Fossil Fuel Subsidy and Taxation Reform Scenarios Modelling for Saint Lucia

JUNE 2021

Disclaimer

This report will serve as a guide to the GOSL as it navigates the implementation of critical strategies and policies to support its economic development; especially in light of the impacts of the COVID-19 pandemic. The responsible agencies acknowledge that there is a need to continue engaging all stakeholders, as it considers the recommendations offered herein, in order to determine the most viable options.

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Abbreviations

BAU	Business as Usual
C.I.F	Cost, Insurance and Freight
CAEP	Climate Action Enhancement Package
CLD	Causal Loop Diagram
CO2e	Carbon dioxide equivalent
ECLAC	Economic Commission for Latin America and the Caribbean
EE	Energy Efficiency
FFSR	Fossil fuel subsidy Reform
GEM	Green Economy Model
GGGI	Global Green Growth Institute
GHG	Greenhouse Gas
GoSL	Government of Saint Lucia
GSI	Global Subsidies Initiative
GSI – IF	Global Subsidies Initiative – Integrated Fiscal model
IEA	International Energy Agency
IISD	International Institute for Sustainable Development
LPG	Liquefied Petroleum Gasoline
NDCs	Nationally Determined Contributions
RE	Renewable Energy
SD	System Dynamics
TJ	Terajoule
UNFCCC	United Nations Framework Convention on Climate Change
UNSD	United Nations Statistics Division
WRI	World Resources Institute
XCD	East Caribbean Dollars

Acknowledgments

Summary

The Government of Saint Lucia provides direct subsidies on the use of LPG and price support to diesel and gasoline by setting a price cap to limit the impact of the increase of international prices of oil products. Subsidies and other inefficient tax regimes or policies on fossil fuels can lead to overconsumption of fossil fuels and put pressure on public budgets. Fossil fuel subsidy reform (FFSR) creates opportunities for increased government revenues and has a great potential to reduce imported oil products and consequently GHG emissions. Subsidy reform and better taxation of fossil fuels aim to increase government revenues and reduce expenditures, as well as to develop and strengthen social safety nets (Bridle et al., 2018). Removal of subsidies and reforming taxation schemes can lead to substantial fiscal savings and free up resources for governments to invest in sectors such as health, education, and sustainable energy for all (Global Subsidies Initiative [GSI], 2019), along with advancement of more energy efficient technologies and practices that could further lead to reduction of air pollution and GHG emissions. According to the research from (GSI, 2019) studied in 30 countries, an average of 13.22% of total national emissions can be decreased by FFSR. Among the NDCs submitted to the United Nations Framework Convention on Climate Change (UNFCCC), only 8 % of NDCs address the issue of fossil fuel subsidies.

The Fossil fuel subsidy/ taxation modelling activity is part of the NDC Partnership Climate Action Enhancement Package (CAEP), and aims to achieve the following objectives:

- to investigate current tax rates and structure surrounding fossil fuels use in Saint Lucia,
- to analyse and model different scenarios of fossil fuel subsidy and taxation reform,
- to recommend possible future fossil fuel subsidy and tax schemes that would result in reduced fossil fuel consumption and GHG emissions as well as reallocation of the increased tax revenues to more targeted areas.

The methodology included different methods such as modelling of fossil fuel subsidy reform (FFSR) scenarios, stakeholders' consultations and validation workshops and interviews with Government officials. Through a series of workshops with relevant stakeholders and departments of the government of Saint Lucia, feasible policy options for modelling scenarios were explored and analysed. For modelling the different fossil fuel subsidy and taxation reform policy options, the Green Economy Model and the GSI-IF models were utilized. The models estimated the impact of fossil fuel subsidy reform scenarios fiscal savings from subsidy reductions and increased taxations, explored the impacts on GHG emissions, and evaluated the reallocation of subsidy savings and tax revenues to other programs including energy efficiency and renewable energy.

Based on the analysis of different fossil fuel subsidy reform (FFSR) scenarios and the close consultation with stakeholders through three workshops and a series of interviews the "Fossil fuel subsidy and price cap gradual linear removal and reallocation (for 10 years) of increased revenues" proved to perform best against the selected indicators.

Under this scenario, the subsidy on LPG 20lbs and 22lbs and the price cap on gasoline and diesel are gradually removed over the course of five years starting in 2022, while the increased annual revenues will be reallocated for 10 years in debt reduction (40%), investment in renewable energy (15%) and energy efficiency (15%), and compensation to low-income households (30%). By 2050, the cumulative subsidy savings will be approximately EC$ 3,777 million. By 2032, 10 years after the adoption of the FFSR, it can be expected that the energy bill will be decreased by 3.5% compared to Business as Usual (BAU) scenario, the annual Gross Domestic Product (GDP) will increase by 1.9 % compared to BAU scenario and the CO_2 emissions will be reduced by 16.4% compared to the BAU scenario.

Currently, the oil prices internationally are at very low levels presenting a great opportunity to start gradually removing the fossil fuel subsidy and price cap. Fossil fuel subsidy utilizes central government resources that could be used for other sectors such of health, education, etc. or other purposes such as reduction of debt, compensation of the affected households and investments in energy efficiency and renewable energy. Reallocating subsidy savings to compensation, energy efficiency and renewable energy will contribute to offsetting the energy cost increase resulting from subsidy removal. Adequate social dialogue is needed to make sure that the views and concerns of key stakeholders are taken into account and incorporated in the design of the fossil fuel subsidy and taxation reform and adequate compensation schemes target those most in need for full compensation. The potential impacts of the subsidy and price cap removal on the most vulnerable groups should be analysed and the groups that will need to receive compensation from the Government to be identified. The fossil fuel subsidy and taxation reform presents an opportunity to start gradually substituting imported fossil fuels with local resources, including renewable energy, while transforming and modernizing the energy system of the country. The FFSR should be combined with other policies that support renewable energy and energy efficiency, including the repurposing of subsidies and increased revenues. Adequate pricing of fossil fuels provides the right signals to consumers for stimulating behavioral change towards energy and fuel efficiency both in electricity and transport sectors.

1. Introduction

According to International Energy Agency (IEA, n.d.) fossil fuel consumption subsidies are still in place in more than 40 countries around the world. While governments try to make energy more affordable, in practice, many subsidies are inefficiently designed or not well-targeted to those in need, providing perverse incentives for wasteful fuel consumption, causing air pollution and increased GHG emissions, posing systematic pressures to government budgets and worsening trade balances in case of imported fuels.

In unanticipated situations such as the pandemic caused by COVID-19, the importance of mobilizing fiscal revenues is increasing. Fiscal stimulus packages for supporting economic growth and expenditures for vulnerable groups and health care are not able to be sustained without adequate fiscal revenues (OECD, 2020).

Subsidy reform will play a critical role of reducing inequality in the field of energy and fuel consumption, as energy subsidies and particularly the price support (price cap) for gasoline and diesel can be considered as a benefit for high- and middle-income consumers. According to studies (Del Granado, Coady, and Gillingham, 2012), households with low income consume a small fraction of the total fuel and electricity supply. This implies that through FFSR, the inequality of having this benefit is expected to be reduced.

In addition, tax reduction on fossil fuels can lead to overconsumption of fossil fuels and result in high level of CO_2 emissions. Fossil fuel subsidy reform (FFSR) creates opportunities for increased government revenues and reduced government expenditures presents an opportunity for reducing fossil fuel consumption and GHG emissions. According to research from (GSI, 2019) that studied 26 countries, an average of 13.22% of total national emissions can be decreased by FFSR. Among the NDCs submitted to UNFCCC, only 8 % of NDCs address the issue of fossil fuel subsidies. Subsidy reform and better taxation of fossil fuels aim to increase government revenues and reduce expenditures, as well as to develop and strengthen social safety nets (Bridle et al., 2018). Removal of subsidies and taxation reform schemes can lead to substantial fiscal savings and free up resources for governments to invest in sectors such as health, education and sustainable energy for all (GSI, 2019).

