Impact of Tax Incentives on Access to Stand-Alone Solar

Policy recommendations from analysis in Malawi, Rwanda, and Sierra Leone

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Africa Clean Energy
Catalysing Africa's Solar Markets

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Tetra Tech International Development

This report was authored by the Africa Clean Energy Technical Assistance Facility and Open Capital Advisors.

Prosperity House, Westlands Road,
P.O. Box 4320, 00100, Nairobi, Kenya.
Tel: +254 (0)20 271 0485

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ABBREVIATIONS AND ACRONYMS

Acronym	Definition
ACE	Africa Clean Energy
CET	Common External Tariff
CO2	Carbon dioxide
EAC	East African Community
EACCMA	East Africa Community Customs Management Acts
ECA	Economic Consulting Associates
ECOWAS	Economic Community of West African States
ECREEE	ECOWAS Centre for Renewable Energy and Energy Efficiency
FCDO	Foreign Commonwealth and Development Office
FOB	Free-on-Board
GDP	Gross Domestic Product
GOM	Government of Malawi
GOR	Government of Rwanda
OGS	Standalone solar
PAYGo	Pay-as-you-go
PED	Price Elasticity of Demand
PV	Photo Voltaic
SAS	Stand-Alone Solar
SHS	Solar Home System
SME	Small and Medium-sized Enterprises
SSA	Sub-Saharan Africa
SDG	Sustainable Development Goal
TAF	Technical Assistance Facility
USD	United States Dollar
VAT	Value Added Tax
WHT	Withholding Taxes

EXECUTIVE SUMMARY

Objective and Main Finding

ACE TAF conducted this study on responsible VAT and duties for the solar sector. The analysis summarised in this report aims to provide a quick and clear understanding of the impact of VAT and duty regimes on energy access and a range socioeconomic development outcome. This report summarises the key findings of the analysis and its application to three focus countries: Malawi, Rwanda, and Sierra Leone.

The benefits to households gaining access to SAS products alone outweighs the foregone tax revenues associated with VAT and duty exemptions. While there remains a significant energy access deficit in many Sub-Saharan Africa (SSA) countries, tax exemptions offer an effective tool to support achieving energy access objectives and valuable economic activities for households. Beyond these economic benefits to users of SAS systems, a faster growing SAS sector will also support jobs in the value chain, deliver environmental benefits and key sustainable development outcomes including improved health and education.

Background

Standalone solar products play a critical role in helping countries achieve their electrification targets. The importance of these products is now well recognized by governments which deploy a range of fiscal strategies, including tax incentives, to support the growth of the sector.[1] SAS products often represent the most cost-effective way of providing electricity to unserved households in sparsely populated rural areas, where it is expensive and impractical at least in the short-term to extend large grid infrastructure, and where customers often have relatively low ability to bear the financial cost of energy access.

While many African governments have implemented VAT and duty exemptions, not all countries provide tax exemptions, and/or these exemptions are not always fully implemented. This is in part because of a limited evidence base on the benefits of granting exemptions, and the financial cost and capacity development needed to consistently implement such incentives.[2] Therefore many governments have not assessed the impact of taxes foregone on SAS uptake and the full range of socioeconomic benefits to the different stakeholders – government, households, and the environment. Even where exemptions are granted, inconsistent application at the border remains a major challenge. Codes do not always clearly define the components of the standalone system that are exempt; for example, SAS providers in Zambia sometimes incur taxes on solar components especially batteries, that are at other times granted exemption from duties.[3]

In the absence of an evidence base to support tax exemptions, there is a risk of reversing existing policies as countries face a challenging public finance context because of the COVID-19 pandemic. Countries that previously had exemptions are now reviewing these policies, as they need to balance priorities given the economic downturn which is both reducing tax receipts and increasing the need for public spending. These policy changes will potentially have an adverse effect on the ability to achieve energy access targets. For example, in June 2020, the Kenyan National Assembly passed the 2020 Finance Act that introduced 14% VAT on standalone solar products which will likely erode the progress made towards the achievement of universal energy access by 2022.[4]

1 *Johanna Diecker, Susie Wheeldon, and Andrew Scott, Accelerating access to electricity in Africa with off-grid solar: Policies to expand the market for solar household solutions, Oversees Development Institute (ODI), January 2016, link*

2 *BloombergNEF, Sub-Saharan Africa Market Outlook 2020: Reducing risk, opening opportunities across the world's fastest growing regions, Climatescope, 2020, link*

3 *Energy Africa – Zambia, Technical assistance to model and analyse the economic effects of fiscal policy options for off-grid technologies in Zambia, 2018, link*

4 *GOGLA, "Policy Alert: Kenya Introduces VAT on Off-Grid Solar Products" June 26, 2020, link*

Methodology

Insights in this study are informed by secondary research, quantitative analysis, and consultations with key public and private sector stakeholders. The team reviewed government energy policies of 14 countries in SSA, previous studies on impact of taxes on SAS uptake, and over 50 reports on off-grid energy sector in SSA. This literature review was complemented with by consultations with 25 private and public sector stakeholders in the three focus countries – Malawi, Rwanda, and Sierra Leone, to develop a standardized tool to estimate the impact of tax exemptions in different country contexts. The deliverables of the study include an excel based tool that quantifies the cost-benefit tax scenarios (as shown in table 1) on OGS uptake, an assessment report that summarizes the key learnings and recommendations, and policy brief to summarize results for public policy makers.

Table 1: Tax scenarios compared with the baseline in each focus country.

Scenarios	Description
Scenario 1 (No VAT/ No duty)	Does not include taxes on any solar generation components of SAS systems
Scenario 2 (Duty on/ No VAT)	Includes Duty of 25% on all components of SAS systems without VAT
Scenario 3 (VAT on/ No duty)	Includes VAT of 18% on all components of SAS systems without duty
Scenario 4 (Both VAT and Duty on)	Includes Duty of 25% and VAT of 18% on all components of SAS systems

Analysis and research led to the findings shown in the section that follows.

Findings of the Study

1

VAT and duty exemptions have a significant effect on countries' ability to achieve their access targets and reach the poorest and most remote households. For example, in Malawi, where the baseline SAS percentage uptake was 10% in 2019, introducing VAT and duty will lead to 14% less households getting access to SAS over the 6 years compared to this baseline. In absolute terms this translates to 47,512 households (as shown in figure 1) or over 200,000 people by 2025 .

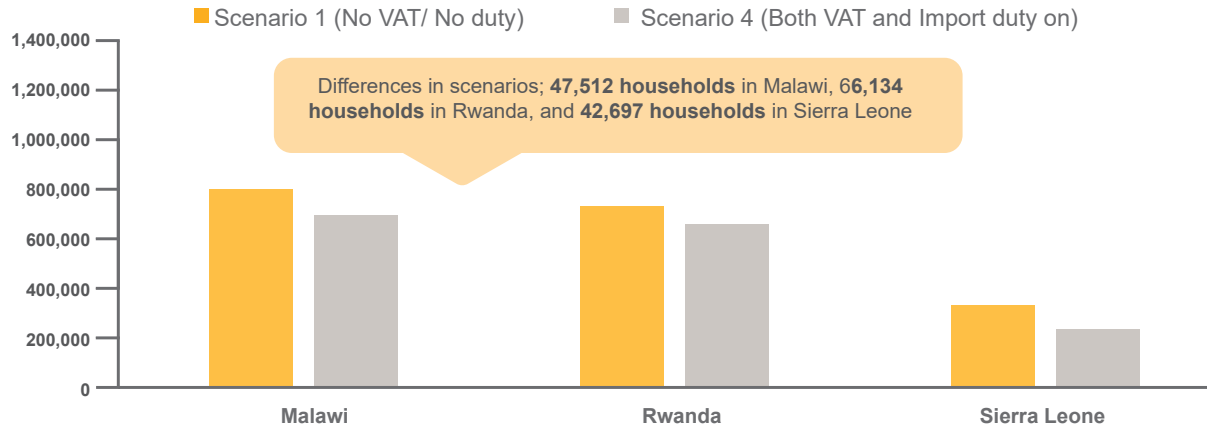


Figure 1: Comparison between projected number of households in 2025 with access to SAS systems, scenarios 1 and 4

2 **The gains to households from accelerated access to SAS technologies greatly outweigh the foregone tax revenues and environmental benefits.** Figure 2 compares the combined cost of exemptions to the three focus countries, with the combined benefits to households, government, and the environment across the three focus countries.

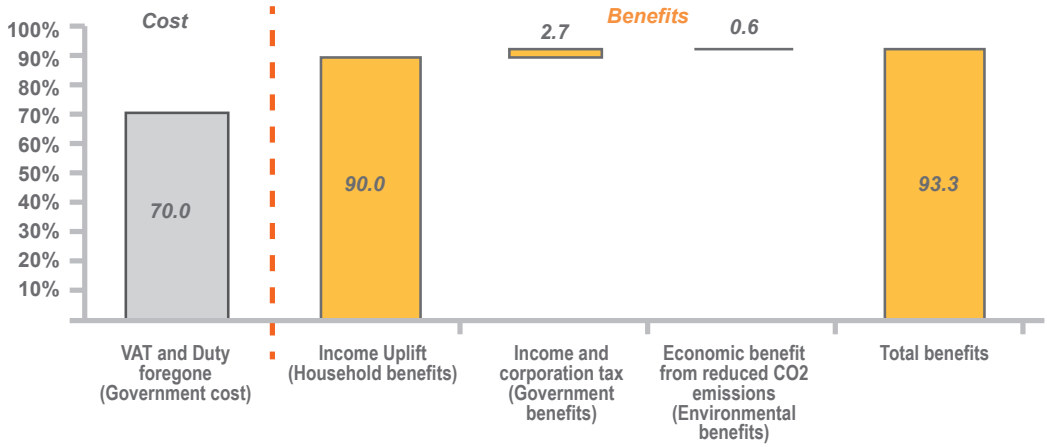


Figure 2: Cost benefit analysis of VAT and Duty Exemptions across the three focus countries, USD Millions

3 **Households especially those in rural areas where majority of the SAS products are sold stand to gain the most economic benefits.** This study considers three key economic benefits to households, additional income from new and pre-existing businesses because of SAS systems, additional income from extra hours spent at work, and income from new upstream jobs. Other non-monetary benefits to households and the environment are discussed in detail in subsequent chapters of this report.

Recommendations

Governments should continue to provide VAT and duty exemptions for quality certified SAS products to ensure the SAS sector delivers its full potential economic and wider benefits.

Explore additional fiscal strategies such as subsidy programs to support low-income and disadvantaged groups especially women to increase access to solar home systems.

Clarity and consistency in tax policy decision making processes must be put in place to provide confidence to investors over a 5-10 year timeferame.

Set clear pre-conditions for reconsidering exemptions as appropriate in future.

Improve implementation of current tax exemptions by training officials involved in tax implementation and working with private sector stakeholders and industry associations.

Governments should leverage the ACE-TAF excel-based tool to conduct a cost-benefit analysis when exploring future revisions to tax incentives for the SAS sector.

1 INTRODUCTION

1.1 Background, Objective, and Methodology of the Study

Standalone solar (SAS) products play a critical role achieving national electrification targets. Sub-Saharan African governments have recognized their importance and are leveraging various fiscal strategies, including tax incentives, to support the growth of the sector. SAS products often represent the most cost-effective way of providing electricity to unserved households in sparsely populated rural areas, where it is expensive and time-consuming to extend large grid infrastructure, and for customers who often have relatively low affordability to bear the cost of energy access. In recognition of this, governments leverage a range of policy, regulatory, and fiscal strategies to create a favorable environment for the sector to grow. Among these, tax incentives such as VAT and duty exemptions are a common and effective tool – typically linked to quality standards to ensure consumers have access to reliable and durable products.[5]

Many governments in SSA have implemented VAT and duty exemptions to improve affordability to end-consumers. Tax incentives, particularly VAT and duty incentives, are the most widely used fiscal tool due to their relative simplicity and low implementation cost compared to other fiscal policy tools; of 38 countries surveyed, 23 provide duty exemptions and 14 provide VAT exemptions for SAS products.[6] These tax incentives significantly reduce the final price of the SAS products, bringing them within the reach of low income (and price sensitive) households. [7,8]

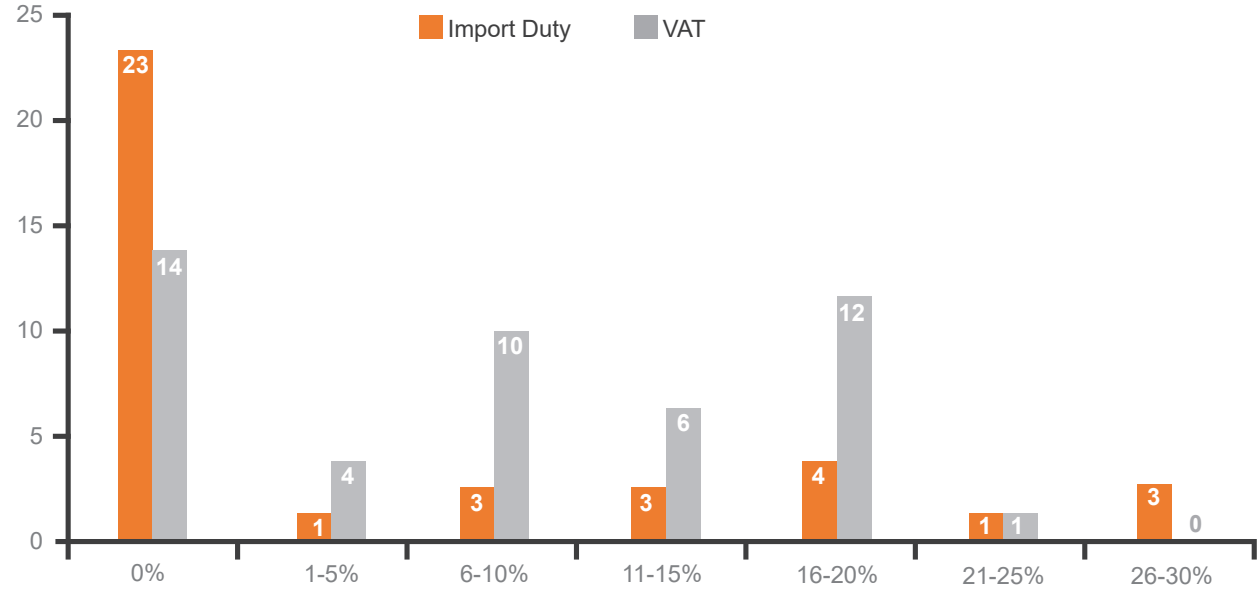


Figure 3: Number of SSA countries grouped by VAT and duty rates for SAS products.

