)	-TOP 23,799	TOP 553,351	TOP 577,150	ENPV(TOP)	-TOP 166,595	TOP 3,873,457	TOP 4,040,052
ENPV(USD)	-\$ 10,084.45	\$ 234,470.74	\$ 244,555.19	ENPV(USD)	-\$ 70,591.17	\$ 1,641,295.18	\$ 1,711,886.35
EIRR (%)	7%	33%	60%	EIRR (%)	7%	33%	60%
EMIRR (%)	7%	19%	24%	EMIRR (%)	7%	19%	24%
Individual results				Aggregate results			
RCP 8.5 Assumed				RCP 8.5 Assumed			
Cambodia -Package 1				Cambodia -Package 1			
Individual results	WOP Scenario	WP Scenario	Incremental Scenario	Aggregate results	WOP Scenario	WP Scenario	Incremental Scenario
ENPV(KHR)	-KHR 2,225,866	KHR 116,329,755	KHR 118,555,622	ENPV(KHR)	-KHR 89,034,651	KHR 4,653,190,218	KHR 4,742,224,869
ENPV(USD)	-\$ 541	\$ 28,297	\$ 28,839	ENPV(USD)	-\$ 21,658	\$ 1,131,888	\$ 1,153,545
EIRR (%)	8%	22%	28%	EIRR (%)	8%	22%	28%
EMIRR (%)	8%	15%	16%	EMIRR (%)	8%	15%	16%
South Sudan -Package 1				South Sudan -Package 1			
Individual results	WOP Scenario	WP Scenario	Incremental Scenario	Aggregate results	WOP Scenario	WP Scenario	Incremental Scenario
ENPV(SDG)	-SDG 1,056,065	SDG 28,135,882	SDG 29,191,947	ENPV(SDG)	-SDG 31,681,955	SDG 844,076,459	SDG 875,758,415
ENPV(USD)	-\$ 1,973.95	\$ 52,590.43	\$ 54,564.39	ENPV(USD)	-\$ 59,218.61	\$ 1,577,713.01	\$ 1,636,931.62
EIRR (%)	-2%	32%	35%	EIRR (%)	-2%	32%	35%
EMIRR (%)	1%	18%	19%	EMIRR (%)	1%	18%	19%
Tonga -Package 1				Tonga -Package 1			
Individual results	WOP Scenario	WP Scenario	Incremental Scenario	Aggregate results	WOP Scenario	WP Scenario	Incremental Scenario
ENPV(TOP)	-TOP 26,134	TOP 502,624	TOP 528,757	ENPV(TOP)	-TOP 182,935	TOP 3,518,367	TOP 3,701,302
ENPV(USD)	-\$ 11,073.56	\$ 212,976.21	\$ 224,049.77	ENPV(USD)	-\$ 77,514.94	\$ 1,490,833.45	\$ 1,568,348.39
EIRR (%)	7%	30%	52%	EIRR (%)	7%	30%	52%
EMIRR (%)	7%	18%	23%	EMIRR (%)	7%	18%	23%

PACKAGE 2							
Individual results				Aggregate results			
RCP 4.5 Assumed				RCP 4.5 Assumed			
Cambodia t-Package 2				Cambodia t-Package 2			
Individual results	WOP Scenario	WP Scenario	Incremental Scenario	Aggregate results	WOP Scenario	WP Scenario	Incremental Scenario
ENPV(KHR)	-KHR 1,513,189	KHR 125,196,281	KHR 126,709,470	ENPV(KHR)	-KHR 363,165,297	KHR 30,047,107,389	KHR 30,410,272,686
ENPV(USD)	-\$ 368	\$ 30,454	\$ 30,822	ENPV(USD)	-\$ 88,340	\$ 7,308,953	\$ 7,397,293
EIRR (%)	8%	24%	29%	EIRR (%)	8%	24%	29%
EMIRR (%)	9%	15%	17%	EMIRR (%)	9%	15%	17%
South Sudan -Package 2				South Sudan -Package 2			
Individual results	WOP Scenario	WP Scenario	Incremental Scenario	Aggregate results	WOP Scenario	WP Scenario	Incremental Scenario
ENPV(SDG)	-SDG 1,033,387	SDG 29,827,232	SDG 30,860,619	ENPV(SDG)	-SDG 77,504,050	SDG 2,237,042,366	SDG 2,314,546,416