In 2019, to a large extent due to lower average fuel prices over the course of the year, fossil fuel consumption subsidies value declined about USD 120 billion (IEA, n.d.). According to IEA by 2019, subsidies on oil products remained the largest single component of the total subsidies (around USD 150 billion out of the total USD 320 billion). Figure 1 depicts the level of energy subsidies in different countries in 2019.
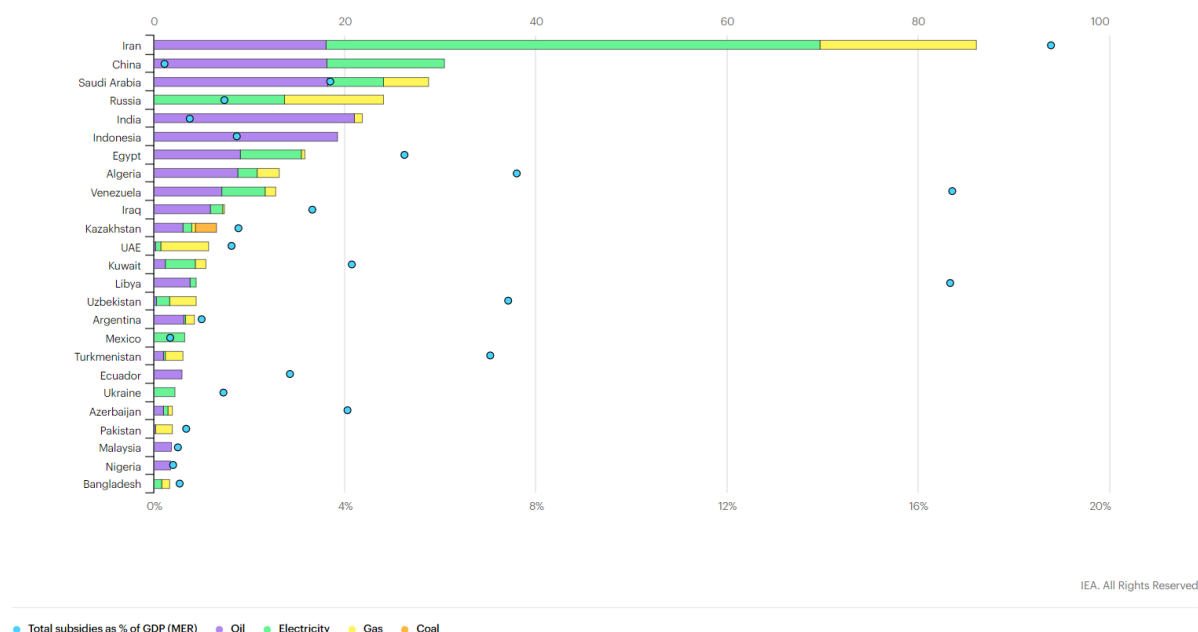
Figure 1: Value of fossil fuel subsidies by fuel in selected countries (USD billion)
Source: IEA, 2019

It is estimated that the Caribbean is dependent on imported fossil fuels to cover more than 90 per cent of its energy needs for electricity generation, primary energy supply and transport (ECLAC, 2016). This situation exerts significant financial pressures on public budgets and private expenditures, creates supply risks, vulnerabilities to external economic shocks and trade imbalances. From 2011–2014, with high international oil prices, oil imports in the region accounted for 9-10 % of GDP. In 2015–2016, when oil prices dropped below US$60 per barrel, oil imports accounted on average of about 5-6 % of GDP. With an average of US$0.33/kWh, electricity tariffs in the Caribbean are among the highest in the world (Dubrie et al., 2019). This situation further impedes the region's economic competitiveness, growth and prosperity. Fossil fuel subsidies can significantly reduce the price of energy however, they limit the incentives for energy savings and switch to cleaner fuels and energy sources. Caribbean countries provided direct or indirect fuel subsidies which ranged from 0.1 per cent to 2 per cent of GDP (ECLAC, 2016)

Given that fossil fuel subsidy and reduced taxation in Saint Lucia utilizes central government resources that could have been used in other sectors such as health, education, etc., while at the same time drives increased consumption of imported fossil fuels that also contribute to CO2 emissions, it is deemed necessary to analyse different fossil fuel subsidy and taxation reform scenarios. Furthermore, looking at the fossil fuel subsidy is one of the main objectives, which also means exploring options of directing this subsidy to those most in need, and important sectors like health and education, promoting reduction in fossil fuel consumption and supporting renewable energy and energy efficiency for long term security of energy supply. We also analyze what is the impact of subsidy reforms on revenues, potential savings, and their potential economic impacts.

The Fossil fuel subsidy and taxation modelling activity is part of the NDC Partnership (CAEP), which aims to i) assist Saint Lucia in enhancing its NDC as part of the Paris Agreement's NDC revision process, including support for raising the ambition; and ii) the fast-track implementation of NDC, including provision of in-country technical expertise and capacity building.

More specifically, the objectives of the activity of modelling fossil fuel subsidy and taxation reform scenarios are as follows:

• to investigate and understand the current tax rates and structures surrounding fossil fuels use in

Saint Lucia,
- to analyse and model different policy scenarios of fossil fuel subsidy and taxation reform,
- to recommend possible fossil fuel subsidy and tax reforms that would result in reduced fossil fuel consumption and GHG emissions, as well as to analyze reallocation mechanisms of the increased tax revenues.

2. Background

According to the UNSD, on 2017 Saint Lucia imported 100% of oil products, while 70% of the total energy supply was used for electricity generation. The transport sector contributed to almost 77% of the final energy consumption of oil products, followed by 19% by households and 4% by agriculture, forestry and fishing.

Table a: Energy balance 2017 for Saint Lucia focusing on oil products (Unit: Terajoules)

2017	All Oil	Gasoline	Diesel	Kerosene	LPG
Primary production					
Imports	5366				
Exports					
International marine bunkers	-263				
International aviation bunkers					
Stock changes					
Total energy supply	5104				
Statistical Difference	0				
	All Oil	Gasoline	Diesel	Kerosene	LPG
Transformation	-3606				
Electricity plants	-3606		-3606		
Other transformation	0				
Final energy consumption	1531	801	409	27	294
Transport (Road)	1179	801	351	27	
Other	352		57.75		294.25
Agriculture, forestry, fishing	57.75		57.75		
Households	294.25				294.25
Non-energy use	90				

Source: UN (2020), GoSL (2020a), LUCELEC (2020), OLADE (2014)

Fuel pricing is regulated by the Ministry of Commerce as is mandated to regulate price-controlled items, however, fuel price calculation is the core responsibility of the Department of Finance. There is a clear policy to subsidize the 20 pounds and 22 pounds Liquefied Petroleum Gas (LPG - Cooking Gas) to particularly support low-income households, whereas the 100 pound is not subsidized. The subsidy on kerosene was abolished in September 2012. A shift away from a 100 pound to 20 pound usage has been observed due to the potential financial savings.

Table 1: LPG cumulative subsidies per year and per cylinder

	Total estimated subsidy for LPG (EC$)	LPG subsidy (EC$)	
		Per cylinder 20lbs	Per cylinder 22lbs
2017	6.2 million	8	8.52
2018	7.2 million	8.76	9.29
2019	7.1 million	8.69	9.25

Source: GoSL (2018; 2019; 2020a)

Gasoline and diesel are not directly subsidized. The Government has targeted an excise tax for gasoline and diesel at $4/gallon, broken down to $2.50 excise tax (optional) and $1.50 (compulsory) for road infrastructural projects. In addition, there is a price cap of $13.95 per gallon set by the Government to protect consumers from high increases of and volatile international prices of oil products. In addition, there have been several changes in the price build up, including changes on the level of the excise tax and the price cap. From January 2015 to June 2017, excise tax on gasoline and diesel remained constant at $2.50 per imperial gallon. A policy decision was taken to increase the excise tax on gasoline and diesel within a maximum of $4.00 per gallon, as of July 2017. The price cap for gasoline and diesel was set at $12.75 from July 2017. This was increased to $13.95 in June 2018.

In cases international prices of oil products push the overall price higher than the cap, then automatically the excise tax is reduced to the right level to meet the price cap. The reduced excise tax is regarded as an implicit subsidy on fossil fuels which equals to the forgone revenues on diesel and gasoline, which is the amount of tax reduction from $4/ gallon. This means that the government indirectly subsidizes these fuels by adjusting the level of excise tax to maintain the price cap. Therefore, the level of excise tax and price cap are the major factors for calculating the implicit subsidy (or foregone revenues) from gasoline and diesel consumption.

More information on the price build - up and fuel price calculations are provided by the Department of Finance of Saint Lucia (n.d.) and illustrated in Figure 1.
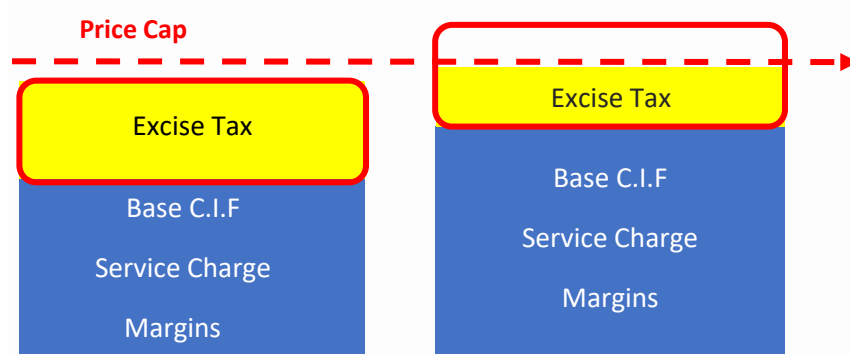