5 Johanna Diecker, Susie Wheeldon, and Andrew Scott, Accelerating access to electricity in Africa with off-grid solar: Policies to expand the market for solar household solutions, Oversees Development Institute (ODI), January 2016, link

6 BloombergNEF, Sub-Saharan Africa Market Outlook 2020: Reducing risk, opening opportunities across the world's fastest growing regions, Climatescope, 2020, link

7 GOGLA, Providing Energy Access through Off-grid Solar: Guidance for Governments, 2019, link

8 Masami Kojima et al., Who Uses Electricity in Sub-Saharan Africa" Findings from household surveys, The World Bank, 2016, link

9 BloombergNEF, Sub-Saharan Africa Market Outlook 2020: Reducing risk, opening opportunities across the world's fastest growing regions, Climatescope, 2020, link

However, not all countries provide tax exemptions or incentives, in part because of the cost of implementation and limited capacity to develop and consistently implement such incentives. [9] The governments of nations such as Somalia have not yet implemented much needed interventions for their SAS sector because they lack the capacity to develop and implement appropriate policies to guide their universal electrification efforts, which has hindered the growth of their sector.[10,11] In other countries, inconsistent application of tax incentives is still a major barrier to the growth of the SAS sector. In part because of the ambiguity in tax laws that lead to different interpretation by customs authorities. In some instances, the law, does not clearly define the components of the standalone system that are exempt. Studies have shown that SAS companies in select African countries such as Zambia sometimes incur taxes on solar components especially batteries that are typically exempt from duties. This inconsistent application of taxes is because of unclear and sometimes dated description of system components in the necessary policies. Specific to Zambia, at the time of drafting the exemptions in 2008, SAS systems did not commonly use li-on batteries and therefore were not mentioned in the regulation.[12] Solar operators in Uganda as well face similar challenges with application of taxes on otherwise exempt solar components.[13] In addition, some countries are reviewing and, in some cases, reversing exemptions previously granted to SAS products.

Many governments across SSA have not yet assessed their impact on energy access targets. Countries that previously had exemptions are now revising them because of the need to balance priorities given the economic downturn due from the COVID-19 pandemic. These policy changes will potentially have an adverse effect on the ability to achieve energy access targets. For example, in June 2020, the Kenyan National Assembly passed the 2020 Finance Act that introduced 14% VAT on standalone solar products which will likely erode the progress made towards the achievement of universal energy access by 2022.[14]

While VAT is typically defined by national governments, duties are often harmonized at a regional level. In the East African Community's Customs Management Act defines over-arching tariffs across the EAC region, while the ECOWAS Common External Tariff applies to all member states in the region.

Furthermore, regional bodies often support harmonized policy making all member states. For example, ECREEE (ECOWAS Centre for Renewable Energy and Energy Efficiency) assists the 15 ECOWAS member states to develop, adopt and implement national renewable energy and energy efficiency policies. In addition, the body sets targets, regulatory frameworks, standards, and designs incentives (e.g., tax exemption, public procurement, portfolio standards) for member states.[15]

There is a rich and growing evidence base on the relationships between taxes and development of the SAS sector. These studies include Energy Africa 2016 – Mozambique OGS Fiscal Study, Energy Africa 2017 – Malawi OGS Fiscal Study, Energy Africa 2018 – Uganda OGS Fiscal Study, Energy Africa 2018 – Zambia OGS Fiscal Study, Shell Foundation 2018 – Uganda-Fiscal-Policy-Analysis for OGS, Duke 2019 – The True Cost of Solar Tariffs in East Africa, and HB 2019 – Policy Research on the 10% duties on solar (Nigeria). Some of the key findings from these previous studies are summarized in Table 2.

Box 1: Impact of tax changes to SAS sector as shown by other studies.

> Studies conducted on East Africa have found that introduction of import tariffs have a negative impact on uptake of SAS units, thus impacting the ability of governments to achieve their access targets. A Duke study of Kenya and Uganda found that a 20% import tariff would result in a decrease of 18% in the sales of kits without televisions. This reduced further to a 32% decrease in sales for kits with televisions.
>
> Conversely, an ECA study on Mozambique found that setting import duties and VAT at 0% would increase projected sales of SAS to 500,000 over a 10-year period. This would result in 3.1 million people accessing power through solar PV by 2026 against a national access target of 4.1 million by 2030. Maintaining the current taxation regime would leave that number at 231,000 by 2030 (5% of the national access target).

10 Accelerating access to electricity in Africa with off-grid solar Off-grid solar country briefing: Somalia, ODI, GOGLA, Practical Action and SolarAid, October 2015 link

11 Economic Consulting Association, Off-Grid Solar Market Assessment in Mozambique, Lighting Global, December 2018, link

12 Energy Africa – Zambia, Technical assistance to model and analyse the economic effects of fiscal policy options for off-grid technologies in Zambia, 2018, link

13 UNCDF, Uganda Solar Energy Association taxation handbook, September 2019, link

14 GOGLA, "Policy Alert: Kenya Introduces VAT on Off-Grid Solar Products" June 26, 2020, link

15 Ministry of Infrastructure, Ministerial Guidelines on Minimum Standards Requirements for Solar Home Systems, 2018, link

This study builds on the existing literature by:

1. **Developing a standardized tool that can be quickly adapted and used across countries with different contexts**. The tool developed includes user guidelines embedded within a simple and user-friendly Excel tool. It is easy to use with clear (and limited) inputs required to reproduce the analysis for different countries. As such it provides a quick and user-friendly way to develop understanding of the trade-offs involved in VAT and import tax regimes for the SAS sector. It can also be customized to apply to specific products where the data is available.
2. **Recommending best practice for responsible taxation**, that balances the interests of various stakeholders in achieving their energy access objectives and targets, supporting wider socioeconomic development, while also understanding the short- and medium-term fiscal implications.
3. **Evaluating the potential for further uptake with changes in tax policy**, examining the balance between required interventions and government targets given the economic environment.

Insights in this study are informed by secondary research, analysis, and consultations with key public and private sector stakeholders in Malawi, Rwanda, and Sierra Leone. ACE TAF reviewed government energy policies of 14 countries in SSA, previous studies on impact of taxes on standalone solar uptake, and over 50+ reports on off-grid energy sector in SSA. ACE TAF also developed a tool that quantifies the cost-benefit trade-offs of various tax scenarios on OGS uptake. Lastly, ACE TAF carried out consultations with 25 experts in private and public sector across Malawi, Rwanda, and Sierra Leone. The consultations focused on review of existing taxation policies and regulations and their impact on SAS systems uptake in these countries.

1.2 ACE TAF Fiscal Incentive Tool Guide

The key objective of the ACE TAF Tax Quantitative Tool is to provide a quick and clear understanding of the impact of different VAT and duty regimes on a range of fiscal and socioeconomic development outcomes. It is developed to provide an evidence base to support decision-making, and does not advocate any specific optimal tax policy, recognising that governments will have to weigh important short-term and long-term considerations. To support this decision-making process, it presents the impact of up to four tax policy options for both VAT and duties on the development of the SAS sub-sector and estimates how this impact on the development of SAS subsector will affect ability to reach energy access deficit communities, and how this in turn will impact on the fiscal base through a wide range of other tax mechanisms. Finally, it estimates the value of the SAS sector on other socioeconomic development priorities including job creation, education, and health, so that the trade-offs inherent in different tax policies and their associated outcomes can be examined.

The tool is aimed primarily at national governments although has been built to be flexibly used by a range of stakeholders. The tool should also be used by renewable energy associations and companies who want to examine the evidence base when engaging in public policy debates. It may also support regional dialogue with a view to harmonising duty and/or VAT regimes across national jurisdictions.

2 IMPACT OF TAXATION POLICIES ON THE OFF-GRID SECTOR IN SUB-SAHARAN AFRICA

This section explores the costs and benefits of VAT and duty exemptions. It provides an evidence base on the trade-offs between the objectives of a range of stakeholders, including for (1) national revenue authorities in terms of tax receipts, (2) government agencies especially those responsible for energy access policies and targets, (3) households using SAS products for income generation, education, and further benefits, (4) SAS supply chains including corporation taxes and income taxes, jobs created in the SAS value chain, businesses created, and (5) delivering climate change benefits through reduced CO_2 emissions.

Previous studies (Box 2) have found that many governments in SSA either zero rate or exempt solar generation parts of standalone solar systems of VAT and/or duties to stimulate the SAS uptake. *16,17,18,19,20*

Box 2: Application of VAT and Duty incentives (zero rating and exemptions) across SSA and their impact to final consumers and businesses

A review of tax policies on the SAS sector in Sub-Saharan Africa showed that 24 countries currently charge 0% duty on solar products while 15 apply VAT exemptions on solar PV products.

Countries that have used VAT as a fiscal tool to stimulate OGS growth either employed zero-rating or exemptions, however, these two methods have different impact on businesses. Governments typically categorize components of solar home systems as either generation, transmission, or productive use – solar generation parts are the focus of most exemptions/zero-rating. For zero-rated products, the government does not charge a tax on the retail sale of the product, but businesses can claim VAT refunds on the inputs used to make these products. For exempt products, the government does not tax the retail sale of the product, but the business cannot claim VAT refund on the inputs used to make the product. As a result, zero rating has a more favorable impact to businesses because they can claim the VAT refunds for inputs used to make zero rated products which is not the case with exempt supplies.

In addition to the application differences between zero rating and exemptions. VAT and Duties are covered by different stakeholders – the business or the final consumer. Duties are often charged on the Free-on-Board (FOB) price of products and are borne wholly by businesses at the port of entry of the SAS products while VAT are directly applied to the final retail price and are borne by the consumers. In countries with exemptions, however, businesses face inconsistent application of duties on their products. As a result, businesses factor this into their product pricing thereby creating additional costs for the final consumer.

16 UOMA, Fiscal Policy Analysis: An assessment of the tax and subsidy options to accelerate solar home systems in Uganda, 2018, Kampala Uganda, link

17 Sijbren Cnossen, Mobilizing VAT revenues in African Countries, International Tax and Public Finance, February 2020, link

18 How Could We Improve the Federal Tax System? – VAT, Tax Policy Center, Urban Institute & Brookings Institution, May, 2020 link

19 Sub-Saharan Africa Market Outlook 2020, UKaid and BloombergNEF, February 2020, link

20 World-Wide Tax Summaries – Uganda (last reviewed January 2021), PWC, link Amendments to the Customs and Excise (Tariffs) Order, Malawi Revenue Authority, 12 September 2019, link

2.1 Overall Findings on Impact of Taxation Policies on SAS Sector

VAT and duty exemptions can significantly accelerate achievement of energy access targets and reach the poorest and most remote households. In percentage terms, exemptions would result in a 2-percentage point increase in access within the next five years, representing tens of thousands of households in each of the focus countries (figure 4).). For example, in Malawi, where the baseline SAS percentage uptake was 10% in 2019, introducing VAT and duty will lead to 14% less households getting access to SAS over the 6 years compared to this baseline. In absolute terms this translates to 47,512 households (as shown in figure 4) or over 200,000 people by 2025 . Alongside tax exemptions, fiscal incentives such as supply, and demand-side subsidies should target the hardest to reach customers and encourage adoption of products driving productive use.

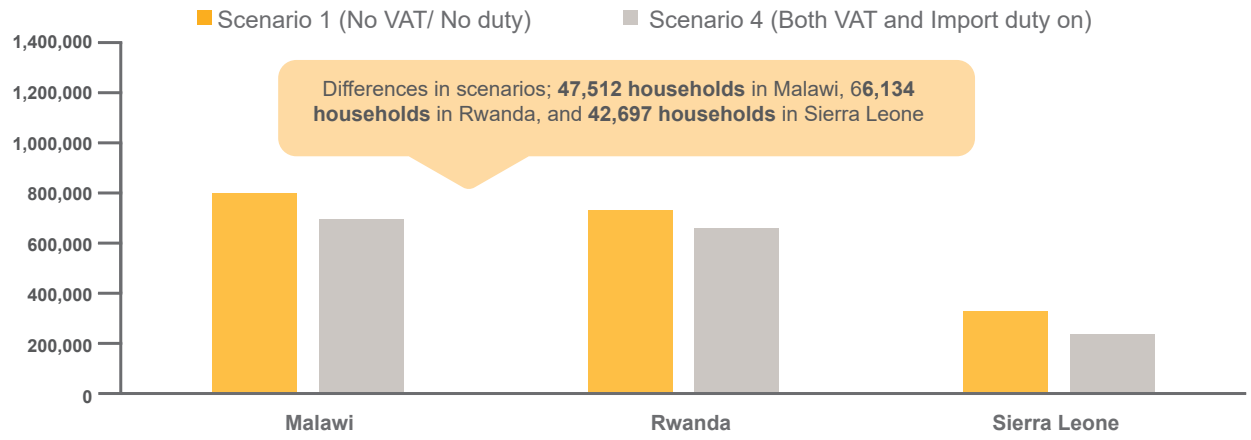
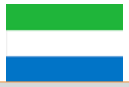


Figure 4: Comparison between projected number of households in 2025 with access to energy by national targets, scenarios 1 and 4 (% of population)

The cost of foregone revenue from VAT and duty exemptions is partially offset by the gains from corporation and income taxes and delivers benefits to households that greatly outweigh the cost of the exemptions. Figure 4 summarizes the impact of exemptions, showing the difference between 'Scenario 1', with no VAT or duties, and 'Scenario 4', where both VAT and duty is charged. The exemption of VAT and duty across all three countries would lead to reduced direct revenue to government. While this reduction would negatively impact government revenue targets in the short term, the long-term benefits accrued to households and the environment greatly outweigh the losses in revenue. For instance, governments will be able to gain monetary benefits in the form of corporation taxes (through increased SAS product sales) and income taxes (derived from increased upstream job opportunities). Households will experience income uplift from upstream and downstream opportunities; majority of which will accrue to rural households since SAS providers largely serve rural households. In addition to these monetary benefits, increased adoption of SAS products will create benefits to households such as more hours of study and reductions in carbon emissions.