ENPV(USD)	-\$ 1,931.57	\$ 55,751.83	\$ 57,683.40	ENPV(USD)	-\$ 144,867.38	\$ 4,181,387.60	\$ 4,326,254.98
EIRR (%)	-2%	34%	37%	ERR (%)	-2%	34%	37%
EMIRR (%)	1%	19%	20%	EMIRR (%)	1%	19%	20%
Tonga -Package 2				Tonga -Package 2			
Individual results	WOP Scenario	WP Scenario	Incremental Scenario	Aggregate results	WOP Scenario	WP Scenario	Incremental Scenario
ENPV(TOP)	-TOP 23,799	TOP 544,014	TOP 567,813	ENPV(TOP)	-TOP 2,379,931	TOP 54,401,374	TOP 56,781,305
ENPV(USD)	-\$ 10,084.45	\$ 230,514.30	\$ 240,598.75	ENPV(USD)	-\$ 1,008,445.23	\$ 23,051,429.75	\$ 24,059,874.99
EIRR (%)	7%	32%	58%	EIRR (%)	7%	32%	58%
EMIRR (%)	7%	19%	24%	EMIRR (%)	7%	19%	24%
Individual results				Aggregate results			
RCP 8.5 Assumed				RCP 8.5 Assumed			
Cambodia -Package 2				Cambodia -Package 2			
Individual results	WOP Scenario	WP Scenario	Incremental Scenario	Aggregate results	WOP Scenario	WP Scenario	Incremental Scenario
ENPV(KHR)	-KHR 2,225,866	KHR 120,353,139	KHR 122,579,005	ENPV(KHR)	-KHR 534,207,906	KHR 28,884,753,315	KHR 29,418,961,220
ENPV(USD)	-\$ 541	\$ 29,276	\$ 29,817	ENPV(USD)	-\$ 129,946	\$ 7,026,211	\$ 7,156,157
EIRR (%)	8%	23%	29%	EIRR (%)	8%	23%	29%
EMIRR (%)	8%	15%	17%	EMIRR (%)	8%	15%	17%
South Sudan -Package 2				South Sudan -Package 2			
Individual results	WOP Scenario	WP Scenario	Incremental Scenario	Aggregate results	WOP Scenario	WP Scenario	Incremental Scenario
ENPV(SDG)	-SDG 1,056,065	SDG 29,677,445	SDG 30,733,510	ENPV(SDG)	-SDG 79,204,889	SDG 2,225,808,383	SDG 2,305,013,272
ENPV(USD)	-\$ 1,973.95	\$ 55,471.86	\$ 57,445.81	ENPV(USD)	-\$ 148,046.52	\$ 4,160,389.50	\$ 4,308,436.02
EIRR (%)	-2%	34%	37%	EIRR (%)	-2%	34%	37%
EMIRR (%)	1%	19%	20%	EMIRR (%)	1%	19%	20%
Tonga -Package 2				Tonga -Package 2			
Individual results	WOP Scenario	WP Scenario	Incremental Scenario	Aggregate results	WOP Scenario	WP Scenario	Incremental Scenario
ENPV(TOP)	-TOP 26,134	TOP 494,454	TOP 520,587	ENPV(TOP)	-TOP 2,613,361	TOP 49,445,380	TOP 52,058,740
ENPV(USD)	-\$ 11,073.56	\$ 209,514.32	\$ 220,587.88	ENPV(USD)	-\$ 1,107,356.30	\$ 20,951,432.00	\$ 22,058,788.30
EIRR (%)	7%	30%	51%	EIRR (%)	7%	30%	51%
EMIRR (%)	7%	18%	22%	EMIRR (%)	7%	18%	22%