Figure 2: Price build up and price cap

Figure 3 depicts the average prices for gasoline, diesel and LPG 20lb from 2011 to 2019.
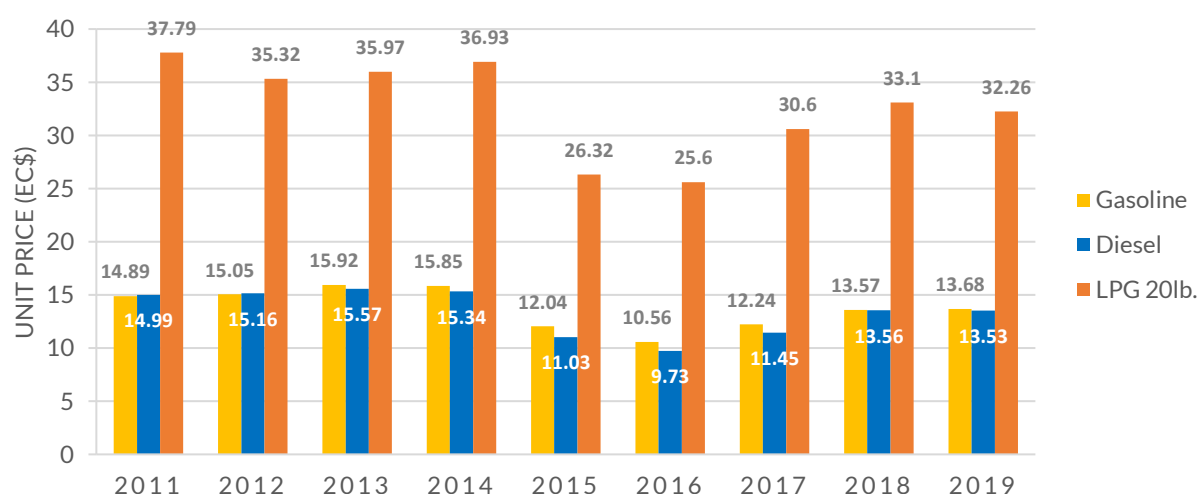

Figure 3: Average fossil fuel prices from 2011 – 2019
Source: GoSL (2020a)

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Although Saint Lucia's contribution to global GHG emissions is minuscule, the Government aims to revise its NDC and enhance its ambition by the end of 2020. In 2017 the electricity sector contributed the highest share to country's CO_2 emissions by 56%, followed by transport with a 18% share and households with 16% (fig. 3). Consumption of diesel oil (mainly by transport and electricity) contributes to 77% of CO_2 emissions, while consumption of gasoline and LPG contributes to 15% and 5% respectively. The data show that targeting the consumption of diesel and gasoline presents the greatest potential for CO_2 emissions reductions.
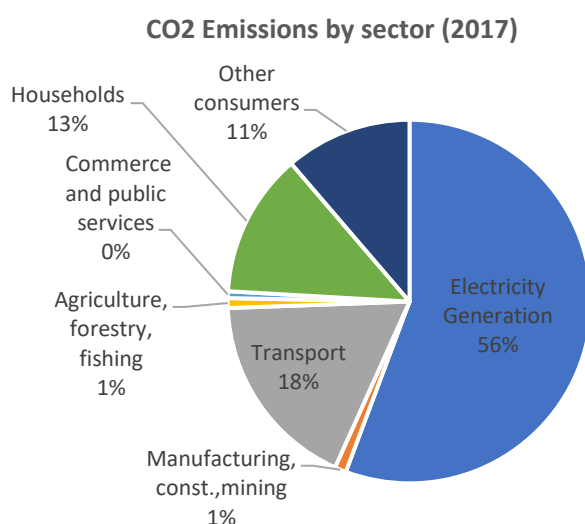

Figure 4: CO2 emissions by sector
Source: UN (2020), GOSL (2020b), LUCELEC (2020)
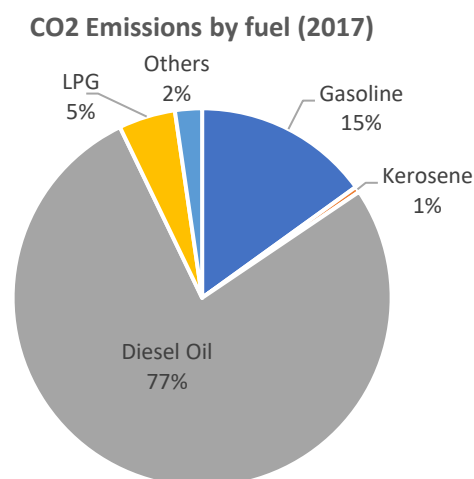
Figure 5: CO2 emissions by fuel
Source: UN (2020), GoSL (2020b), LUCELEC (2020)

3. Methodology

The methodology included different methods such as modelling of fossil fuel subsidy reform (FFSR) scenarios, stakeholders' consultation and validation workshops and interviews with Government officials. The data collection and analysis, including the modelling of FFSR scenarios, lasted from May of 2020 until the end of 2020.

Modelling of different FFSR policy scenarios

Modelling and analysis of the different FFSR policy scenarios was conducted by utilising the Green Economy Model (GEM) (Bassi, 2015) and the GSI-IF models (Merrill et al., 2015; Gerasimchuk et al., 2017; GSI, 2019). These are partial equilibrium models based on system dynamics with calibration supported by econometric analysis. Chapter 4 describes in detail the modelling approach. The models estimated the fiscal savings from subsidy and price cap removals, explored the impacts of reallocation of increased revenues to other programs including energy efficiency and renewable energy and estimated the impact of FFSR scenarios on GDP and CO_2 emissions.

In addition, analysis is also being conducted by the World Resources Institute (WRI) to appraise the distributional impact of the proposed fossil fuel subsidy reforms and provide recommendations to the government to offset any regressive impacts to low-income households with a redistributive approach.

Stakeholders' consultation and validation workshops

Different FFSR policy scenarios for modelling were discussed and validated through a series of consultation and validation workshops (three in total) with relevant stakeholders and departments of the Government of Saint Lucia (GoSL).

The goal of the stakeholders' consultation and validation workshops was to seek guidance from stakeholders and the relevant departments of the GoSL. The workshops aimed to enhance understanding of the alternative FFSR policy scenarios in Saint Lucia. The project team also presented and sought validation of the results of the FFSR scenarios modelling. The last workshop aimed to present results of the preliminary distributional impacts analysis aligned with fossil fuel subsidy/taxation policy scenarios. The target groups and participants of the workshops were relevant government officials, energy specialists, fiscal policy specialists and other implementing partners.

Interviews

After the 2nd stakeholders' consultation workshop, a series of interviews were conducted with the departments of Sustainable Development, Economic Development, Energy, Finance and the Statistics Office. The alternative fossil fuel subsidy/taxation policy scenarios were refined based on the guidance and inputs received during the interviews. The modifications of the scenarios incorporating the feedback received and the results of the fossil fuel subsidy/taxation modelling were presented in the 3rd stakeholders consultation workshop.

More specifically, the methodology consisted of the following steps:

Step 1: Collection of background and baseline data
The project team with support from different departments of the Government of Saint Lucia collected background and baseline current and historical data on rates of fossil fuel subsidies and taxation revenues, price build up, fuel consumption by different sectors, associated CO_2 emissions by fuel and by sector.

Step 2: Development of modelling approach
The modelling approach was developed to analyse the effects of different FFSR policies on government revenues, GDP and carbon emissions and different options of reallocating the increased revenues.

Step 3: First stakeholders' consultation workshop
The first stakeholders' consultation workshop aimed to share the modelling approach with stakeholders for validation along with identifying data gaps. Data gaps and possible data sources were discussed for completing the baseline data collection.

Step 4: Development of BAU and draft FFSR policy scenarios
In step 4 the BAU scenario incorporating the economic impact of COVID-19 was developed along with a few draft FFSR policy scenarios.

Step 5: Second stakeholders' consultation workshop
The objective of the second stakeholders' consultation workshop was to discuss and validate the assumptions of the BAU and the draft FFSR policy scenarios. Stakeholders provided feedback on the timing and trajectory of the phase-out of fossil fuel subsidy and price cap along with options for increased revenues reallocation.

Step 6: Interviews with GoSL relevant departments
A round of interviews with experts from relevant departments of the Government was conducted to receive guidance on the refinement of the FFSR policy scenarios and the options of increased revenues reallocation.

Step 7: Refinement of FFSR policy scenarios
The project team incorporated all the feedback acquired from the interviews and finalized the FSSR scenarios accordingly.

Step 8: Final stakeholders' consultation workshop
The objective of the third and final stakeholders' consultation and validation workshop was to share and discuss the modelling results of the FSSR policy scenarios. The discussion focused mainly on the timing of fossil fuel subsidy and taxation reform, the different options of revenues reallocation and the impact of the reform to GDP and CO2 emissions.

4. Models utilized during the FFSR policy analysis

4.1 Introduction to System Dynamics and the GEM model

Finding that most currently available models are either too detailed or too narrowly focused on one or two sectors to effectively capture the many drivers of development in Saint Lucia, this report presents results from integrated, cross-sectoral models. Specifically, the Green Economy Model (GEM) customized to the Saint Lucian context was designed to assess policy outcomes across sectors, economic actors, dimensions of development, and over time.

GEM extends and advances the policy analysis carried out with sectoral tools by accounting for the dynamic interplay between economic sectors, as well as social, economic and environmental dimensions of development (Bassi, 2015). The inclusion of cross-sectoral relations supports a wider analysis of the implications of alternative development policies and proposes a long-term perspective that allows for the identification and anticipation of potential side effects and sustainability of different strategies (IISD, 2019).

GEM is built using the System Dynamics (SD) methodology, serving primarily as a knowledge integrator (Probst and Bassi, 2014). SD is a form of computer simulation modelling designed to facilitate a comprehensive approach to development planning in the medium to long term (Meadows, 1980; Randers, 1980; Richardson & Pugh, 1981; Forrester, 2002). SD operates by simulating differential equations with "what if" scenarios, explicitly represents stocks and flows, and can integrate optimization and econometrics. The purpose of SD is not to make precise predictions of the future, or to optimize performance; rather, these models are used to inform policy formulation, forecasting policy outcomes (both desirable and undesirable) and leading to the creation of a resilient and well-balanced strategy (Roberts, Andersen, Deal, Garet, & Shaffer, 1983; Probst & Bassi, 2014).