Table 2: Summary of findings from study countries

	 Malawi	 Rwanda	 Sierra Leone
Costs and benefits to government			
Direct revenue **foregone** due to VAT and duty exemptions (USD Millions) *	-25	-28	-17
Corporation taxes gained (USD)	47,094	51,920	30,758
Income taxes gained from new jobs created (USD)	75,745	383,282	113,043
Household benefits			
Increase in new upstream jobs created *	2,900	2,700	1,600
Increase in upstream jobs for women	790	742	442
Increase in number of households starting new businesses	25,920	26,199	14,388
Increase in number of households able to use new SHS to support existing businesses	30,333	30,963	17,004
Increase in number of households with members getting new jobs	16,495	16,672	9,156
Increase in number of households able to spend more time at work	103,681	104,797	57,553
Increase in overall income uplift for households (USD Millions)**	35	36	19
Increase in household savings on energy expenditure (USD Millions)	16.12	16.29	8.95
Increase in total study hours (millions of hours)	1.41	1.43	0.78
Environmental benefits			
Reduction in CO2 emissions (tonnes)	5,309	5,002	2,746
Increase in economic benefit from reduced CO2 emissions (USD Millions)	0.25	0.25	0.14

**figures rounded off to the nearest million or hundred. **Individual line items representing income uplift from different economic activities (downstream and upstream opportunities) do not add up to overall income uplift for households since households engage in more than one economic activity.*

In addition to the quantitative costs and benefits of taxes shown above, it is important for policy makers to consider the factors presented below when reviewing the findings of this study. These factors are especially critical when comparing the study findings to other assessments of fiscal strategies such as direct and indirect subsidies.

Applicability to market stage of growth.

- **Market building.** Companies are better able to commit to market entry and investment with tax incentives in place. In terms of timing, taxes are essential at earlier stages of market development as compared to developed markets where more nuanced approaches are required.
- **Limiting market distortions**. Taxes minimize market distortion since they do not create a system where customers are facing different prices / using vouchers to afford their system.

Ease of delivery to target population segment.

- **Transparency and low administration cost.** The cost of tax implementation is lower compared to more targeted schemes, and easy for consumers and providers to respond to.
- **Progressive taxation.** Governments can collect taxes on profits and salaries without affecting the section of the population that needs energy access the most. This allows for potential consumers with the lowest ability to pay, who either pay a tax that represents a significant share of income or can no longer afford access to clean and modern energy access, to have access to SAS.

Other

- **This analysis is best interpreted "at the margin", not market wide**. It shows the impact of a price change based on price sensitivity of current consumers in the focus countries. It therefore by nature is biased to current consumers and not those who are currently not served by off-grid solar products.

2.2 Impact of Introducing Taxes on SAS Systems

2.2.1 Malawi

With VAT and duty exemptions maintained, the government of Malawi will forego USD 25M over 6 years in direct revenue as shown in figure 3. In addition, to VAT and duties, the analysis considered additional taxes to SAS sector including, withholding taxes (WHT), excise duties, and import declaration fees.

However, these revenue losses are offset by increased revenues from corporation taxes. Over a 6-year period, Malawi stands to gain USD 1.13M in corporation taxes from private operators and USD 17.8M in income taxes. These figures reduce to USD 1.08M and USD 13.9M respectively where VAT and duty are reintroduced.

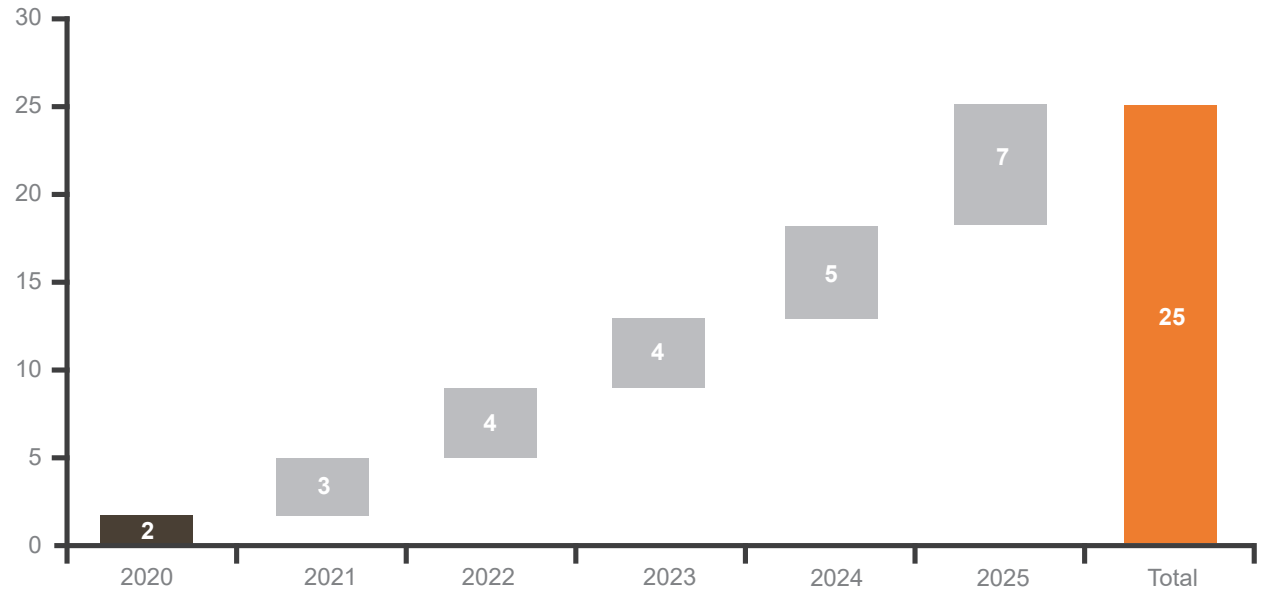


Figure 5: Difference in tax collections between scenario 1 and scenario 4 in Malawi, USD Millions

Increased SAS uptake due to exemptions on VAT and duty will lead to an estimated 15,900 upstream jobs created over 6 years. This figure reduces to just over 12,000 where VAT and duty are introduced. Similarly, with exemptions in place, over 402,000 households starting new businesses over a 5-year period, compared to 376,000 households where VAT and duty are charged on SAS products. Under the full exemptions, households are projected to earn additional income of USD 211M over 5 years, compared to USD 197M where VAT and duty are still charged.

Furthermore, with full exemptions on VAT and duty, households are projected to save approximately USD 250M on alternative fuel sources over 5 years. This figure reduces by over USD 16M where VAT and duty are introduced. Similarly, households are projected to gain up to 22M hours of study over 5 years where exemptions on VAT and duty are maintained. This reduces to 20.5M hours where VAT and duty are introduced at 18% and 12% respectively.

Introducing taxes on SAS systems will lead to an increase in revenues for national governments, however, there will be lower benefits for households (e.g., in number of study hours, jobs created, economic uplift) and the environment as shown in Table 3.

Table 3: Malawi study findings, impact of introducing VAT and duty.

	Scenario 1 (VAT and Duty on)	Scenario 4 (No VAT/No Duty)	Difference
Benefits to government			
Direct government revenues under scenario (USD Millions)	28.1	53.8	-25.8
Corporation taxes gained (USD Millions)	1.14	1.09	0.05
Income taxes gained from new jobs created (USD)	411,236	335,491	75,745
Household benefits			
New jobs created	15,890	12,692	3,198
New jobs created for women	4,290	3,500	790
Number of households starting new businesses (thousands)	402	376	26
Number of households able to use new SHS to support their existing businesses (thousands)	474	444	30
Number of households with members getting new jobs (thousands)	255	239	16
Number of households able to spend more time at work (thousands)	1,606	1,503	103
Overall income uplift for users of SAS products (USD Millions)**	552	516	35
Household savings on alternative sources of energy (USD Millions)	249	233	16
Total hours of study (millions of hours)	21.9	20.5	1.4
Environmental benefits			
Reduction in CO2 emissions (tonnes)	76,684	71,735	5,309
Economic benefit of reduced CO2 emissions (USD Millions)	3.83	3.58	0.25

***Individual line items representing income uplift from different economic activities (downstream and upstream opportunities) do not add up to overall income uplift for households since households engage in more than one economic activity.*

2.2.2 Rwanda

By maintaining VAT and duty exemptions, the government of Rwanda will forego USD 28 M over a 6-year period as shown in figure 6. In addition to VAT and duties, the analysis considered additional taxes to SAS sector including, withholding taxes (WHT), excise duties, import declaration fees, and infrastructure levies.

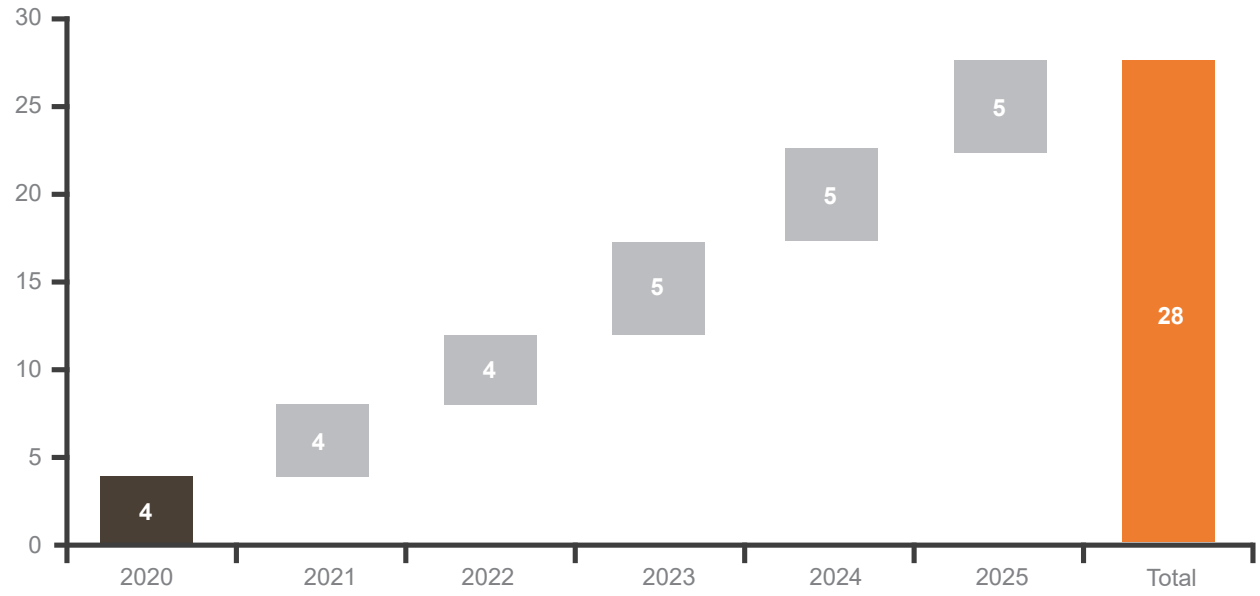


Figure 6: Difference in tax collections between scenario 1 and scenario 4 in Rwanda, USD Millions

Increased corporation taxes and income taxes from SAS operator's expansion and entry of new players due to VAT and duty exemptions have the potential to offset a portion of government revenues forgone from exemptions. Over a 6-year period, the Rwandan government stands to gain over USD 0.05M in corporation tax and USD 3.084M in income taxes if they maintain exemptions on VAT and duty rather than introducing VAT and duty at 15%.

Table 4: Rwanda study findings, impact of introducing VAT and Duty.

	Scenario 1 (No VAT/No Duty)	Scenario 4 (VAT and Duty on)	Difference
Benefits to government			
Direct government revenue under scenario (USD Millions)	25.4	53.7	-28.3
Corporation taxes gained (USD Millions)	1.25	1.2	0.05
Income taxes gained from new jobs created (USD)	237,329	199,886	37,443
Household benefits			
New jobs created	17,424	14,674	2,750
New jobs created for women	4,704	3,962	742
Number of households starting new businesses (thousands)	403	377	26
Number of households able to use new SHS to support their existing businesses (thousands)	476	445	31
Number of households with members getting new jobs (thousands)	256	240	16
Number of households able to spend more time at work (thousands)	1,611	1,507	104

Overall income uplift for users of SAS products (USD Millions)**	553	517	36
Household savings on alternative sources of energy (USD Millions)	250	234	16
Total hours of study (millions of hours)	21.9	20.5	1.4
Environmental benefits			
Reduction in CO2 emissions (tonnes)	76,933	71,931	5,002
Economic benefit of reduced CO2 emissions (USD Millions)	3.84	3.59	0.25

***Individual line items representing income uplift from different economic activities (downstream and upstream opportunities) do not add up to overall income uplift for households since households engage in more than one economic activity.*

2.2.3 Sierra Leone

Like Rwanda and Malawi above, maintaining VAT and duty exemptions will result in foregone government revenues of USD 16.8M over a 6-year period as shown in figure 7. These losses, however, are offset by increased revenue from other sources, namely corporation taxes and income taxes. With an assumed net margin of 2% for SAS operators on their solar products, over a 6-year period, Sierra Leone is projected to gain about USD 30,000 in corporation taxes and USD 1.9M in income taxes if VAT and duty are exempted, rather than introducing VAT and duty at 15%.