PACKAGE 3							
Individual results				Aggregate results			
RCP 4.5 Assumed				RCP 4.5 Assumed			
Cambodia -Package 3				Cambodia t-Package 3			
Individual results	WOP Scenario	WP Scenario	Incremental Scenario	Aggregate results	WOP Scenario	WP Scenario	Incremental Scenario
ENPV(KHR)	-KHR 1,513,189	KHR 48,178,255	KHR 62,786,906	ENPV(KHR)	-KHR 363,165,297	KHR 11,562,781,274	KHR 15,068,857,492
ENPV(USD)	-\$ 368	\$ 11,719	\$ 15,273	ENPV(USD)	-\$ 88,340	\$ 2,812,644	\$ 3,665,497
EIRR (%)	8%	15%	21%	EIRR (%)	8%	15%	21%
EMIRR (%)	9%	12%	14%	EMIRR (%)	9%	12%	14%
South Sudan -Package 3				South Sudan -Package 3			
Individual results	WOP Scenario	WP Scenario	Incremental Scenario	Aggregate results	WOP Scenario	WP Scenario	Incremental Scenario
ENPV(SDG)	-SDG 1,033,387	SDG 10,421,131	SDG 11,454,519	ENPV(SDG)	-SDG 527,027,541	SDG 5,314,776,914	SDG 5,841,804,455

ENPV(USD)	-\$ 1,931.57	\$ 19,478.75	\$ 21,410.32	ENPV(USD)	-\$ 985,098.21	\$ 9,934,162.46	\$ 10,919,260.66
EIRR (%)	-2%	20%	22%	ERR (%)	-2%	20%	22%
EMIRR (%)	1%	14%	15%	EMIRR (%)	1%	14%	15%
Tonga -Package 3				Tonga -Package 3			
Individual results	WOP Scenario	WP Scenario	Incremental Scenario	Aggregate results	WOP Scenario	WP Scenario	Incremental Scenario
ENPV(TOP)	-TOP 23,799	TOP 484,463	TOP 508,262	ENPV(TOP)	-TOP 1,189,965	TOP 24,223,131	TOP 25,413,097
ENPV(USD)	-\$ 10,084.45	\$ 205,280.78	\$ 215,365.23	ENPV(USD)	-\$ 504,222.62	\$ 10,264,038.76	\$ 10,768,261.38
EIRR (%)	7%	30%	54%	EIRR (%)	7%	30%	54%
EMIRR (%)	7%	18%	23%	EMIRR (%)	7%	18%	23%
Individual results				Aggregate results			
RCP 8.5 Assumed				RCP 8.5 Assumed			
Cambodia -Package 3				Cambodia -Package 3			
Individual results	WOP Scenario	WP Scenario	Incremental Scenario	Aggregate results	WOP Scenario	WP Scenario	Incremental Scenario
ENPV(KHR)	-KHR 2,225,866	KHR 47,723,461	KHR 49,949,327	ENPV(KHR)	-KHR 534,207,906	KHR 11,453,630,525	KHR 11,987,838,431
ENPV(USD)	-\$ 541	\$ 11,609	\$ 12,150	ENPV(USD)	-\$ 129,946	\$ 2,786,094	\$ 2,916,040
EIRR (%)	8%	15%	19%	EIRR (%)	8%	15%	19%
EMIRR (%)	8%	12%	13%	EMIRR (%)	8%	12%	13%
South Sudan -Package 3				South Sudan -Package 3			
Individual results	WOP Scenario	WP Scenario	Incremental Scenario	Aggregate results	WOP Scenario	WP Scenario	Incremental Scenario
ENPV(SDG)	-SDG 1,056,065	SDG 10,292,802	SDG 11,348,867	ENPV(SDG)	-SDG 538,593,242	SDG 5,249,329,042	SDG 5,787,922,284
ENPV(USD)	-\$ 1,973.95	\$ 19,238.88	\$ 21,212.84	ENPV(USD)	-\$ 1,006,716.34	\$ 9,811,829.99	\$ 10,818,546.33
EIRR (%)	-2%	20%	22%	EIRR (%)	-2%	20%	22%
EMIRR (%)	1%	14%	14%	EMIRR (%)	1%	14%	14%
Tonga -Package 3				Tonga -Package 3			
Individual results	WOP Scenario	WP Scenario	Incremental Scenario	Aggregate results	WOP Scenario	WP Scenario	Incremental Scenario
ENPV(TOP)	-TOP 26,134	TOP 434,903	TOP 461,036	ENPV(TOP)	-TOP 1,306,680	TOP 21,745,134	TOP 23,051,815
ENPV(USD)	-\$ 11,073.56	\$ 184,280.80	\$ 195,354.36	ENPV(USD)	-\$ 553,678.15	\$ 9,214,039.88	\$ 9,767,718.04
EIRR (%)	7%	28%	47%	EIRR (%)	7%	28%	47%
EMIRR (%)	7%	17%	22%	EMIRR (%)	7%	17%	22%