GEM includes four key capitals (physical, human, social and natural) as interconnected via the explicit representation of feedback loops (reinforcing or balancing). Policies can be implemented to strengthen growth (i.e. reinforcing loops) or curb change (e.g. by strengthening balancing loops). In this specific study GEM was used to (1) test the effectiveness of individual policies and investments (by assessing their impact within and across sectors, and for social, economic and environmental indicators); and (2) inform development planning (by assessing the outcomes of the simultaneous implementation of various intervention options).

The GEM-Saint Lucia model was designed to include all key sectors that are relevant for the assessment of different fossil fuel subsidy reform scenarios for Saint Lucia. These include, among others: population

trends, covid-19 impacts on the economy, energy demand and supply and associated emissions, energy cost and current subsidy expenditures and policies. The model also provides an economic valuation of the selected externalities such as carbon emissions (social cost of carbon) and air pollution from the transport sector.

The model was designed explicitly to analyze green economy and low carbon development scenarios. As a result, it includes several sectors across social, economic and environmental dimensions. The effective integration of these sectors is made through the use of stocks and flows, which brings consistency to the mathematical formulations used to create the model. This integration was possible through several interactions with leading international experts, national researchers, policy makers and members of the community in several countries.

Figure 6 presents the generalized underlying structure of GEM, the model used as a starting point for the creation of the GEM-Saint Lucia model. This diagram shows how the key capitals are interconnected, and contribute to shaping future trends across social, economic and environmental indicators. Specifically, feedback loops can be identified that are reinforcing (R) in all areas, pertaining economic growth and social development. These are enabled by the availability of natural capital, which, if not properly managed, can constrain economic growth (hence the balancing loops -(B)- identified in the diagram). Policies can be implemented to promote sustainable consumption and production, decoupling economic growth from resource use (also through education and behavioral change), to mitigate the exploitation of natural capital and generate a stronger and more resilient green growth.

In general, GEMs include the following groups of sectors, to ensure that green economy opportunities are effectively analyzed:

- *Industrial sectors:* embedded in the conventional (carbon-intensive) structure that has contributed to modern lifestyles and, as proven by various studies, is being challenged by rising energy prices and externalities. Such sectors have to aim for a transition to energy efficient technologies and resource efficiency to prosper while lowering costs and reducing their impact on the environment. Major steps are necessary to retrofit and replace old 'brown' economic structures, to develop innovative regulations, and to introduce new 'green' economic structures.
- *Natural capital-based sectors:* heavily relying on the availability of natural resources (stocks and flows), these sectors can thrive and be sustainable only if resource extraction is managed in ways that maintain the ecosystem balance. Overexploitation of natural resources should be avoided to curb impacts on ecosystem services, which would ultimately undermine productivity and competitiveness.

With the horizontal integration of several sectors having the potential to re-shape consumption and production, the model is able to inform policy formulation and evaluation for *emerging economies* (those that find themselves increasingly locked into conventional energy and carbon intensive economic structures, but can more easily turn to greener paths than developed countries, as their economies are more flexible and adaptable) as well as *developing economies* (being less locked into carbon-intensive capital and thus having the unique opportunity to steer their development path towards the new 'greener' economic development paradigm).
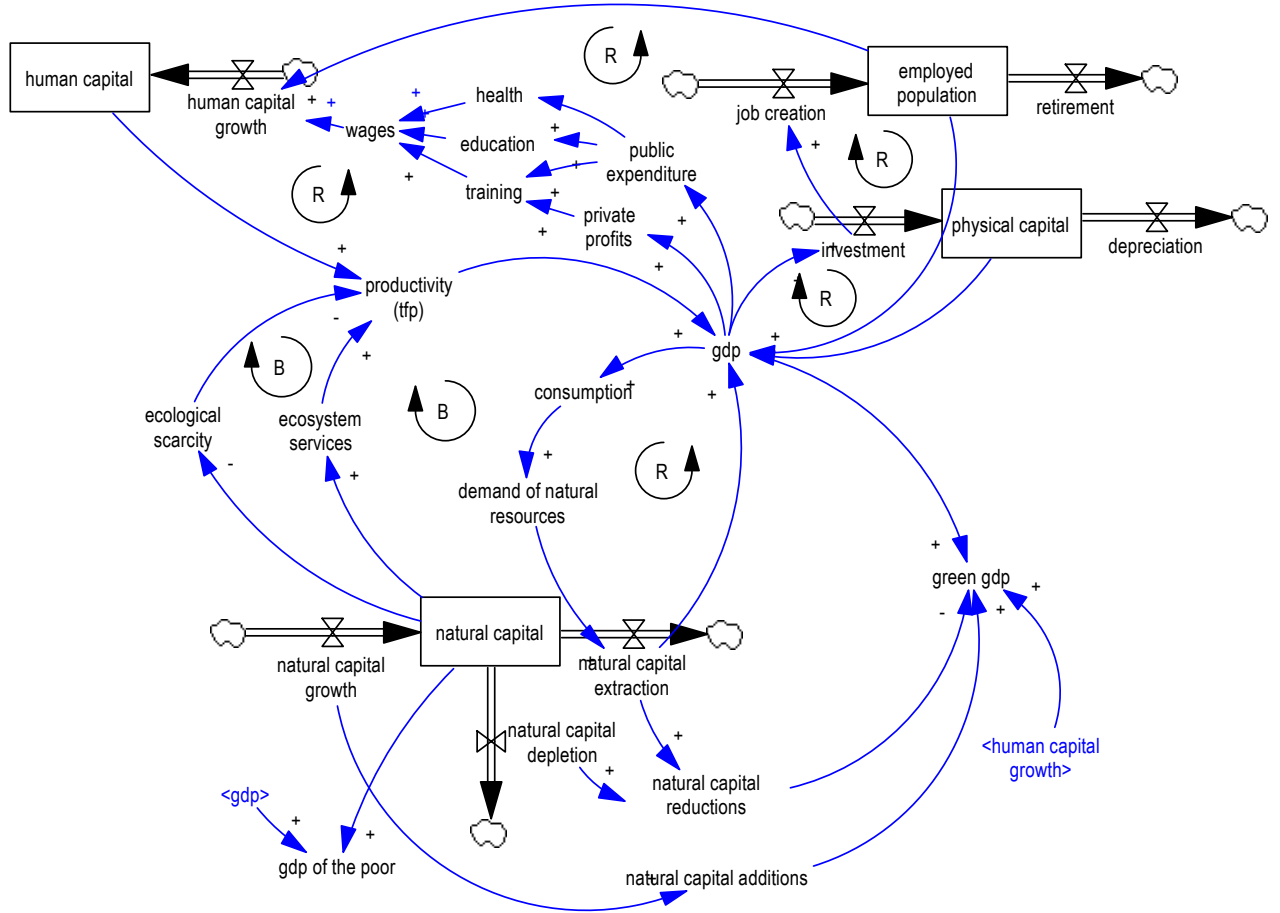
Figure 6: Causal Loop Diagram (CLD) representing the main variables and feedback loops of GEM applications *(Bassi, 2015).*

4.2 The GSI-IF model

The GSI-IF model is an integrated model developed for forecasting energy demand and the impacts of changing fossil fuel subsidy and carbon pricing policies. GSI-IF is a System Dynamics-based partial equilibrium model with calibration supported by econometric analysis (Merrill et al., 2015; Gerasimchuk et al., 2017; GSI, 2019). The GSI-IF model is integrated into GEM for the customization to Saint Lucia, allowing to estimate the direct, indirect and induced impacts related to reforming fossil fuel subsidies. Whereas energy demand and related emissions are forecasted by the GSI-IF model, GEM provides input to the GSI-IF module in form of relative macroeconomic production (real GDP) and population, the two main drivers for energy demand in GSI-IF. Further, GSI-IF outputs for emissions and energy cost affect the total factor productivity function in GEM. The integration of the two models hence allows to both (i) assess the macroeconomic implications of phasing out fossil fuel subsidies (*GSI-IF to GEM: emissions and energy cost*), while (ii) simultaneously estimating the feedback of fossil fuel subsidy removal induced macroeconomic implications on total energy demand and emissions (*GEM to GSI-IF: real GDP and population*). Furthermore, the GSI-IF allows for various policy decisions related to fossil fuel subsidies such as for example reallocation of subsidy savings to energy efficiency, renewable energy, deficit reduction or compensation to households.

The GSI-IF model projects national energy consumption by sector and source, from 2000 to 2050. Energy consumption is then multiplied by GHG emission factors to obtain total national emissions from the use of energy.

The main structural assumptions of the model are (see Figure 7):

- Final energy consumption is estimated considering (1) indicated demand (including the effect of GDP, population and energy efficiency); (2) the price effect; and (3) the substitution effect. Items (1) and (2) are used to estimate *demand for energy services*.
- The potential for fuel substitution is represented by the ratio of an energy price over the national weighted average energy price. This implies that an energy source will become more attractive if its price increases less than others when subsidies are removed.
- It is assumed that price effects require a 1-year delay to influence energy consumption.