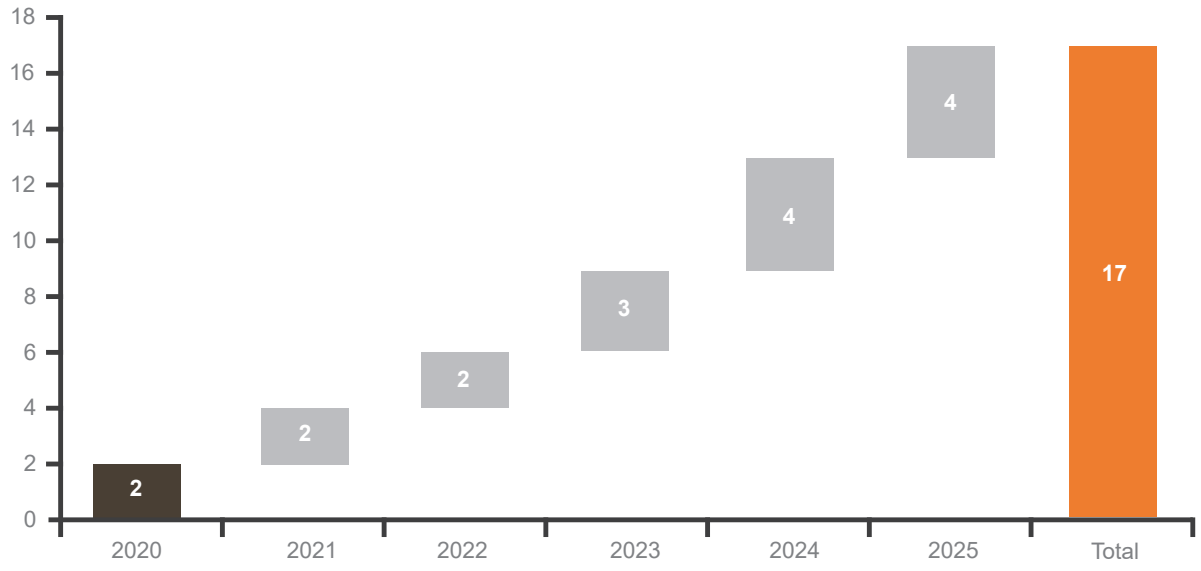


Figure 7: Difference in tax collections between scenario 1 and scenario 4 in Sierra Leone, USD Millions

Furthermore, introducing VAT and duty will have a negative impact on the benefits accruing to households and the environment as shown in Table 7.

Table 5: Sierra Leone study findings, impact of introducing VAT and Duty.

	Scenario 1 (No VAT/No Duty)	Scenario 4 (VAT and Duty on)	Difference
Benefits to government			
Direct government revenue under scenario (USD Millions)	15.1	31.7	-16.8
Corporation taxes gained (USD Millions)	0.74	0.71	0.03
Income taxes gained from new jobs created (USD)	716,520	603,477	113,043
Household benefits			
New jobs created	10,370	8,734	1,636
New jobs created for women	2,800	2,358	442
Number of households starting new businesses (thousands)	123	109	14
Number of households able to use new SHS to support their existing businesses (thousands)	145	128	17
Number of households with members getting new jobs (thousands)	78	69	9
Number of households able to spend more time at work (thousands)	494	436	58
Overall income uplift for users of SAS products (USD Millions)**	169	149	19.7
Household savings on alternative sources of energy (USD Millions)	77	68	9
Total hours of study (millions of hours)	6.7	5.9	0.8
Environmental benefits			
Reduction in CO2 emissions (tonnes)	23,569	20,823	2,746
Economic benefit of reduced CO2 emissions (USD Millions)	1.17	1.04	0.13

***Individual line items representing income uplift from different economic activities (downstream and upstream opportunities) do not add up to overall income uplift for households since households engage in more than one economic activity.*

3 RECOMMENDATIONS FOR RESPONSIBLE TAXATION DESIGN AND IMPLEMENTATION

Tax is critical to the development of countries because it provides the revenue necessary to support infrastructure development. [21] However, African economies have narrow tax bases with low potential for tax collection since there are high unemployment rates and most of the productive population is in the informal sector primarily in subsistence farming.[22] Many of the countries in Sub-Saharan Africa have a tax-to-GDP ratio below 15%.[23]At that level, revenues are inadequate to finance basic state functions, much less achieve the Sustainable Development Goals (SDGs) set for 2030. It has been proposed that governments need to raise their ratio to at least above 20% to achieve the SDGs with lower reliance on external development finance.[24] While governments explore ways to increase local taxation, they must consider the broader impact of heavy taxation on critical sectors especially energy, education, and health, all of which contribute towards the sustainable development goals.

Tax incentives provide an avenue for governments to spur growth of these sectors and provide support to sections of the population – women and youth – that are disproportionately affected by taxes. [25] Given that the SAS sector in many African countries is still in the early to growth stages of development, majority of the businesses operating in the sector are small and medium-sized enterprises (SMEs). One of many powerful tools to influence gender equality through taxation are tax policies related to SMEs because women are overrepresented as employees in these companies and at the lowest wage levels. Reports estimate 56% of the jobs being created in the standalone solar sector are in rural areas. In addition, 27% of the full-time jobs created in the standalone solar sector are filled by women with this percentage expected to grow. [26] Tax incentives may also have an impact on other areas in sustainable development, such as infrastructure investment (domestic and foreign tax incentives), environmental sustainability (carbon taxes), and health outcomes (taxes on harmful and unhealthy products). [27]

However, governments have historically had unclear tax policies with inconsistent application. Unclear tax systems can be a barrier to domestic resource mobilization and impede development, therefore it is important to have a fair, efficient, and effective revenue collection infrastructure to promote economic and social development. [28] One of the primary challenges SAS companies face is the inconsistent application of taxes incentives by customs officials. [29] In the East African countries, particularly Kenya and Uganda, SAS companies struggle with delays in clearing consignments and sometimes incur fees on solar components that are otherwise exempt. Considering these factors, this study proposes the following areas for governments to explore with regards to responsible taxation design and implementation:

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21 The Role of Taxation and Domestic Resource Mobilization in the Implementation of the Sustainable Development Goals, United Nations Tax Committee, October 2019, link

22 The Role of Taxation and Domestic Resource Mobilization in the Implementation of the Sustainable Development Goals, United Nations Tax Committee, October 2019, link

23 "Mobilizing Tax Resources to Boost Growth and Prosperity in Sub-Saharan Africa", The World Bank, September 2019, link

24 Cathal Long and Mark Miller, Taxation and the Sustainable Development Goals, Overseas Development Institute (ODI), April 2017, link

25 The Role of Taxation and Domestic Resource Mobilization in the Implementation of the Sustainable Development Goals, United Nations Tax Committee, October 2019, link

26 GIZ and Vivid Economics, Off-Grid Solar. A Growth Engine for Jobs, GOGLA link

27 The Role of Taxation and Domestic Resource Mobilization in the Implementation of the Sustainable Development Goals, United Nations Tax Committee, October 2019, link

28 Tax And The United Nations Sustainable Development Goals, The International Chamber of Commerce (ICC), link

29 The East African Regional Handbook on Solar Taxation, link

1 **Governments should continue to provide VAT and duty exemptions for quality certified SAS products to ensure the SAS sector delivers its full potential economic and wider benefits.**

While the main business case for exemptions differs by product type, the core feature SAS products is to reach households who would otherwise have very limited or no access to energy technologies. The analysis above shows that the benefits to accessing a high-quality SAS product greatly outweigh the foregone tax revenue, both in terms of direct economic gains through access to more and better jobs and improved livelihoods, and through delivering key socioeconomic benefits to current and future generations, such as improved health, education, and the environment. Small single and multi-light systems offer a crucial entry-level product for vulnerable and hard to reach communities, while larger systems offer up significant economic potential to access new and better jobs in communities where they are needed most. Furthermore, our analysis shows that gains in corporation tax and income taxes will partly offset foregone revenue from VAT and duty from SAS products, and this effect would be expected to grow over time. As an example, over a 6-year period the government of Malawi would forego USD 25 M in VAT and duties but would gain USD 19 M from corporation and income tax. Households would gain USD 14 million from new jobs and new businesses and over 4 million hours in additional study hours. Lastly, there would be a 2,746-ton reduction in CO2 emissions. It is important that these exemptions are linked only to quality certified products to make sure consumers gain trust in high-quality and reliable products.

2 **Clarity and consistency in tax policy decision making processes must be put in place to provide confidence to investors over a 5 – 10-year timeframe.**

For investors and companies to have confidence to enter and to scale operations, having confidence that exemptions will be maintained at least until there is a significant change in the maturity of the market, is vitally important. However, it must also be acknowledged that governments face lower tax revenues due to the decline in the economy because of COVID-19. As the case in Kenya and Nigeria, governments have revised consumption taxes in some sectors. In almost all countries, exemptions on SAS products are effectively reviewed annually, causing uncertainty especially among the private sector developers who are unable to plan adequately over the long-term. A consistent and transparent decision-making process is crucial to make sure SAS companies continue to invest in the long-term success of the market and can plan accordingly when tax regimes do change. Governments should agree a periodic process to review tax exemptions and an indicative timeframe for these exemptions to be maintained, for instance, between 5 – 10 years.

3 **Set clear pre-conditions for reconsidering exemptions as appropriate in future.**

For example, when national energy access targets are achieved it may be worth revisiting the question of exemptions as at least at this point the full market potential will have been reached with an initial entry-level energy access product. Furthermore, as the sector matures, businesses should be aiming to become financially stable and profitable, with a core customer base that is familiar with the products and increasingly able and willing to pay. The question of exemptions should be revisited as the SAS sector achieves pre-defined objectives in terms of reach of its full potential customer base, and economic viability. However, even then the imposition of taxes must be considered against the needs of low-income households that will continue replacing and upgrading SAS systems, driving livelihoods among the most vulnerable population groups.

30 Amendments to the Customs and Excise (Tariffs) Order, Malawi Revenue Authority, 12 September 2019, link

4 **Improve implementation of current tax exemptions by training officials involved in tax implementation and working with private sector stakeholders and industry associations.**

Private operators currently still face instances where products that qualify for exemptions are not exempted for taxes and duties at the points of entry. [30] In addition, there has been rapid growth in solar technology over the past decade and this technology advancement is expected to continue. These changes in technology lead to new products coming to market such as new types of batteries or bulbs which may not be accurately covered by existing exemption rules. Therefore, there is a need to train officials involved in tax implementation on the application of current tax exemptions on solar products. The government could conduct annual training sessions to inform customs authorities on new changes to tax laws applicable to the solar sector. The government can explore ways of working with the private sector to develop material that contains information on the latest solar technology and their applicable taxes.

Other Sub-Saharan countries such as Kenya and Uganda have worked to explore this. In 2020, the private sector solar associations in these countries launched an East African Solar Taxation handbook to improve the implementation of tax incentives and support customs officers.[31] In addition, ACE TAF is actively engaging keyholders to improve tax incentives implementation in countries such as Kenya, Nigeria, Malawi, and Zambia by developing custom handbooks that outline duty/VAT exemptions for SAS products and the clear process of implementation.

5 **Explore additional fiscal strategies such as subsidy programs to support low-income and disadvantaged groups especially women to increase access to solar home systems.**

Studies have shown that indirect taxes such as VAT and consumption taxes have a larger impact on women given the regressivity of the tax and the over-representation of women in low-income groups. [32] Furthermore, this will have an even greater impact on women and low-income groups. The Malawi Government should maintain exemptions (especially VAT) on solar products because it increases affordability for low-income groups and encourages purchase of solutions that ease household activities especially for women in rural areas. Entrepreneurship resulting from women's access to renewable energy has the potential to enhance economic growth and promote social inclusivity and empowerment. [33] In addition, the government should explore other fiscal policy incentives such as direct subsidies targeted at low-income groups and women to increase access to solar home systems.

6 **6.Governments should leverage the ACE TAF excel-based tool to conduct a cost-benefit analysis when exploring future revisions to tax incentives for the SAS sector.**

ACE TAF developed an excel-based tool that can be easily tailored to any country by updating the relevant assumptions as shown in the step-by-step tool guide in the appendix. This tool provides an objective evidence base of the costs and benefits to government, households, and the environment. This information will provide the necessary foundation to guide policy decisions on tax incentives for the SAS sector while considering all short and long-term effects.

31 The East African Regional Handbook on Solar Taxation, UNREEEA, KEREA, USEA, October 2020, link

32 Committee of Experts on International Cooperation in Tax Matters, The Role of Taxation and Domestic Resource Mobilization in the Implementation of the Sustainable Development Goals, United Nations, October 2018, link

33 Renewable Energy: A Gender Perspective, IRENA, January 2019, link

APPENDICES

Appendix 1-3 provide the results of the application and calibration of the tool to three country case studies – Malawi, Rwanda, and Sierra Leone.

Appendix 1: Malawi Country Assesment Report

Introduction

Over 80% of Malawi's 17.5 million population has no access to electricity.[34] With low rates of electrification, Malawi has a strong potential for standalone solar solutions. The government recognizes the demand and potential of standalone solar solutions to address the electrification challenge and has included solar home systems in Malawi's national electrification policies, including the National Energy Policy, the Renewable Energy Strategy, and the Sustainable Energy for All (SE4ALL) Action Plan. The SE4ALL strategy in particular, projects that standalone solar shall provide access to approximately 70% of all households by 2030. Comparatively, grid and mini-grid connections are expected to provide power to 30% and 0.1% of all households, respectively. [35] There are over 13 companies selling solar home systems to date in Malawi accounting for the 320,000 solar home systems sold since 2015. [36] Despite this traction, the SAS penetration is lower than the SE4ALL interim 2020 target of 30%. [37] Therefore, there is a need for additional government initiatives to further enhance the environment to scale SAS uptake.

The Government of Malawi (GoM) has implemented different fiscal strategies including Value-Added-Tax (VAT) and Duty exemptions to enhance SAS uptake. To jumpstart the SAS industry during it nascent stages GoM implemented business rates relief and introduced duty and VAT exemptions in 2013 and 2019 respectively with the aim of lowering the final price of SAS to stimulate uptake among low income unelectrified communities.[38,39,40] GoM has considered other fiscal initiatives to boost SAS uptake such as the adoption of the Lighting Global standards, which were developed by the World Bank and the International Finance Corporation (IFC), to strengthen the existing quality standards framework.[41] Further, the GoM has committed to adopting the Global Tracking Framework (GTF) to track access to electricity.[42] Despite these various efforts to strengthen the fiscal environment, the GoM still faces implementation challenges with regard to duty and VAT exemptions that are affecting the scale of standalone solar products. Solar operators in Malawi reported instances where they paid duty fees for solar home system components particularly solar batteries and LED lights despite the exemptions.[43]

34 World Bank, Access to electricity (% of population) - Sub-Saharan Africa, (Washington, D.C., United States, 2017), link

35 Edward Borgenstein et al., Malawi Sustainable Energy Investment Study, GoM, September 2019, link

36 GOGLA, Global Off-Grid Solar Market Reports,2020, link

37 Edward Borgenstein et al., Malawi Sustainable Energy Investment Study, GoM, September 2019, link

38 Department of Energy Affairs, Malawi Renewable Energy Strategy,2017, link

39 SADC, Revised Malawi Profile, 2013, link

40 Ministry of Finance, 2020 Budget statement, September 2019, link

41 Department of Energy Affairs, Malawi Renewable Energy Strategy,2017, link

42 Department of Energy Affairs, National Energy Policy (2018), August 2018, link

43 ACE TAF consultations

Findings From Analysis

Baseline and Tax Scenarios

The analysis carried out in this study explores cost and benefit trade-offs of tax exemptions by comparing Malawi's current tax regime to four different tax scenarios shown in Table 6. The outputs of the analysis are shown in the subsequent sub-sections of this chapter.