## 6.2. EFA: Overall Project Perspective Results

**Economic analysis results for the entire BRACE project (aggregate results for the entire project).** The ex-ante economic part of the EFA pursued from the entire project perspective over 15 years using economic discount rate of 9% also show positive results suggesting the overall project's viability and economic sustainability. In the case of this analysis, the project's budget was considered as well as the project's implementation schedule (budget's phasing in).

Table 8 below present detailed overall results of this project. Please note, the results are presented separately for RCP 4.5 and RCP 8.5. For modelling details, please refer to Excel sheet "*Overall Project Results.*"

**Table 5. Aggregate Economic Part of the EFA (Entire Project Perspective) -RCP 4.5 vs. RCP 8.5.**

OVERALL BRACE PROJECT RESULTS (ALL TARGETS) with GCF funding accounted for					
Aggregate Economic Results			Aggregate Economic Results		
RCP 4.5 assumed. Analytical timeframe: 15 years, discount rate: 9%			RCP 8.5 assumed. Analytical timeframe: 15 years, discount rate: 9%		
ENPV (USD)	\$	87,844,031	ENPV (USD)	\$	86,012,237
ERR (%)		36%	ERR (%)		35%
EMIRR (%)		20%	EMIRR (%)		20%
BCR		6.84	BCR		6.75

## 6.3. EFA: Sensitivity Analysis Results

### 6.3.1. Direct Beneficiaries Sensitivity Analysis

**School-level sensitivity.** The pursued school-level sensitivity analysis shows that obtained ex-ante EFA results are insensitive to changes in benefits of up to 30% of benefits decrease.

Please note, the results are presented separately for RCP 4.5 and RCP 8.5. They can be seen in Tables 6-8 below.

For modelling details, please refer to Excel sheet "*Sensitivity Analysis Separate.*"

**Table 6. Cambodia Sensitivity per All Packages Combined.**

CAMBODIA TARGET (SENSITIVITY PER ALL PACKAGES COMBINED) with GCF funding accounted for					
RCP 4.5 assumed. Analytical timeframe: 15 years, discount rate: 9%			RCP 8.5 assumed. Analytical timeframe: 15 years, discount rate: 9%		
Aggregate Economic Results (sensitized)			Aggregate Economic Results (sensitized)		
Benefits [-10%]			Benefits [-10%]		
ENPV (USD)		8,558,502	ENPV (USD)		8,192,938
ERR (%)		17%	ERR (%)		17%
EMIRR (%)		13%	EMIRR (%)		13%
Benefits [-20%]			Benefits [-20%]		
ENPV (USD)		5,774,715	ENPV (USD)		5,441,683
ERR (%)		15%	ERR (%)		14%
EMIRR (%)		12%	EMIRR (%)		12%
Benefits [-30%]			Benefits [-30%]		
ENPV (USD)		2,990,928	ENPV (USD)		2,690,429
ERR (%)		12%	ERR (%)		12%
EMIRR (%)		10%	EMIRR (%)		10%



**Table 7. South Sudan Sensitivity per All Packages Combined.**

SOUTH SUDAN (SENSITIVITY PER ALL PACKAGES COMBINED) with GCF funding accounted for			
RCP 4.5 assumed. Analytical timeframe: 15 years, discount rate: 9%		RCP 8.5 assumed. Analytical timeframe: 15 years, discount rate: 9%	
Aggregate Economic Results (sensitized)		Aggregate Economic Results (sensitized)	
Benefits [-10%]		Benefits [-10%]	
ENPV (USD)	11,824,027	ENPV (USD)	11,572,463
ERR (%)	19%	ERR (%)	19%
EMIRR (%)	13%	EMIRR (%)	13%
Benefits [-20%]		Benefits [-20%]	
ENPV (USD)	7,854,862	ENPV (USD)	7,594,993
ERR (%)	16%	ERR (%)	15%
EMIRR (%)	12%	EMIRR (%)	12%
Benefits [-30%]		Benefits [-30%]	
ENPV (USD)	3,885,697	ENPV (USD)	3,617,523
ERR (%)	12%	ERR (%)	12%
EMIRR (%)	11%	EMIRR (%)	10%