One of the main drivers of the model is energy price, which can be modified in two ways: (1) by setting baseline medium to longer-term trends (which is an endogenous calculation for electricity) and (2) by removing fossil fuel subsidies. The removal of subsidies increases energy prices, which lowers energy demand in two possible ways: energy is becoming more expensive and consumption is reduced to offset the growth in expenditure, and, if energy services are required, the use of (previously) subsidized fossil fuels declines and consumption of now comparatively cheaper fuels increase.

GHG emissions are affected by both the reduction of energy consumption and the change in fuel mix, and the model analyzes these effects separately. As a result, the model allows to estimate the impact of fossil fuel subsidy removal on GHG emissions, and compare such reduction to other possible intervention options (e.g. investments and/or mandates on energy efficiency and renewable energy). Emission reductions can also be estimated as a result of the reallocation of subsidy savings through investments in RE and EE.
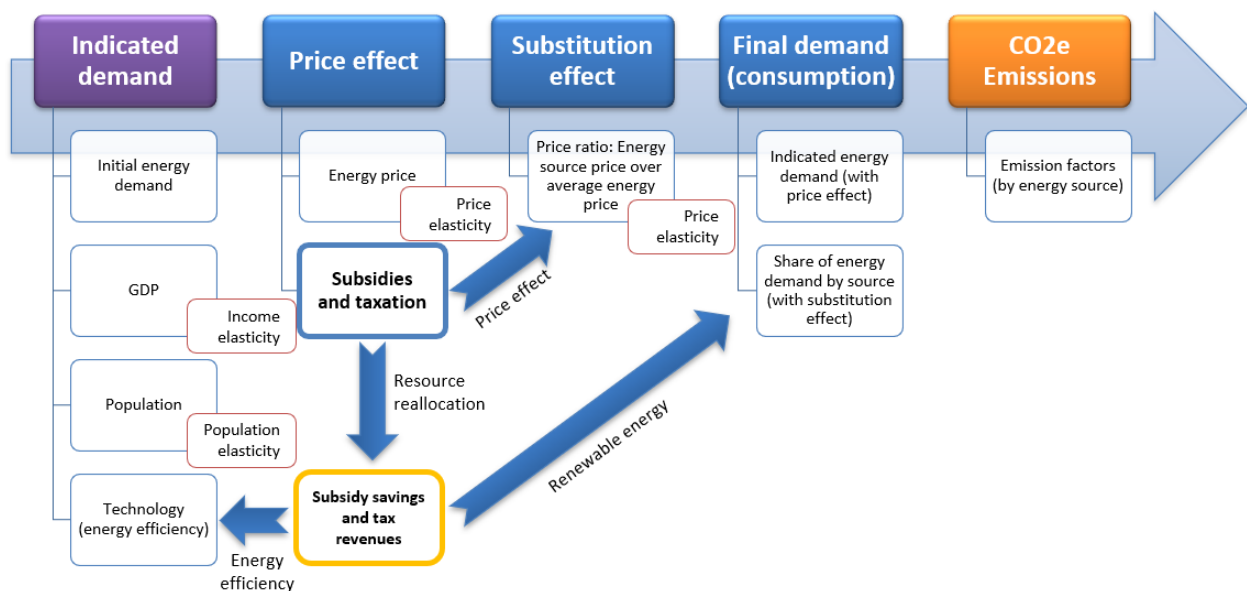

Figure 7: Conceptual overview of the GSI-IF model *(GSI, 2019).*

5. FFSR policy scenarios

The impact assessment in GEM uses scenario analysis to determine the impacts of policy interventions. A Business As Usual (BAU) scenario and three alternative fossil fuel subsidy reform (FFSR) scenarios were developed and assessed. All scenarios were simulated to analyze the socioeconomic and carbon emissions impacts of FFSR. The assessment of the alternative FSSR policy scenarios focuses on i) phasing out fossil fuel subsidies on LPG and ii) removal of the price cap on gasoline and diesel.

BAU scenario assumptions

The BAU scenario assumes the continuation of historical trends and only considers policies that will be implemented with certainty. Population and GDP growth are the main drivers of energy demand that leads to a further increase in subsidies. The total population in the Saint Lucia GEM is calibrated to match the forecasted trend in total population reported by the UN Population Statistics division. Saint Lucia's population is projected to peak in 2035 (189,100 people) and decline to around 182,500 people by 2050. Real GDP growth is projected to decline to -17% during the pandemic, rebound in 2021 and realign with pre-COVID expectations around 2025. Long term average GDP growth is projected at 1.3% between 2025 and 2050.

The total amount of subsidies paid increases over time as a result of (i) higher energy consumption and (ii) higher energy prices. For all petroleum-based, liquid fuels, a 0.5% increase in price every year is assumed driven by market dynamics. This means that the average price will be 16% higher in 2050 when compared to 2020. Subsidies, measured as a share of government revenues, increase to close to 6%, indicating higher stress on public finances. The subsidy impact is applied on top and above this assumption. If the energy prices increase more than 0.5% annually, then the subsidies and therefore stress on public finances will increase further.

FFSR scenarios assumptions

In GEM, the phasing out of fossil fuel subsidies is regarded as an opportunity to free up financial resources for reinvestment. As a result, the money saved from FFSR can be used for improving energy efficiency, increasing renewable generation capacity, deficit reduction and compensation to low- income households.

The following impacts are expected and modelled from the fossil fuel subsidy and price cap removals.

1- Higher energy price and higher energy costs,

2- Reduced energy consumption (energy conservation due to the higher price of energy),

3- Avoided public expenditures (and increased revenues) because of subsidy and price cap removal,

4- Reallocation of subsidy savings:

    a. To RE (reducing emissions and supporting GDP, also via employment)

    b. To EE (reducing energy cost and costs, hence supporting GDP growth)

    c. To the economy (driving GDP higher)

The assumptions for the scenarios simulated in the context of this assessment are presented in Table 2.

Table 2: Scenario assumptions Saint Lucia GEM assessment

Scenario name	Description and assumptions
Business as Usual (BAU)	• Continuation of historical policies • No phase out of fossil fuel subsidies
Fossil Fuel Subsidy Removal (FFSR)	• Linear phase out of fossil fuel subsidies and removal of price cap • No reallocation of savings
FFSR + R5 *Reallocation (5 years)*	• Linear phase out of fossil fuel subsidies and removal of price cap • Reallocation to EE, RE for 5 years, after which all goes to debt reduction • Phase out and reallocation of subsidies during the first 5 years: ○ energy efficiency (15%), ○ renewable energy (15%), ○ compensation (30%), and ○ debt reduction (40%).
FFSR + R10 *Reallocation (10 years)*	• Linear phase out of fossil fuel subsidies and removal of price cap • Reallocation to EE, RE for 10 years, after which all goes to debt reduction • Phase out and reallocation of subsidies during the first 10 years: ○ energy efficiency (15%), ○ renewable energy (15%), ○ compensation (30%), and ○ debt reduction (40%).

6. Modelling Results

6.1 Subsidy savings and additional revenues

The phase-out of fossil fuel subsidies (i.e. on LPG) and removal of price cap (i.e. on diesel and gasoline) yields average annual savings between XCD 28.9 million per year between 2022 and 2030 and XCD 118.6 million per year on average between 2040 and 2050. It is important to highlight that the amount of support provided is forecasted to increase over time, due to the forecasted growth of consumption. This means that the average annual support for LPG is expected to increase to approximately $8 million in 2030.

Average annual savings from the removal of fossil fuel subsidies and price cap removal for all scenarios are presented in Table 3 for selected years. Cumulative savings between 2022 and 2050 are projected at between XCD 2.18 billion (FFSR) and XCD 2.1 billion (FFSR + R10 scenario) respectively.

Table 3: Average annual savings and cumulative savings from phasing out fossil fuel subsidies and removal of price cap - FFSR scenarios

Scenario	Unit	2022-2030	2030-2040	2040-2050	2022-2050
Average savings per decade					
FFSR	mn XCD / Year	28.91	64.49	118.22	*75.06*
FFSR + reallocation	mn XCD / Year	28.37	63.97	119.56	*75.24*
FFSR + reallocation (10 years)	mn XCD / Year	27.99	61.03	114.90	*72.35*
Cumulative savings 2022-2050					
FFSR	mn XCD	2,176.65			
FFSR + reallocation	mn XCD	2,181.83			
FFSR + reallocation (10 years)	mn XCD	2,098.10			

In the reallocation scenarios (FFSR R5 and R10), the envisaged debt reduction from the reallocation of fossil fuels subsidies and increased revenues contributes to reducing annual borrowing, and hence public

debt. The development of government domestic financing (borrowing) in the BAU and FFSR scenarios is presented in Figure 8 on the left. Between 2020 and 2050, government domestic financing in the FFSR scenario is on average XCD 1 million per year lower compared to the BAU scenario. The reduction in borrowing is caused by reduced economic growth and hence reduced needs for public expenditure. This negative impact on the economy is due to the FFSR-induced increase in energy prices. In the FFSR R5 and FFSR R10 scenarios, the reallocation of subsidies for debt reduction contributes to cumulative avoided domestic financing of XCD 1.65 billion and XCD 1.46 billion between 2020 and 2050 respectively. This is equivalent to average annual savings of approximately XCD 53.2 million per year in the FFSR R5 and XCD 47.0 million per year in the FFSR R10 scenario. The resulting reduction in public debt contributes to a decline in the debt share of GDP after 2035. The development of the debt share of GDP in all scenarios is presented in Figure 8 on the right, compared to historical data.