Table 6: VAT and duty rates for component and plug-and-play systems

Taxes	VAT		Duty	
System type	Component-based	Plug-and-play	Component-based	Plug-and-play
Scenario 1 (No VAT/ No duty)	0.0%	0.0%	0.0%	0.0%
Scenario 2 (Duty on/ No VAT)	0.0%	0.0%	16.0%	16.0%
Scenario 3 (VAT on/ No duty)	18.0%	18.0%	0.0%	0.0%
Scenario 4 (Both VAT and Duty on)	18.0%	18.0%	16.0%	16.0%

Scenario Outputs

Fiscal Impacts

Maintaining the current VAT and duties exemptions or introducing more exemptions on different components of solar home systems will have a negative impact on government revenues in the short term. As shown in figure 8, government has higher revenues in all scenarios except scenario. VAT is the main source of government revenues from the SAS subsector; SAS VAT exemptions represent a larger source of revenues than duties. Evidently, scenario 3 represents higher revenues than scenario 2.

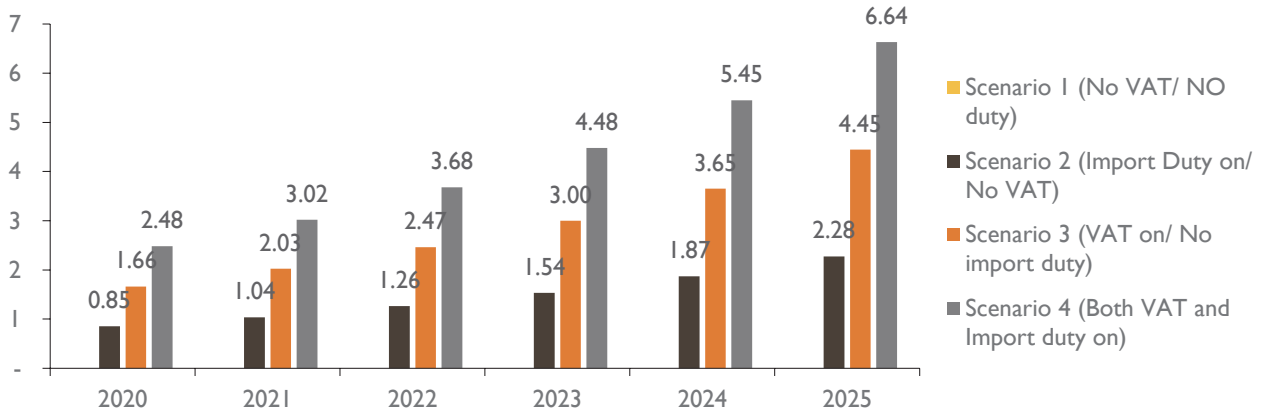

Figure 8: Overall taxes gained (foregone) in comparison to the baseline scenario, USD Millions

While exemptions would reduce revenues in the short-term, other fiscal and wider economic benefits will offset this in the medium term. Other fiscal benefits and economic benefits include increased corporation taxes from growth in SAS operators, income taxes from upstream jobs, and economic uplift from downstream jobs.

Corporation tax receipts will increase as the subsector grows with potential of offsetting revenues foregone from VAT and duty exemptions. Given the nascent nature of the SAS sector, SAS operators earn low gross margins – estimated at 2% in this model. Under this conservative estimate, scenario 1 results in no net change in corporation taxes when compared to the current baseline scenario over the 6 years.
As shown in figure 9, scenarios 3 and 4 return lower corporation taxes due to lower sales in comparison to the

baseline. Scenario 2 shows growth in corporation taxes indicating that removal of VAT would result in higher growth than removal of duties.

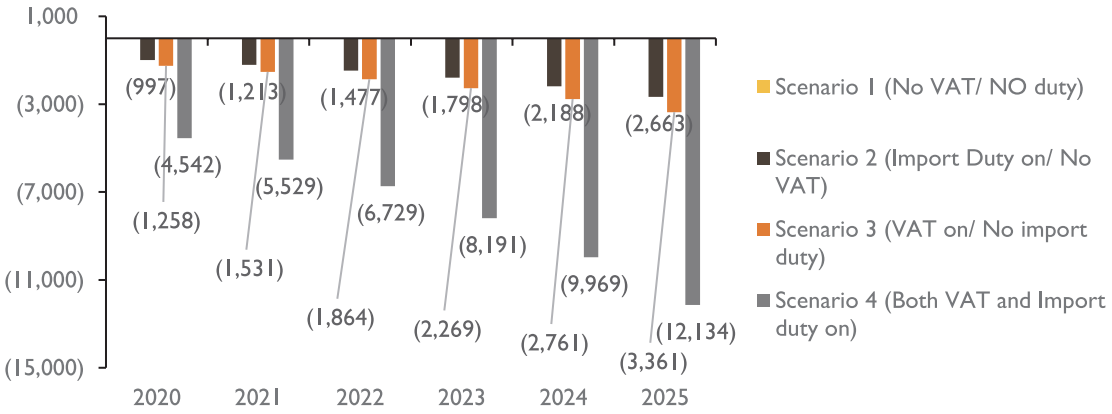

Figure 9: Corporation taxes gained (foregone) from SAS across scenarios, compared to the baseline

Furthermore, income taxes gained from management jobs created by solar sector will offset direct revenues foregone by VAT and Duty exemptions. The solar sector will generate approximately 105 management jobs annually resulting in approximately USD 2.5 million earned in income taxes over the 6 years in scenario 1 (as shown in figure 10).

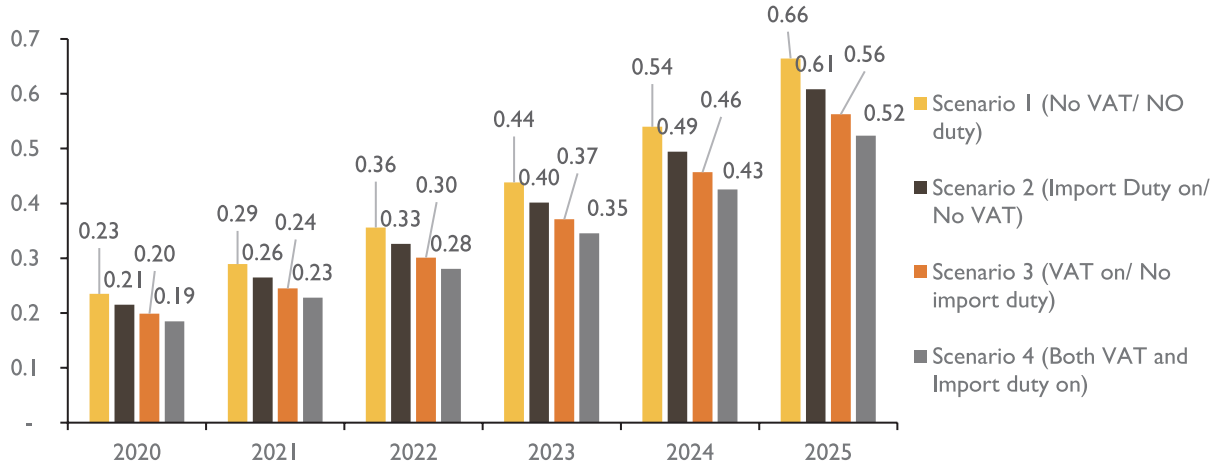

Figure 10: Income taxes from management jobs, USD Millions

The growth in the SAS sector will lead to more upstream jobs outside management as well as downstream jobs. Over 15,000 other upstream jobs are created over the 6 years in scenario 1 with approximately 400,000 households starting businesses (downstream opportunities) annually in the same scenario. These downstream jobs are vital, as they improve the economic welfare of people not in the formal employment. New businesses started in these communities can also improve the welfare of entire communities.

These benefits of improved productivity and economic empowerment often impact most on women and people in more vulnerable communities. Of the upstream jobs created, 27% of the positions are filled by women. [44] This translates to over 4,200 upstream jobs for women where VAT and duty are exempted for SAS products (Scenario 1). This number reduces to 3,300 under Scenario 4 (where VAT and duty are applied).

44 Off-Grid Solar. A Growth Engine for Jobs, GOGLA, link

45 Off-Grid Solar. A Growth Engine for Jobs, GOGLA, link

Further economic uplift is also exhibited where households purchase new SAS products. Studies have shown that 11% of households can start a new business and 7% of households have a member within the household taking on a new job as a result of purchasing a SAS product. [45] Each of these economic activities results in an increase in income of USD 312 and USD 336 annually. Furthermore, 13% of households are able to use new SHS to support their existing businesses, making additional annual income of USD 384. 44% of households are also able to spend more time at work, making additional annual income of USD 300. This translates to aggregate additional income of USD 145M per year in a Scenario where VAT and duty are exempted for SAS products (as shown in figure 11 below).

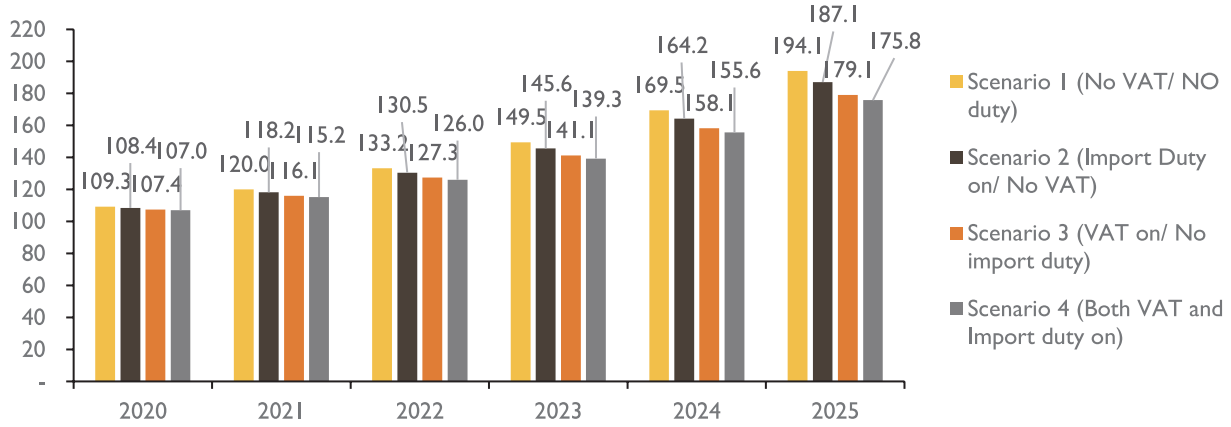

Figure 11: Economic uplift for households under different tax scenarios, USD Millions

Socioeconomic Impacts

In addition to fiscal impacts, taxation policy changes have significant impact on the socioeconomic aspects of the economy. Households, for instance, are able to reduce their expenditure on other energy sources and use the savings on other household needs. The primary alternative sources of energy used in SSA are battery-powered devices, candles, and kerosene. Switching to SAS products would not completely eliminate spending on these energy sources but would potentially reduce spending on battery-powered devices, candles, and kerosene by up to 20%, 70% and 60% respectively. These savings would amount to on average USD 41M over 5 years in a scenario where VAT and duty were exempted fully for SAS products. These savings reduce to on average USD 38M per year where VAT and duty are set at 18% and 12% respectively.

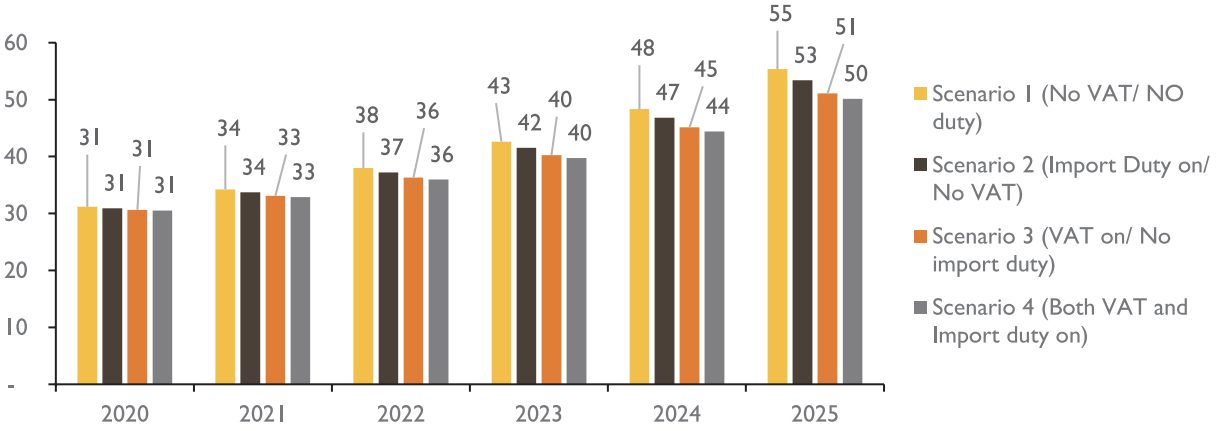

Figure 12: Reduction in households energy expenditure due to use of SAS products, USD Millions

Uptake of SAS due to favorable taxation would also impact the environment and the level of CO2 emissions resulting from increased renewables uptake. Increased uptake of SAS due to removal of VAT and duty would reduce carbon emissions by over 76,000 tonnes over 6 years. This would amount to USD 3.8M on the basis of an international social cost of carbon of USD 50 per tonne of CO2. Where VAT and duty are set at 18% and 12% respectively, this reduction in emissions is 71,000 tonnes over 6 years, which amounts to a net benefit of USD 3.5M.