**Table 8. Tonga Sensitivity per All Packages Combined.**

TONGA (SENSITIVITY PER ALL PACKAGES COMBINED) with GCF funding accounted for			
RCP 4.5 assumed. Analytical timeframe: 15 years, discount rate: 9%		RCP 8.5 assumed. Analytical timeframe: 15 years, discount rate: 9%	
Aggregate Economic Results (sensitized)		Aggregate Economic Results (sensitized)	
Benefits [-10%]		Benefits [-10%]	
ENPV (USD)	28,846,582	ENPV (USD)	26,076,697
ERR (%)	27%	ERR (%)	25%
EMIRR (%)	17%	EMIRR (%)	16%
Benefits [-20%]		Benefits [-20%]	
ENPV (USD)	22,961,205	ENPV (USD)	20,497,088
ERR (%)	24%	ERR (%)	22%
EMIRR (%)	16%	EMIRR (%)	15%
Benefits [-30%]		Benefits [-30%]	
ENPV (USD)	17,975,046	ENPV (USD)	14,917,479
ERR (%)	21%	ERR (%)	18%
EMIRR (%)	15%	EMIRR (%)	13%

### 6.3.2. Overall Project Sensitivity Analysis

**Entire project sensitivity.** A sensitivity analysis was also conducted, considering the entire project's results. It shows the insensitivity of obtained results when benefits are decreased by up to 30%, suggesting the robustness of obtained estimates and negligible risk of a decrease in economic benefits when proposed interventions are implemented.

Please note, the results are presented separately for RCP 4.5 and RCP 8.5, and they are presented in Table 9 below.

For modelling details, please refer to Excel sheet *“Overall Project Results.”*

**Table 9. Sensitivity Analysis Results-Entire Project Perspective EFA**

OVERALL BRACE PROJECT RESULTS (ALL TARGETS)-SENSITIZED with GCF funding accounted for			
RCP 4.5 assumed. Analytical timeframe: 15 years, discount rate: 9%		RCP 8.5 assumed. Analytical timeframe: 15 years, discount rate: 9%	
Aggregate Economic Results (sensitized)		Aggregate Economic Results (sensitized)	
Benefits [-10%]		Benefits [-10%]	
ENPV (USD)	\$ 74,977,085	ENPV (USD)	\$ 73,328,471
ERR (%)	32%	ERR (%)	32%
EMIRR (%)	19%	EMIRR (%)	18%
Benefits [-20%]		Benefits [-20%]	
ENPV (USD)	\$ 62,110,140	ENPV (USD)	\$ 60,644,706
ERR (%)	29%	ERR (%)	28%
EMIRR (%)	17%	EMIRR (%)	17%
Benefits [-30%]		Benefits [-30%]	
ENPV (USD)	\$ 49,243,195	ENPV (USD)	\$ 47,960,940
ERR (%)	26%	ERR (%)	25%
EMIRR (%)	16%	EMIRR (%)	16%

### 6.4. EFA: Other and Non-monetized BRACE Benefits.

**Monetized versus non-monetized benefits.** The BRACE EFA conducted comprehensive modelling, yet there remain potential benefits that could not be fully captured in the analysis. While these benefits could not be assigned a specific value, they may significantly impact intended beneficiaries and the entire economy. These unquantified benefits could elevate the economic benefits of BRACE beyond the evaluation presented in section 6 of the report. This report also delves into several non-quantified benefits to ensure a comprehensive assessment, providing a more holistic view of the project's potential benefits.