The removal of subsidies and price cap represent a saving for the government and leads to full utilization of the excise tax on diesel and gasoline that is consumed (although this is less than BAU), and so there is a net benefit for the government. The impact on energy demand is relatively small, and therefore there is a net benefit in government revenues in all scenarios.
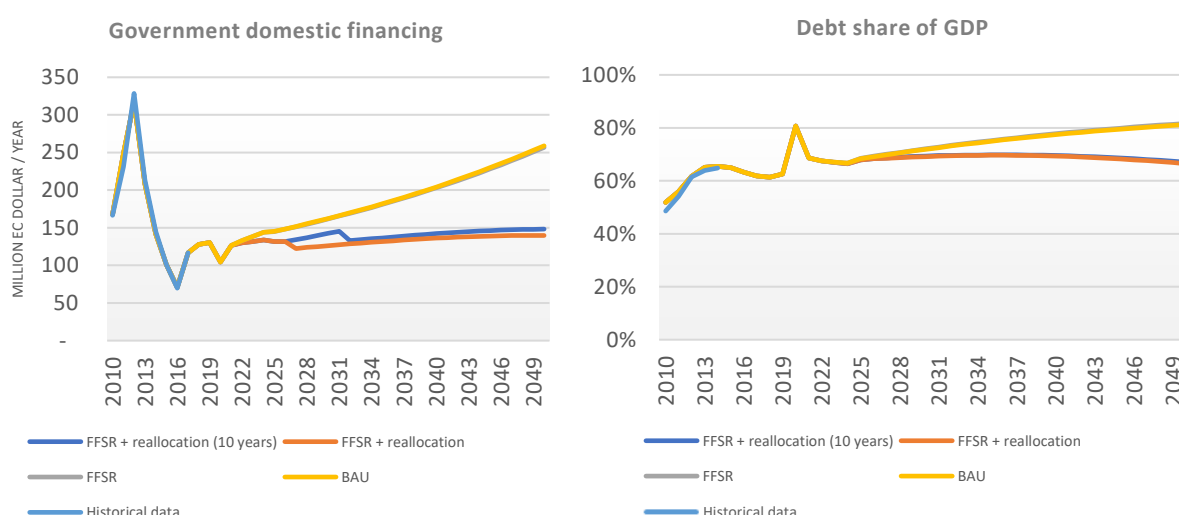

Figure 8: Government domestic financing and debt share of GDP - BAU and FFSR scenarios

The three main drivers of macroeconomic impacts are technology, energy cost and GHG emissions. The phase out of subsidies leads to changes in energy costs and energy related GHG emissions, with positive impacts on total real GDP. The index of energy bill as share of GDP and the index of total GHG emissions from energy are presented in Figure 9 for all scenarios.
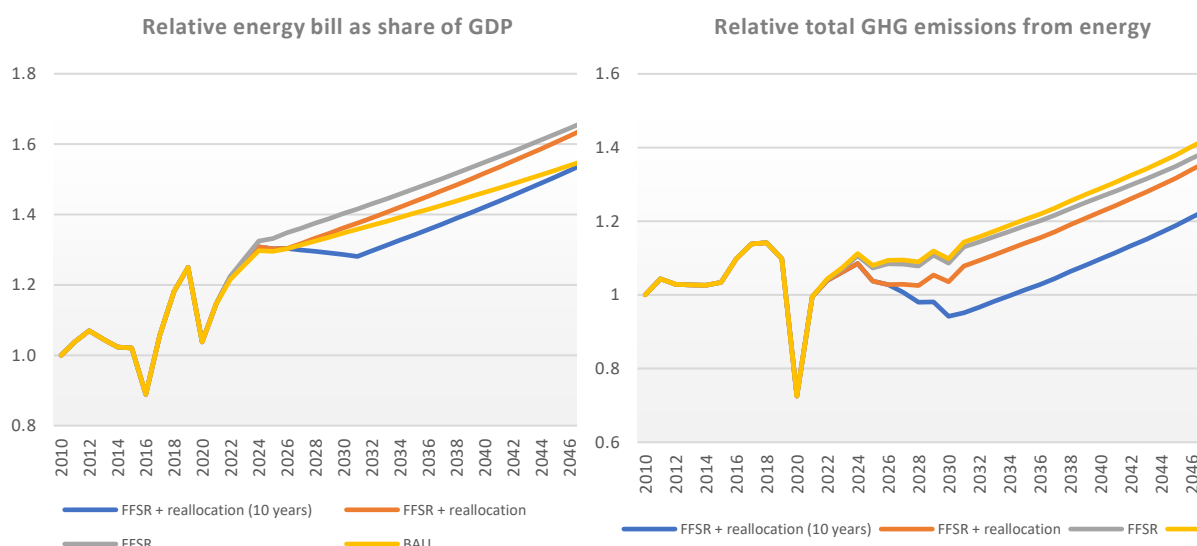
Relative energy bill as share of GDP   **Relative total GHG emissions from energy**

Legend: FFSR + reallocation (10 years) — FFSR + reallocation — FFSR — BAU

Figure 9: Relative energy bill as share of GDP and relative GHG emissions from energy - BAU and FFSR scenarios

6.2 Real GDP and economic growth

The development of total real GDP in the BAU and FFSR scenarios is presented in Figure 10, compared to historical data. In the BAU scenario, total real GDP is projected to increase from XCD 4.47 billion in 2020 to XCD 8.24 billion in 2050, an increase of 84.4% compared to 2020. In the FFSR scenario without reallocation, total real GDP is projected to increase by 82.8% compared to 2020, reaching XCD 8.17 billion by 2050. This indicates that the projected GDP for 2050 is 0.8% or XCD 69.94 million lower compared to the BAU when subsidies are removed but not reallocated. In the FFSR R5 and FFSR R10 scenario, total real GDP in 2050 is projected to reach XCD 8.44 billion and XCD 8.48 billion respectively.

Between 2020 and 2050, total cumulative real GDP is projected to be XCD 1.03 billion lower (FFSR scenario), and XCD 1.51 billion (FFSR R5) and XCD 3.70 billion higher compared to the BAU. In the FFSR scenario, this reduction is equivalent to an annual reduction of XCD 34.32 million on average in total real GDP over the next 30 years. In the FFSR R5 and FFSR R10 scenarios, the additional cumulative real GDP is equivalent to an average annual increase in total real GDP of XCD 50.28 million and XCD 123.49 million respectively over the next 30 years.

Long term GDP growth benefits from FFSR if subsidy savings are recycled and repurposed. In the BAU scenario, real GDP growth between 2020 and 2030 averages 1.44%, compared to 1.4% in the FFSR scenario without reallocation and 1.49% and 1.54% in the FFSR R5 and FFSR R10 scenario respectively. Long term GDP growth (2020-2050) is indicated at 1.42% per year (FFSR R5) and 1.47% per year (FFSR R10), compared to 1.38% per year in the BAU scenario and 1.35% per year in the FFSR scenario without reallocation.
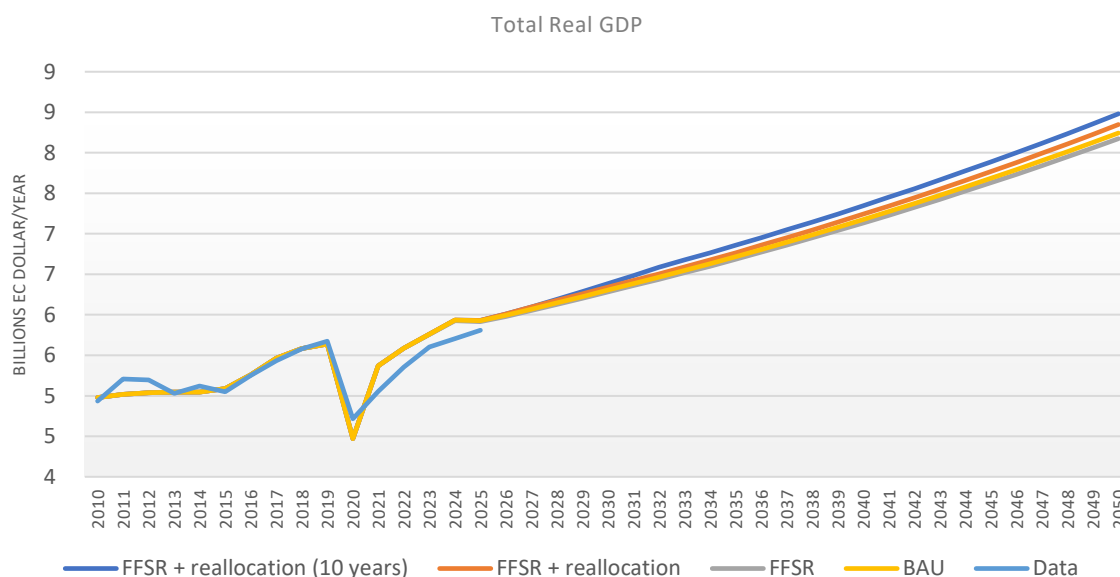
Total Real GDP