Use of SAS products enables students to study in the evening without negative impact to their health as is the case when using kerosene and other energy sources such as candles. Removal of VAT and duty (Scenario 1) would result in cumulative national study hours reaching almost 22M hours over 6 years. Where VAT and duty are introduced, this figure reduces to just over 20.5M hours, a difference of 1.5M which would impact the study outcomes of school-going children.

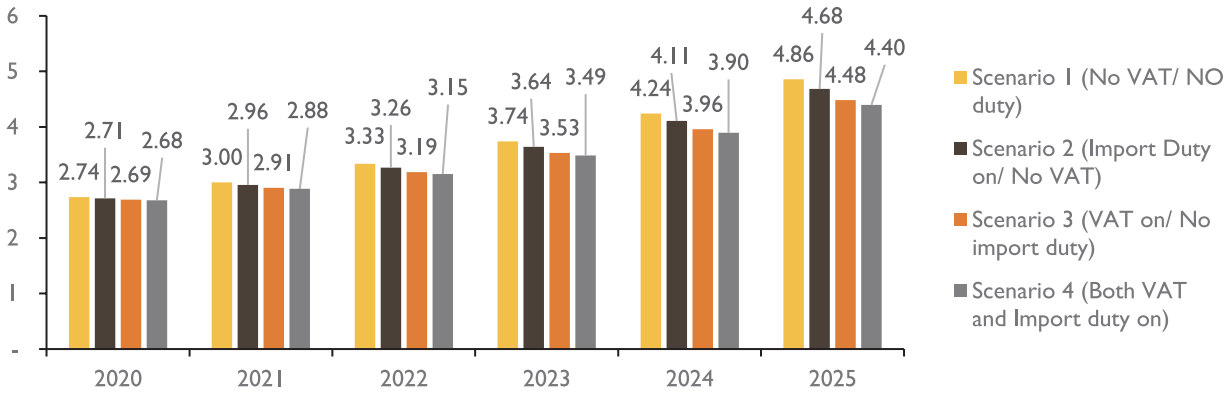

Figure 13: Hours of study under different tax scenarios, million hours

Appendix 2: Rwanda Country Assesment Report

Introduction

Over the past decade, Rwanda's electrification rate has grown significantly from 9% to over 34%. [46] There is potential for SAS products to serve more people in Rwanda and the Government of Rwanda (GoR) further enhancing the uptake of SAS products. [47,48] GoR set a target of 48% for new SASs connections that are primarily located in remote areas, by 2024 – translating to over 176,000 households connected annually from 2019/20 to 2023/24. [49] Tax exemptions have been a key regulatory tool to enhance this uptake, with customs duty and VAT exemptions introduced in 2004, through the East Africa Community Customs Management Acts 2004 (EACCMA, 2004) , through the VAT Law of 2015, respectively. [50,51] However, additional government initiatives are required to further enhance the environment to scale SAS uptake in order to achieve the targets set for the next 5 years.

Despite tax incentives to increase uptake of solar home systems, solar operators in Rwanda face a major challenge of inconsistent application of taxes on solar products. Though solar items were exempt from customs duty, the East African Community (EAC) Common External Tariff (CET) still allocates taxes to some solar lights and components – this is particularly so for component-based systems. Further, the recent extension of exemptions to more solar products in Amendment to the Exemption Regime under the Fifth Schedule of the EACCMA has brought about added ambiguity as to the products that qualify for exemptions. This may lead to misinterpretation by customs officials, resulting in the incorrect taxation of solar products. [52]

Findings From Analysis

Baseline and Tax Scenarios

The analysis carried out in this study explores cost and benefits trade-offs of tax exemptions by comparing Rwanda's current tax regime to four different tax scenarios shown in Table 7. The outputs of the analysis are shown in the subsequent sub-sections of this chapter.

Table 7: VAT and Duty rates for component and plug-and-play systems

Taxes	VAT		Duty	
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Scenario 3 (VAT on/ No duty)	18.0%	18.0%	0.0%	0.0%
Scenario 4 (Both VAT and Duty on)	18.0%	18.0%	16.0%	16.0%

46 World Bank, Access to electricity (% of population) - Sub-Saharan Africa, (Washington, D.C., United States, 2017), link

47 Ministry of Foreign Affairs, Access to Energy in Rwanda, August 2014, link

48 Rwanda Energy Group, Electricity Access, 2020, link

49 Ministry of Infrastructure, Energy Sector Strategic Plan: 2018/19 – 2023/24, September2018, link

50 MINECONFIN, VAT Law, 2015, August 2015, link

51 The East African Community, The East African Community Customs Management Act, 2004, 2009, link

52 Deloitte, Tax Alert, The East African Community (EAC) Gazette 2020, July 2020, link Off-Grid Solar. A Growth Engine for Jobs, GOGLA, link

Scenario Outputs

Fiscal Impacts

Maintaining the current VAT and duties exemptions or introducing more exemptions on different components of solar home systems will have a negative direct impact on government revenues. As shown in figure 14, scenarios that include taxes (scenarios 2 to 4) the government will have a net gain in revenues in comparison to baseline scenario. In scenario 1, the government stands to forego up to USD 28M over the 6 year period.

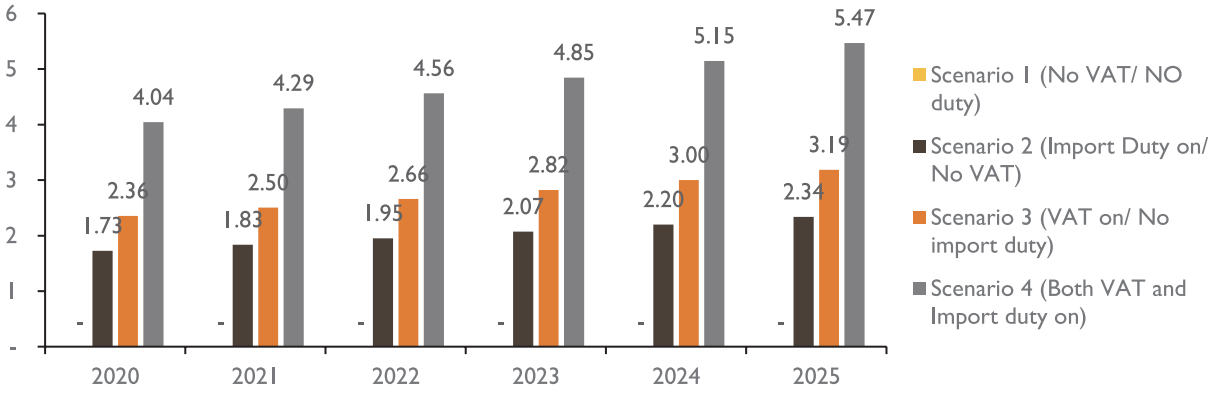


Figure 14: Overall taxes gained (foregone) in comparison to the baseline scenario.

Corporation tax receipts will increase as the subsector grows with potential of offsetting revenues foregone from VAT and duty exemptions. Given the nascent nature of the SAS sector, SAS operators earn low gross margins – estimated at 2% in this model. As shown in figure 15 below, all scenarios result in foregone corporation taxes compared to the baseline. This is because the baseline and scenario 1 represent the most optimal scenarios for growth of the SAS sector due to VAT and import exemptions being in place.

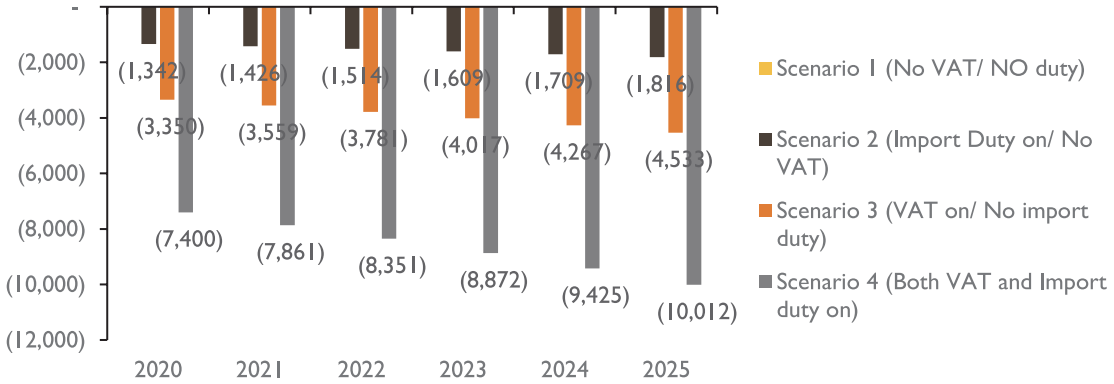


Figure 15: Corporations taxes from SAS across scenarios (compared to the baseline)

Furthermore, income taxes gained from management jobs created by solar sector will offset those foregone by VAT and Duty exemptions. The solar sector will generate an average of 115 management jobs annually resulting over USD 2.7 million earned over the 6 years in scenario 1 (as shown in figure 16 below).

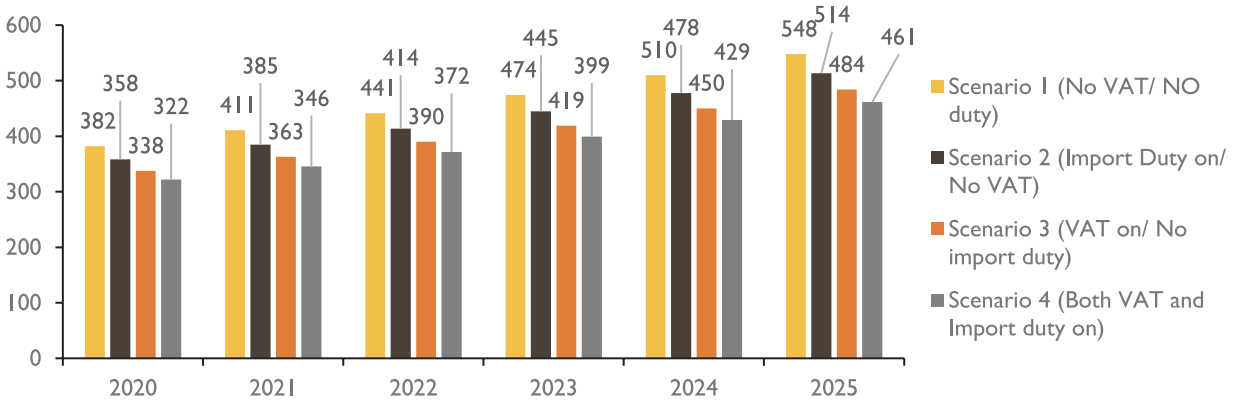


Figure 16: Income taxes from management jobs ('000s)

The growth in the SAS sector will lead to more upstream jobs outside management as well as downstream jobs. Over 16,700 other upstream jobs are created over the 6 years in scenario 1 with approximately over 400,000 households starting businesses (downstream opportunities) over the 6 years. These downstream jobs are vital, as they improve the economic welfare of people not in the formal employment. New businesses started in these communities can also improve the welfare of entire communities.

These benefits of improved productivity and economic empowerment often impact most on women and people in more vulnerable communities. Of the upstream jobs created, 27% of the positions are filled by women. [53] This translates to over 4,700 upstream jobs for women where VAT and duty are exempted for SAS products.

Socioeconomic Impacts

The tax regime on SAS products also have a significant impact on the socioeconomic facets in Rwanda. Households substituting battery-powered devices, candles and kerosene lamps would reduce their lighting expenses by 20%, 70% and 60% respectively Resulting in household savings that total to USD 250M in the tax-exempt scenario.

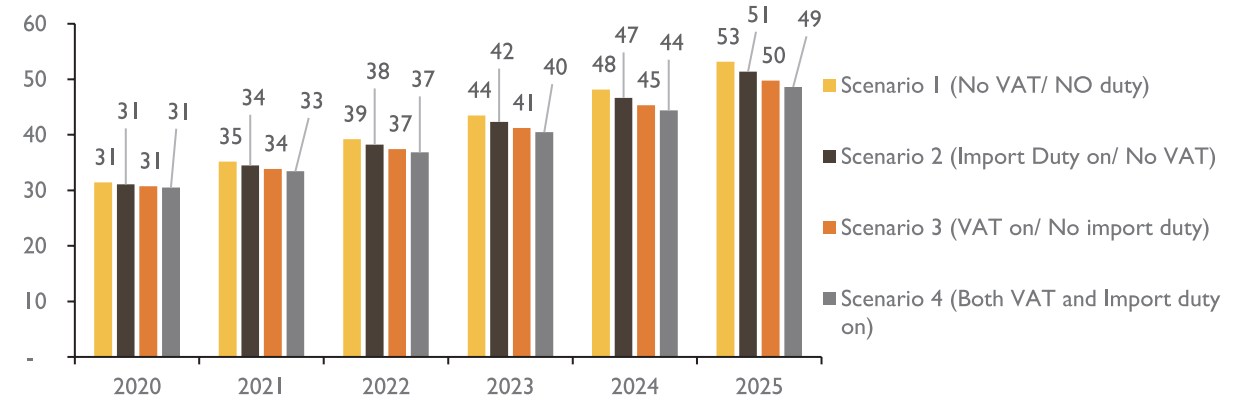


Figure 17: Reduction in expenditure due to switch to SAS from alternatives in Rwanda, USD Millions

The adoption of SASs results in a positive effect on the environment as households would reduce the usage of carbon-emitting lighting sources. The exemption on VAT and duty is projected to reduce carbon emissions by over 76,000 tonnes over the 6-year projection period. With the price of one tonne of carbon dioxide at USD 50, tax exemptions result in an additional USD 3.8M economic benefit to Rwanda when compared to

53 Off-Grid Solar. A Growth Engine for Jobs, GOGLA, link World Bank, Access to electricity (% of population) - Sub-Saharan Africa, (Washington, D.C., United States, 2017), link

the taxable scenario.

The exemption of taxes also has a positive effect on the education of school-going children. These exemptions would result in more productive hours after sunset, resulting in about 22M additional study hours for school-going children across the 5-year projection period.