**Component 3 benefits were not included in the EFA.** The pursued EFA included quantification of likely benefits stemming from interventions defined in Components 1 and 2. The economic benefits of *Component 3: Coordination and Knowledge Sharing on Climate and Education, with outputs and activities leading to Outcome 3 – Education and climate stakeholders globally are connecting, coordinating, collaborating and cross-learning for enhanced climate action in the education sector* are not included in the quantitative part of the EFA at the ex-ante due to the lack of specific information regarding these benefits. However, it is expected that once monetized, these benefits would be positive adding further to the overall positive results of this EFA.

**Improving access to water, hence potentially better sanitation, and health improvements.** Improving access to clean water can significantly enhance the well-being of students by reducing the spread of

waterborne diseases and improving overall hygiene. We can dramatically enhance children's health by providing clean and safe school water sources and implementing proper sanitation strategies such as building latrines and promoting waste management. This initiative not only benefits the student's attendance levels (included in the quantified part of the EFA) but also has the potential to decrease household expenses on medications and healthcare services. However, the specific data needed to quantify such potential household cost-savings was unavailable for the ex-ante EFA.

**Providing increase in employment opportunities.** The BRACE project is expected to provide an increase in employment opportunities, which can have a positive impact on individuals and communities. The improved skills due to continuous access to schooling can help reduce unemployment rates and increase financial stability. This can lead to a boost in the local economy as people have more disposable income to spend on goods and services. Additionally, having a job can provide a sense of purpose, pride, and fulfilment for individuals, which can contribute to better mental health outcomes. The BRACE project is expected to induce some job creation for local communities, and it is also likely to provide some potential spillover effects to other schools not included in the BRACE project (e.g., due to the movement of trained teachers and staff from one school to another). These potential benefits were not priced and included in the EFA as they could not be modelled at the ex-ante.

**Mitigation impacts.** The BRACE project is dedicated to upgrading infrastructure in selected schools to make them more environmentally friendly. As a result, we anticipate a reduction in greenhouse gas emissions due to the improved school infrastructure. While measuring these mitigation impacts at the onset was challenging, especially given the demand-based nature of specific infrastructure interventions that could not be fully anticipated during the ex-ante EFA, we foresee positive economic outcomes from the enhanced infrastructure.

## 7. Analytical Limitations

**Main analytical obstacles.** Even though the analysis was conducted meticulously and with great attention to detail, it is important to recognize that there may still be several factors that could potentially influence the EFA results. Two primary limitations—indicative modelling and the use of secondary data—are briefly outlined below.

**Indicative modelling.** The EFA focused on typical and average primary schools (indicative) in each country. Given the wide range of schools set to benefit from the BRACE project interventions, each with its own unique characteristics, and the varying levels of heterogeneity among students, the analysis had to be based on average school models. While this approach is not ideal, the EFA modelling utilized the best and most up-to-date data available and developed detailed models from that information. Furthermore, sensitivity analysis was conducted to partially account for potential modelling risks.

**Reliance on secondary data and results of past projects.** Due to limited access to primary data at the outset, our analysis heavily relied on secondary data and the necessary assumptions. While primary or self-collected data is typically preferred for EFA, education projects often necessitate reliance on data collected by others due to the long-term nature of education benefits. For instance, estimating the potential benefits of an additional year of education through one-time interviews in schools is not feasible. Instead, longitudinal data collection on graduates is required. This analysis used reliable secondary data and scientific resources to ensure our findings were grounded in reality. Also, due to the need for more methods of estimates for economic benefits accruing to distinct types of training, e.g., safety training or curriculum training, assumptions on potential levels of such benefits had to be stated. Whenever possible,

the stated assumptions were grounded in research and findings done elsewhere and the resources used were quoted in the “Data Sources” or “Calculations” Excel sheets.

## **8. Conclusions**

Based on the pursued ex-ante EFA and its results it is expected that the proposed BRACE project will bring positive economic benefits to target countries. The results do not come as a surprise as education plays a crucial role in driving economic growth and lifting people out of poverty. A strong education system not only produces skilled workers for the national economy but also fosters the expansion of knowledge. It empowers students with the skills needed to enhance individual productivity while generating numerous social and non-market benefits such as improved child well-being, better health outcomes, more effective consumer choices, and increased social capital.

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