Figure 10: Total real GDP – BAU and FFSR scenarios

6.3 Energy cost and CO2e emissions

Macroeconomic impacts of the phasing out of fossil fuel subsidies are driven by changes in energy costs and energy related CO2e emissions. The relative change in energy costs and emissions is captured by the total factor productivity function and hence directly affects macroeconomic productivity moving forward. The development of the energy bill and total CO2e emissions from energy are presented in Figure 11. The energy bill in the FFSR R10 scenario develops similarly to the energy bill in the BAU scenario, despite the additional energy demand from increasing economic growth (real GDP) and the higher energy prices due to FFSR.
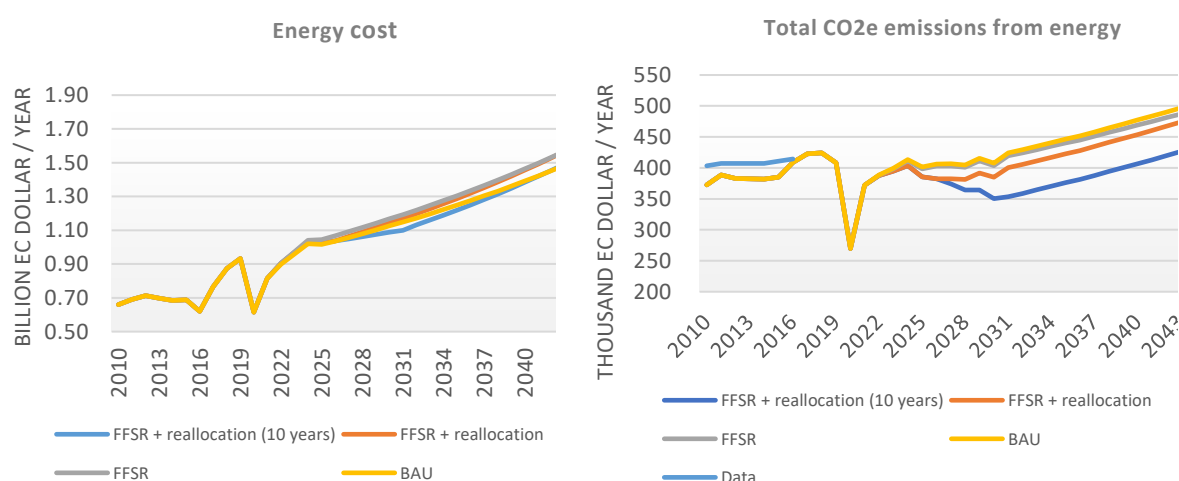

Figure 11: Energy bill and total CO2e emissions from energy - BAU and FFSR scenarios

Total CO2e emissions from energy are presented in Figure 11 on the right. The most marked decline in CO2e emissions from energy is observed in the FFSR R10 scenario, followed by the FFSR R5 scenario. In both scenarios, the reallocation of investments to energy efficiency and renewable energy contribute to cumulative emission reductions of 610,000 tons (FFSR R5) and 1.65 million tons (FFSR R10) scenario by 2050 respectively, compared to the BAU scenario. These reductions are equivalent to average annual reductions of 20,450 tons in the FFSR R5 scenario and 54,880 tons in the FFSR R10 scenario. Cumulative CO2e emissions between 2020 and 2050 in the FFSR scenario total 13.74 million tons per year, which is 202,200 tons less compared to cumulative CO2e emissions in the BAU scenario. Other than in the FFSR R5 and FFSR R10 scenarios, the reductions in emissions in the FFSR scenario are caused by energy conservation and the slowdown in economic growth resulting from higher energy prices. Total real GDP in the FFSR scenario is lower compared to the BAU, which causes energy demand to grow less, which leads to emission reductions.

The development of emission intensity per million XCD of GDP and per TJ of energy used is presented in Figure 12, compared to historical data. In the BAU scenario, the emission intensity increases from 60.3 tons per million XCD in 2020 to 66.7 tons per million XCD in 2050. The FFSR and FFSR R5 scenarios show a similar trend, with emission intensity per million XCD increasing to 65.5 tons (+8.6%) and 63.2 tons (+4.7%) between 2020 and 2050 respectively. Compared to the BAU scenario, emission intensity per million XCD generated in 2050 is 1.7% and 5.2% lower in the FFSR and FFSR R5 scenarios. The FFSR R10 scenario shows a 6.4% decline in emissions compared to 2020. Emission intensity per million XCD generated declines from 60.3 tons to 56.5 tons between 2020 and 2050 and is projected to be 15.3% lower compared to the emission intensity per million XCD forecasted for the BAU in 2050.
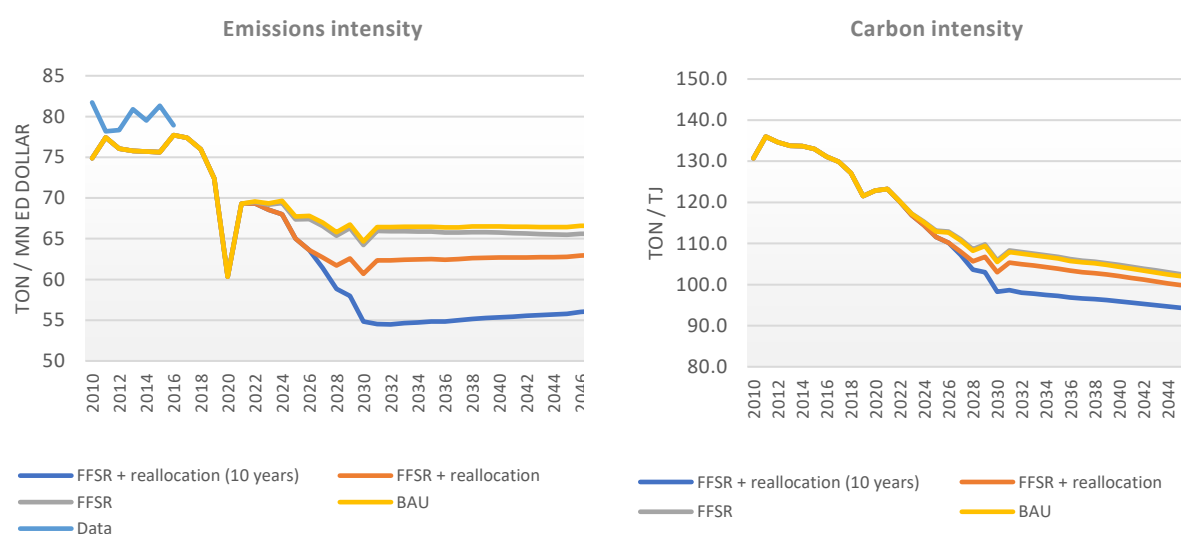

Figure 12: Emission intensity per million XCD and carbon intensity - BAU and FFSR scenarios

The carbon intensity (emissions per TJ of energy consumed) is projected to decline across all scenarios. In the BAU scenario, carbon intensity is projected to decline from 122.9 tons per TJ consumed in 2020 to 100.2 tons per TJ consumed in 2050. In the FFSR scenario, the simulations project a carbon intensity of 100.7 tons per TJ (FFSR), 98.1 tons per TJ (FFSR R5) and 93 tons per TJ (FFSR R10) respectively, which is 0.5% higher (FFSR), and 2% (FFSR R5) and 7.1% (FFSR R10) lower compared to the BAU scenario in 2050.

6.4　Summary of results

The scenarios simulated show different outcomes when considering a few key indicators of performance. Figure 13 shows how FFSR, when implemented in isolation, leads to lower GDP (due to higher energy prices and energy expenditure), which then results in lower employment and emissions. The reallocation scenario shows instead higher GDP, reversing the trend by increasing energy efficiency and promoting a shift to renewable energy, improving energy productivity and stimulating economic growth and employment creation. The positive impacts are felt more strongly in the FFSR R10 scenario (with reallocation to EE and RE for 10 years), when the cumulative impact of efficiency and renewables leads to lasting impacts on the economy. These results highlight the inherently inefficient use of resources when support to the energy sector is provided via subsidies and foregone revenues.

Figure 13: Summary of performance, by scenario.

Table 4 and Table 5 below provide a summary of the results for the FFSR analysis for Saint Lucia. An estimation of net economic outcome for the three FFSR scenarios is provided in Table 4, providing cumulative values for the period 2020-2050 compared to the BAU scenario.

The results indicate that the 10-year energy support phase out trajectory (including reallocation) yields the highest benefits at societal level and is projected to generate EC$ 3.77 billion in net benefits over the next 30 years. Benefits almost exclusively incur through additional GDP (98.2% of benefits) generated as a result of higher productivity, via lower emissions (and hence higher labor productivity), higher energy efficiency and use of renewable energy (and hence lower costs) and job creation (see Table 5). The cumulative energy expenditure in this scenario is EC$ 72.6 million higher compared to the BAU, which is equivalent to approximately EC$ 2.42 million per year on average over the next 30 years, due to the higher economic growth stimulated by the repurposed energy support and reinvestment.

In the FFSR scenario assuming a 5 -year phase out, 49.6% of the net benefits emerge from energy savings, driven by additional energy efficiency, while the residual savings emerge from additional real GDP (48.7%).