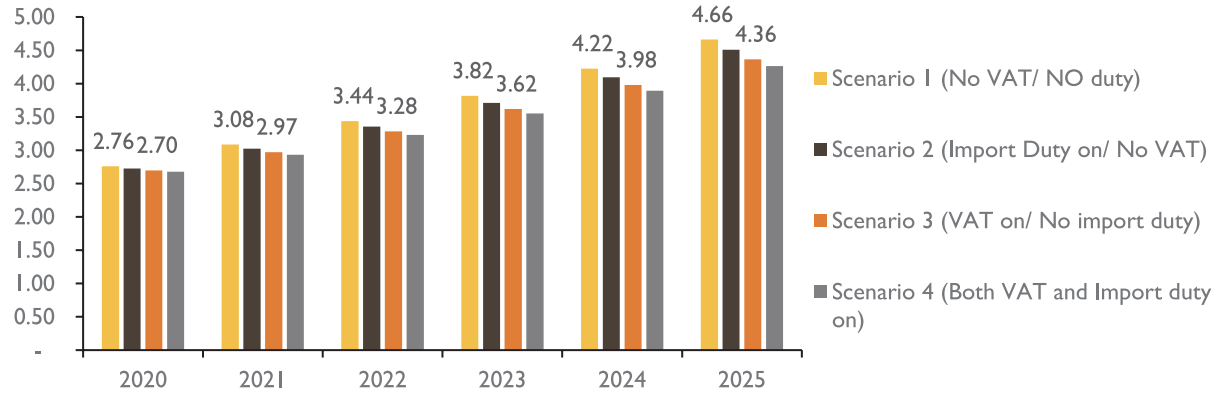


Figure 18: Increase in study hours due to the switch to SAS from alternatives in Rwanda (millions of hours)

54 *World Bank, Access to electricity (% of population) - Sub-Saharan Africa, (Washington, D.C., United States, 2017), link*

55 *https://www.statistics.sl/images/StatisticsSL/Documents/final-results_-2015_population_and_housing_census.pdf*

56 *Donn Tice, Energy Africa Access Campaign: Policy Compact Sierra Leone (London: Evidence on Demand, June 2016),*

57 *ACE TAF consultations*

Appendix 3: Sierra Leone Country Assesment Report

Introduction

Around 74% of Sierra Leone's 7.8 million population has no access to electricity. While in urban areas access is now over 50% of the population, in rural areas it remains just 5%. [54] Nationwide, 76% of households use battery powered / rechargeable lights as their main source of electricity. [55]

Through the signing of the Sierra Leone Energy Africa Compact in 2016, the Government of Sierra Leone (GoSL) aims to supply basic power for all by 2025. This ambitious target relies on both grid and off-grid solutions to achieve universal access five years ahead of the SDG7 and Energy Africa target date of 2030. The Sierra Leone 'Energy Revolution Taskforce' comprising members from the energy ministry, international donors, and the private sector, has made important strides in increasing access to energy. This includes establishment of the Renewable Energy Association of Sierra Leone (REASL) to represent and support the private sector, and the implementation of tax exemptions (see below) for solar products. In 2019 an updated version of the Energy Africa Compact was developed; this agreement was more reflective of the market needs and showed a continued commitment by the government to support access to energy. In the recent years, major international SAS providers and investors, including Azuri, Barefoot, Mobile Power, d.light, Ignite, Greenlight Planet, and Total have moved into Sierra Leone as a result. [56]

The Government of Sierra Leone (GoSL) has put in place GST and duty exemptions for SAS products since 2016. GoSL has eliminated duties and goods and service tax (GST) to the tune of up to 40% of the cost of goods at the border, for qualified internationally certified solar products. Nonetheless, SAS operators face uncertainty around these exemptions which are confirmed each year in the Finance Act, upon verification of IEC test certificates. There is still a need to train standards and customs agents of the National Revenue Authority to ensure these exemptions are correctly applied to all relevant component parts of SAS systems. [57]

Findings From Analysis

Baseline and Tax Scenarios

The analysis carried out in this study explores cost and benefits trade-offs of tax exemptions by comparing Sierra Leone's prevailing regime of exemptions to four different tax scenarios shown in Table 8. The alternative scenarios then consider the impact of implementing either a 15% duty, the 15% standard GST, or both. While there is a single standard rate of GST, there are six import tariff bands (0%, 5%, 10%, 15%, 20% and 30%) applied on a product-by-product basis for over 5,000 tariff lines. [58] In this analysis we use the 15% duty rate for illustrative purposes.

Table 8: GST and Duty rates for component and plug-and-play systems

Taxes	GST		Duty	
System type	Component-based	Plug-and-play	Component-based	Plug-and-play
Scenario 1 (No GST/ No duty) – Current Regime	0.0%	0.0%	0.0%	0.0%
Scenario 2 (Duty on/ No GST)	0.0%	0.0%	15.0%	15.0%
Scenario 3 (GST on/ No duty)	15.0%	15.0%	0.0%	0.0%
Scenario 4 (Both GST and Duty on)	15.0%	15.0%	15.0%	15.0%

58 https://www.nra.gov.sl/import-and-export/customs-duty

Scenario Outputs

Fiscal Impacts

Removing GST and duties will have a negative direct impact on government revenues. Applying both full GST and full duties for SAS products in Sierra Leone could generate an additional USD 1.5 million per year in national revenue by 2025. GST would be the main source of government revenues from the SAS subsector. While these taxes would generate revenues in the short term, they should be considered in the light of both offsetting fiscal effects from other types of taxation generated by a growing SAS sector, and wider economic benefits the SAS sector will generate, as are described in the sub-sections below.

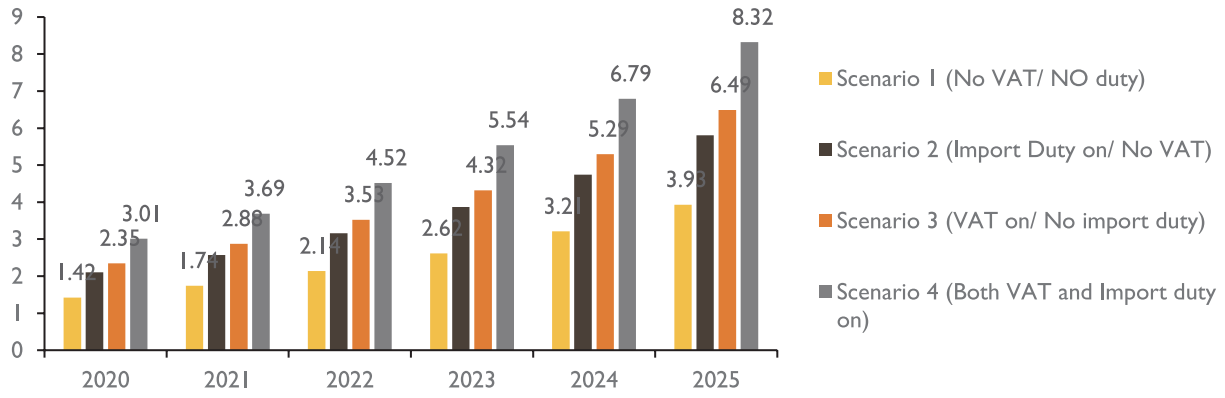


Figure 19: VAT and duties generated by the SAS sector, USD Millions.

Corporation tax receipts would be expected to increase as the subsector grows, although in the immediate term this gain is relatively small compared to the GST and duties foregone. The margins for SAS operators are low – in this analysis modelled as a gross margin of 2% - so the ability to raise corporation tax revenues from this margin is limited.
The estimated corporation tax earned from maintaining the GST and duty exemptions is only around USD 30,000 over the 6 years to 2025, compared to a scenario where GST and duty are introduced at 15%. This, however, should be seen as a lower bound and the eventual aim of the sector should be to identify higher margin customer segments.

Jobs created in the solar value chain will both provide important economic opportunities and may generate direct income tax revenues. With the GST and duty exemptions maintained, an additional 1,636 full time jobs in the sector will be maintained compared to a scenario where both GST and duties are charged and the sector shrinks. Apart from providing valuable livelihoods and skilled job opportunities, these jobs could also contribute in the region of USD 1.9M per year in income taxes and would offset the USD 2.8 million in foregone GST and duties by around USD 900,000 each year.

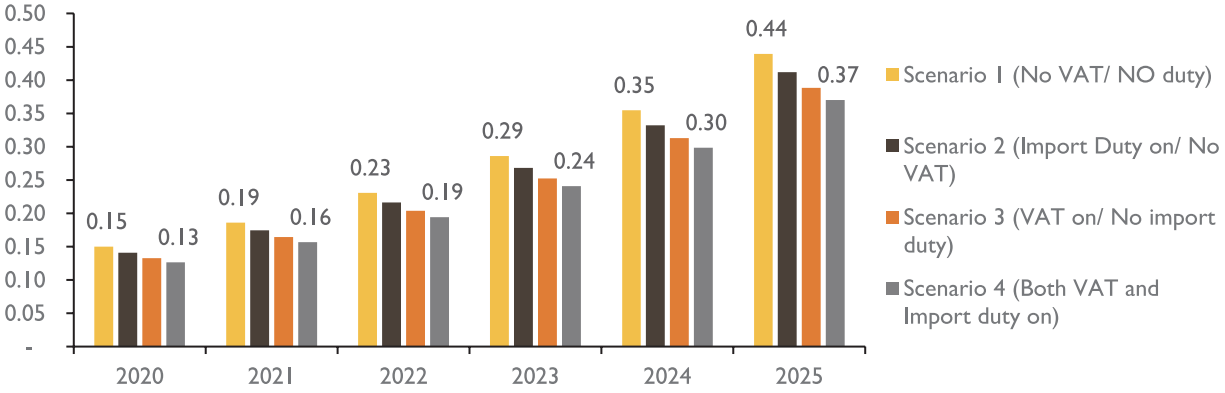


Figure 20: Income taxes gained from management jobs in the SAS value chain, USD Millions.

Similarly, the SAS subsector generates employment opportunities and productive economic potential for households. When SAS products are exempt of GST and duty, around 123,000 households will have used their products to start new businesses or start a new job, falling to just 109,000 if GST and duties are levied. These downstream jobs are vital, as they improve the economic welfare and independence of households and communities often in poor rural areas with limited opportunities to participate in valuable economic activities. The economic uplift to livelihoods generated by the GST and duty exemptions is expected to amount to USD 65 million per year by 2025, completely offsetting the foregone tax revenues and providing a targeted and needed income uplift to the households that need it the most. [59]

These benefits of improved productivity and economic empowerment often impact most on women and people in more vulnerable communities. Women's productivity is another indirect benefit that is derived from the increased uptake of SAS and growth of the sector. Of the jobs created by the SAS sector, 27% of the positions were filled by women.[60] Similarly, the main beneficiaries of access to electricity for "downstream" users in households is often women, who get improved access to information and communication technologies and can start businesses from the house which would otherwise not be possible.

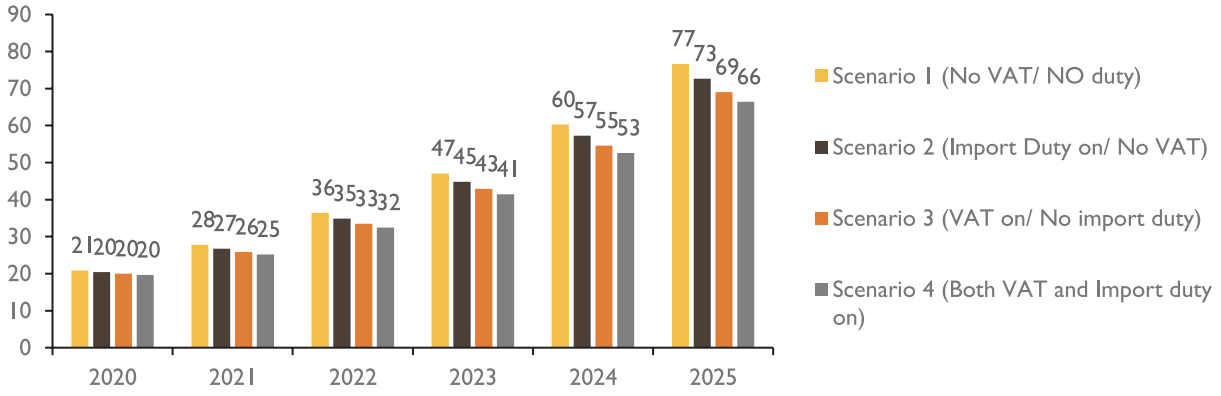


Figure 21: Economic uplift for households under different tax scenarios, USD millions

Socioeconomic Impacts

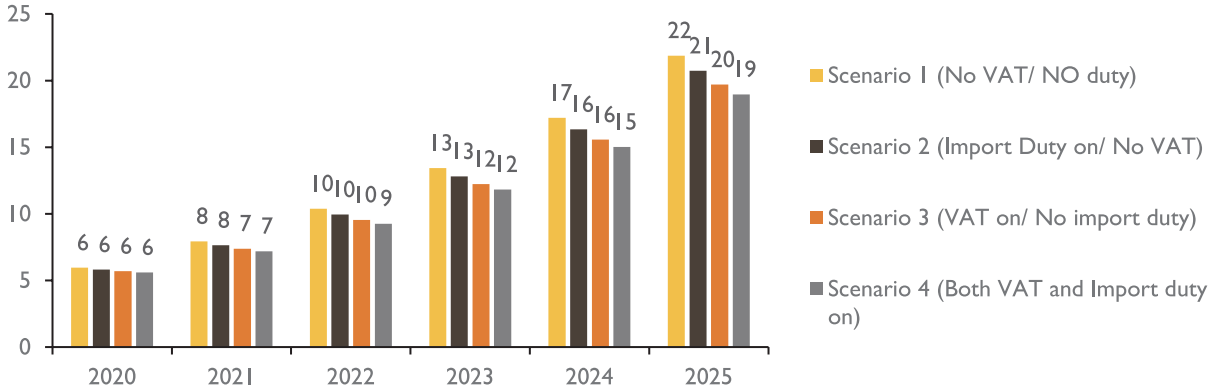


Figure 22: Reduction in energy expenditure on other energy sources resulting from access to SAS products, USD millions

59 Off-Grid Solar: A Growth Engine for Jobs, GOGLA, link

60 Off-Grid Solar. A Growth Engine for Jobs, GOGLA, link

In addition to fiscal impacts, taxation policy changes have significant impact on the socioeconomic aspects of the economy. Households will save expenditure on other energy sources; in Sierra Leone typically small diesel gensets, battery-powered torches, and to a lesser extent kerosene. Switching to SAS products would not completely eliminate spending on these energy sources but should reduce spending on other sources by at least 70%. These savings would amount to USD 21M per year by the end of 2025 and would be almost USD 3 million lower in the GST and duty scenario.