Table 4: Net societal balance fossil fuel subsidy removal - all scenarios

Cumulative value 2020-2050	Unit	FFSR	FFSR with reallocation (5 years)	FFSR with reallocation (10 years)
Subsidy savings	mn XCD	2,176.7	2,181.8	2,098.1
- Subsidy reallocation	mn XCD	0.0	2,181.8	2,098.1
+ Savings in energy costs	mn XCD	-1,783.5	-1,540.0	72.6
+ Additional real GDP	mn XCD	-1,029.6	1,508.4	3,704.7
Net benefits	*mn XCD*	*-2,813.1*	*-31.6*	*3,777.3*
Net societal balance	**mn XCD**	*-2,813.1*	*-31.6*	*3,777.3*

In the FFSR scenario, subsidy savings make up the highest shares of benefits as no reallocation is assumed. This scenario yields the highest savings in energy expenditure, which is in part caused through curbed economic growth due to higher energy prices, as illustrated by the EC\$ 1.03 billion reduction in real GDP over the next 30 years (EC\$ -34.32 million per year on average). The fact that around 74% of savings emerge from subsidy savings shows this scenario yields the lowest benefits on societal level and is projected to lead to a reduction in GDP, as illustrated in Table 5 below.

Table 5: Overview of results Saint Lucia FFSR analysis

Indicator	Unit	2022	2027	2032	2040	2050
Annual GDP						
FFSR + reallocation (10 years)	mn XCD / Year	5,585.4	6,096.9	6,585.3	7,346.2	8,480.6
FFSR + reallocation	mn XCD / Year	5,585.4	6,096.1	6,503.7	7,241.2	8,348.1
FFSR	mn XCD / Year	5,585.2	6,052.1	6,436.8	7,133.0	8,173.6
BAU	mn XCD / Year	5,585.9	6,070.6	6,463.6	7,175.9	8,243.5
Energy bill						
FFSR + reallocation (10 years)	mn XCD / Year	904.6	1,049.3	1,130.9	1,383.3	1,796.8
FFSR + reallocation	mn XCD / Year	904.6	1,063.9	1,197.9	1,455.7	1,879.9
FFSR	mn XCD / Year	905.8	1,091.4	1,219.1	1,463.0	1,856.5
BAU	mn XCD / Year	899.2	1,056.4	1,172.2	1,390.8	1,739.2
Emissions						
FFSR + reallocation (10 years)	Ton / Year	387,293	374,331	358,772	406,690	479,050
FFSR + reallocation	Ton / Year	387,293	382,324	405,565	453,888	527,418
FFSR	Ton / Year	388,036	402,791	424,303	469,001	535,580
BAU	Ton / Year	388,628	406,489	429,313	477,263	549,541
Energy efficiency						
FFSR + reallocation (10 years)	%	113%	125%	141%	152%	168%
FFSR + reallocation	%	113%	123%	130%	140%	155%
FFSR	%	113%	119%	125%	135%	149%
BAU	%	113%	119%	125%	135%	149%
Renewables						
FFSR + reallocation (10 years)	MW	15.0	34.0	52.8	52.2	49.6
FFSR + reallocation	MW	15.0	32.0	37.6	36.9	34.7
FFSR	MW	14.8	25.5	31.1	30.2	27.8
BAU	MW	14.8	25.6	31.3	30.5	28.2
Changes relative to the BAU scenario						
Annual GDP						
FFSR + reallocation (10 years)	%	0.0%	0.4%	1.9%	2.4%	2.9%
FFSR + reallocation	%	0.0%	0.4%	0.6%	0.9%	1.3%
FFSR	%	0.0%	-0.3%	-0.4%	-0.6%	-0.8%
Energy bill						
FFSR + reallocation (10 years)	%	0.6%	-0.7%	-3.5%	-0.5%	3.3%
FFSR + reallocation	%	0.6%	0.7%	2.2%	4.7%	8.1%
FFSR	%	0.7%	3.3%	4.0%	5.2%	6.7%
Emissions						
FFSR + reallocation (10 years)	%	-0.3%	-7.9%	-16.4%	-14.8%	-12.8%
FFSR + reallocation	%	-0.3%	-5.9%	-5.5%	-4.9%	-4.0%
FFSR	%	-0.2%	-0.9%	-1.2%	-1.7%	-2.5%
Energy efficiency						
FFSR + reallocation (10 years)	%	0.1%	5.5%	12.8%	12.8%	12.8%
FFSR + reallocation	%	0.1%	4.0%	4.0%	4.0%	4.0%
FFSR	%	0.0%	0.0%	0.0%	0.0%	0.0%
Renewables						
FFSR + reallocation (10 years)	%	0.8%	32.6%	68.7%	71.1%	76.2%
FFSR + reallocation	%	0.8%	25.0%	20.1%	20.9%	23.1%
FFSR	%	-0.1%	-0.5%	-0.6%	-1.0%	-1.5%

7. Concluding remarks and recommendations

Based on the analysis of different FFSR policy scenarios and the close consultation with stakeholders through three workshops and a series of interviews the following scenario proved to perform best against the selected indicators:

Scenario - full removal: Fossil fuel subsidy and price cap gradual linear removal and reallocation (for 10 years) of increased revenues.

Under this scenario the subsidy on LPG 20lbs and 22lbs and the price cap on gasoline and diesel are gradually removed over the course of five years starting on 2022, while the increased annual revenues will be reallocated for 10 years in debt reduction (40%), investment in renewable energy (15%) and energy efficiency (15%), and compensation to low-income households (30%). By 2050, the cumulative economic impact, including subsidy savings and GDP growth, will be approximately **XCD 3,777 million**.

By 2032, 10 years after the adoption of the FFSR, the following outcomes can be expected:

- The energy bill will be decreased by **3.5%** compared to BAU scenario.
- The annual GDP will increase by **1.9 %** compared to BAU scenario.
- CO_2 emissions will be reduced by **16.4%** compared to the BAU scenario.

Recommendations

- It is recommended, based on the analysis, to **gradually, and in a linear fashion,** remove the subsidy on LPG and the price cap on diesel and gasoline. By removing the fossil fuel subsidy and price cap the government could decrease its expenditures and increase its revenues by receiving the full amount of the excise tax. Currently the oil prices internationally are at very low levels presenting a great opportunity to start gradually removing the fossil fuel subsidy and price cap.

- Fossil fuel subsidy utilizes **central government resources** that could be used for other sectors such as health, education, etc. or other purposes such as reduction of debt (40%), compensation of the affected households (30%) and investments in energy efficiency (15%) and renewable energy (15%). Reallocating subsidy savings to compensation, energy efficiency and renewable energy will contribute to offsetting the energy cost increase resulting from subsidy removal.

- The fossil fuel subsidy and taxation reform present an opportunity to start gradually **substituting imported fossil fuels with local resources, including renewable energy**, while transforming and modernizing the energy system of the country. The FFSR should be combined with other policies that support renewable energy and energy efficiency, including the repurposing of subsidies and increased revenues. Renewable energy could decrease the costs of electricity generation compared to the diesel generators. Financing renewable energy that requires higher upfront capital costs compared to diesel is becoming a critical factor for the energy transition. But once the renewable energy systems (either solar or wind) have been installed then there are no continuous fuel costs as is the case with the diesel generators.

- **Energy/ fuel efficiency reduces energy/ fuel use and energy/ fuel costs**, a strategy that would increase economic resilience, if fossil fuel prices were to increase in the future. This would be particularly important if price shocks materialize in the midst of the long awaited economic rebound post-COVID. Energy efficiency measures may require also some upfront investments. Reallocating the increased revenues from the fossil fuel subsidy reform to incentives (e.g. tax breaks, soft loans) to

mobilize investments in energy efficiency could be a good strategy to finance the transition to energy efficient and therefore less energy costly practices.

- The recent attempts from the GoSL to increase the excise tax on diesel and gasoline at EC 4 (from July 2017) and the increase of price cap (from EC 12.75 to EC 13.95) dollars indicate a clear direction of pricing fossil fuels to provide the **right signals to consumers for stimulating behavioral change** towards energy and fuel efficiency, use of alternative means of transport than private vehicles, gradual uptake of electric vehicles, etc.

- Based on the modelling of different scenarios it is evident that the FFSR with reallocation of increased revenues will lead to reduced fossil fuel consumption and gradual substitution by local and renewable energy resources driving the **reduction of country's GHG emissions** and potentially raising the ambition of its NDC or reducing the cost of reaching more ambitious targets.

- Adequate **social dialogue is needed** to make sure that the views and concerns of key stakeholders are taken into account and incorporated in the design of the fossil fuel subsidy and taxation reform and adequate compensation schemes target those most in need for full compensation. It is important to make sure that part of the increased revenues is reallocated to offset the most vulnerable and poorest groups. Social dialogue is required enhancing inclusion and minimizing the risk of public opposition.

- The potential impacts of the subsidy and price cap removal on the **most vulnerable groups** should be analysed and the groups that will need to receive compensation from the Government to be identified. Vulnerable groups have been increased as a result of the COVID-19 pandemic. Therefore, careful consideration should be given to the timing of the reform in light of the COVID-19 pandemic. A distribution impact analysis is required to identify the vulnerable groups and the expected impact for designing targeted compensation schemes. Recycling the additional revenue should be nicely targeting the poor and fully compensate them.

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