Uptake of SAS products generated by the tax exemptions would also impact the environment and the level of CO2 emissions resulting from increased renewables uptake. Increased uptake of SAS products due to removal of GST and duty would reduce carbon emissions by over 6,700 tonnes of CO2 by the end of 2025, with an environmental benefit of USD 1.17M generated over the 6 years.

Removal of GST and duty would result in cumulative increase in study hours for children of around 1.1 million hours per year.

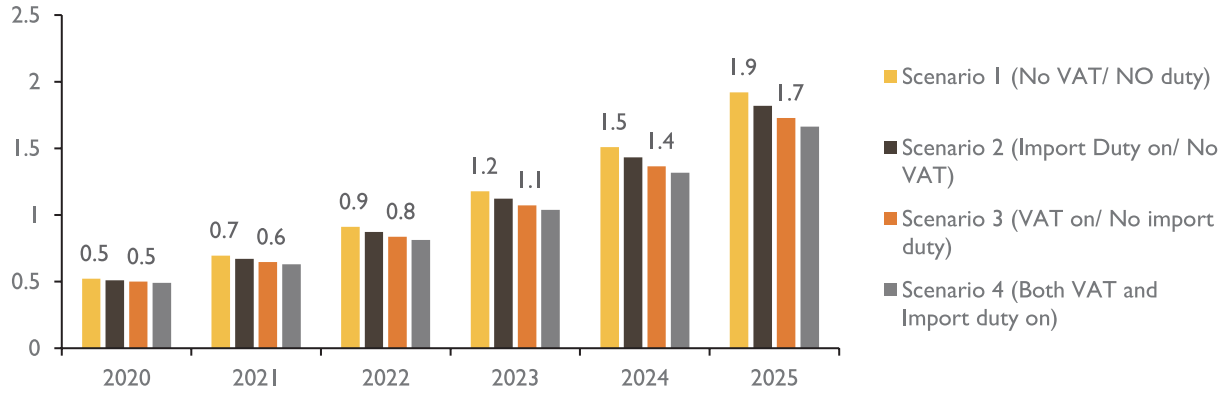


Figure 23: Increased study hours from access to SAS products (million hours per day)

Appendix 4: Detailed Quantitative Tool Guide

Objectives of Responsible Taxation Tool

The key objective of this tool is to provide a quick and clear understanding of the impact of different VAT and duty regimes on a range of fiscal and socioeconomic development outcomes. It has been developed to provide an evidence base to support decision-making, and does not advocate any specific optimal tax policy, recognising that governments will have to weigh up important short-term and long-term considerations. To support this decision-making process, it presents the impact of up to four tax policy options for both VAT and duties on the development of the SAS sub-sector and estimates how this impact on the development of SAS subsector will affect the ability to reach communities without energy access, and how this in turn will impact on the fiscal base through a wide range of other tax mechanisms. Finally, it estimates the value of the SAS sector on other socioeconomic development priorities including job creation, education, and health, so that the trade-offs inherent in different tax policies and their associated outcomes can be examined.

The tool is aimed primarily at national governments although has been built to be flexibly used by a range of stakeholders. While the main intended audience is national governments, the tool should also be used by renewable energy associations and companies who want to examine the evidence base when engaging in public policy debates. It may also support regional dialogue with a view to harmonising duty and/or VAT regimes across national jurisdictions.

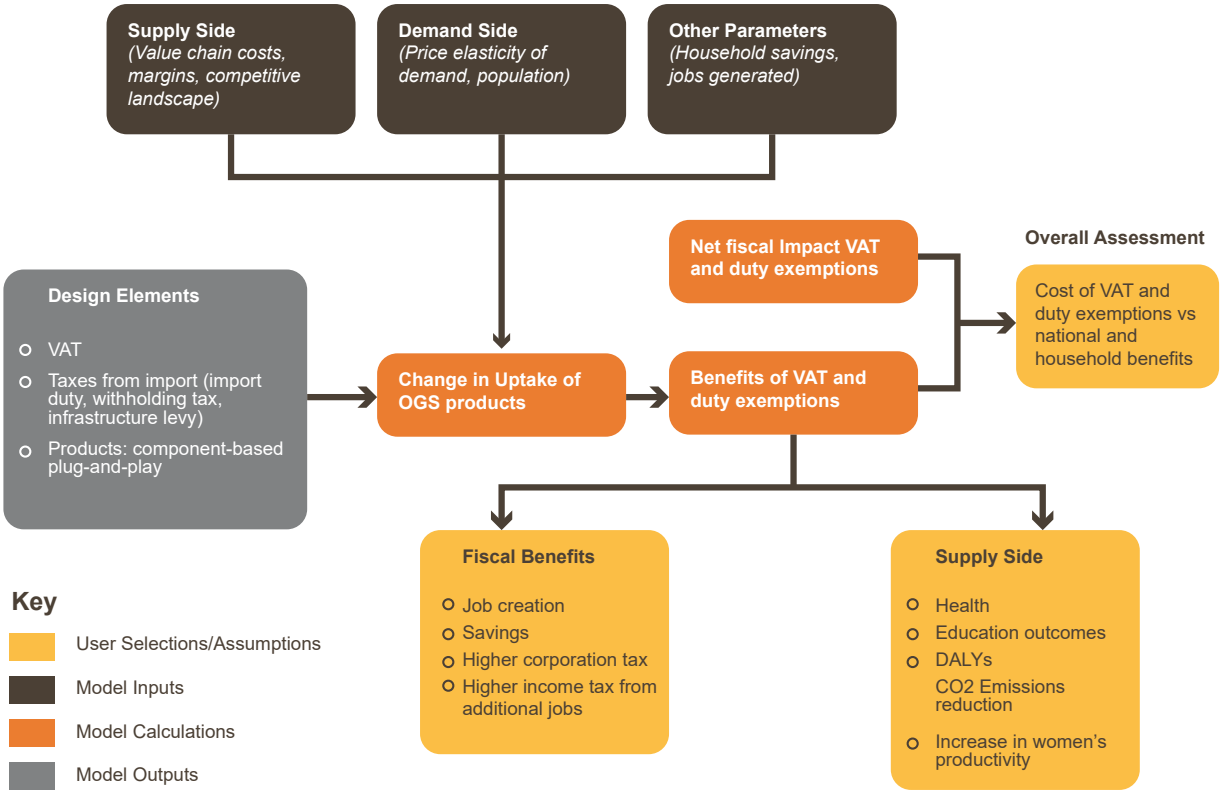
Process for Developing and Testing The Tool

This responsible taxation tool was developed by the ACE TAF consortium, working closely with government and private sector stakeholders. The study to develop this tool was initiated in September 2020, with a final version of the tool completed in February 2021. The Africa Clean Energy Technical Assistance Facility led development of the tool with financial and technical support from FCDO. The tool was developed collaboratively through pilots and calibration in three countries initially: Malawi, Sierra Leone, and Rwanda, including bi-lateral interviews with representatives of: key national policy stakeholders such as the Ministry of Energy, Ministry of Finance, and National Revenue Authorities, and representatives of the private sector (typically national renewable energy associations).

It is important to underline that this is a modelling tool, which is designed to robustly estimate the likely impact of tax regimes on SAS sector development. It is not for impact evaluation or a prediction of outcomes, which will also depend on a range of factors not captured in this tool. It is designed to provide a reasonable and justified indication of the order of magnitude of the relationships between tax regimes, SAS sector development and wider outcomes achieved. As such, it relies on assumptions and existing evidence generated from a range of international settings. These assumptions are clearly listed and sourced in the ‘General assumptions’ and ‘Inputs’ tabs. The sources used represent the best available information points identified at the time of writing and are selected to be robust rather than to favour any particular outcome. For key assumptions where there may be significant uncertainty, the tool also offers the user a choice between three scenarios, to make sure the results can be examined and challenged under a range of modelling assumptions.

IMPACT OF TAX INCENTIVES ON ACCESS TO STAND-ALONE SOLAR | 29

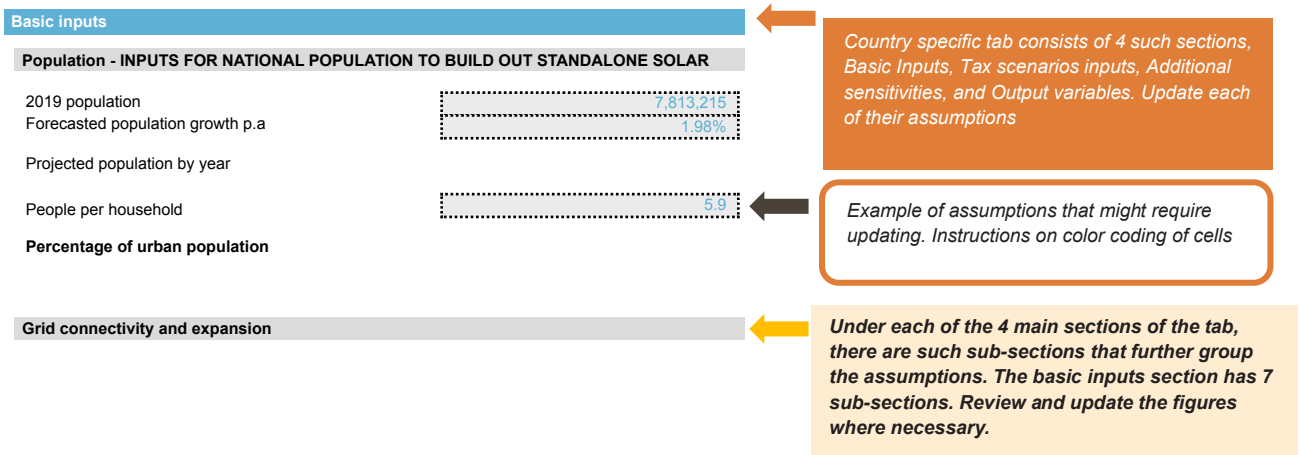
Tool Mechanics and Flow



Step-By-Step Guide to Complete

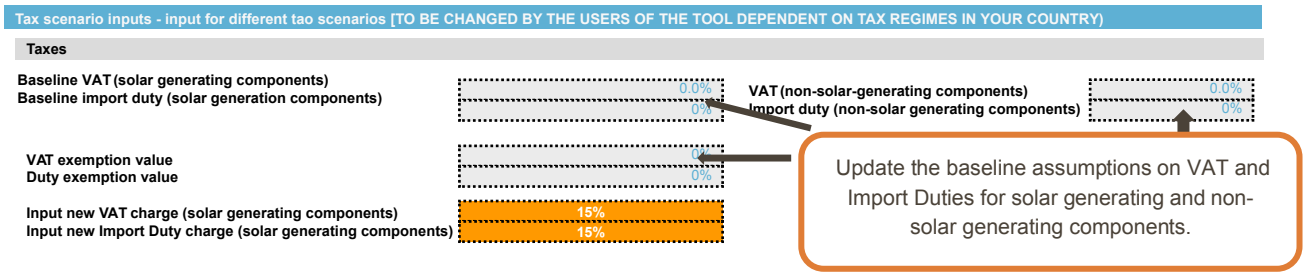
The quantitative tool comprises of five main tabs: Outputs, General Assumptions, Country-specific Inputs, Scenario Analysis and Affordability. Before using the tool, you are required to update two tabs – Country-specific inputs and Affordability tabs – as shown below:

1. **Review and update, where necessary, the assumptions under each of the four sections in the *Country-Specific Inputs* tab.**

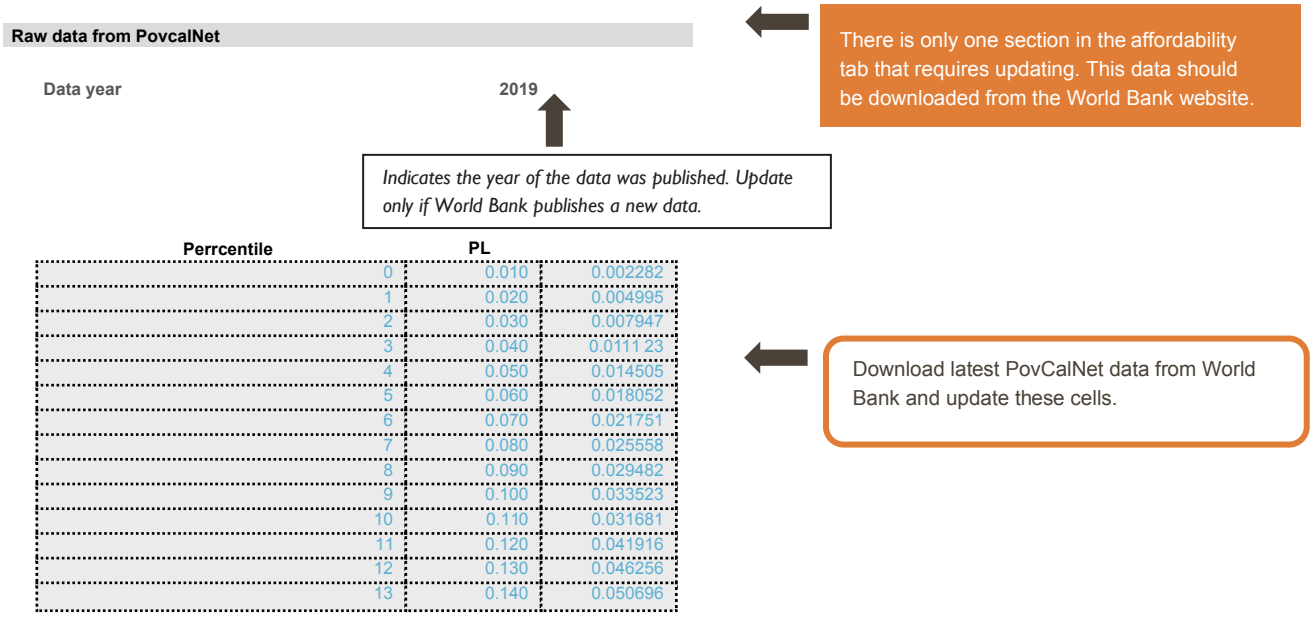


a. Under the Country-Specific Inputs tab, be sure to review the tax scenario inputs.

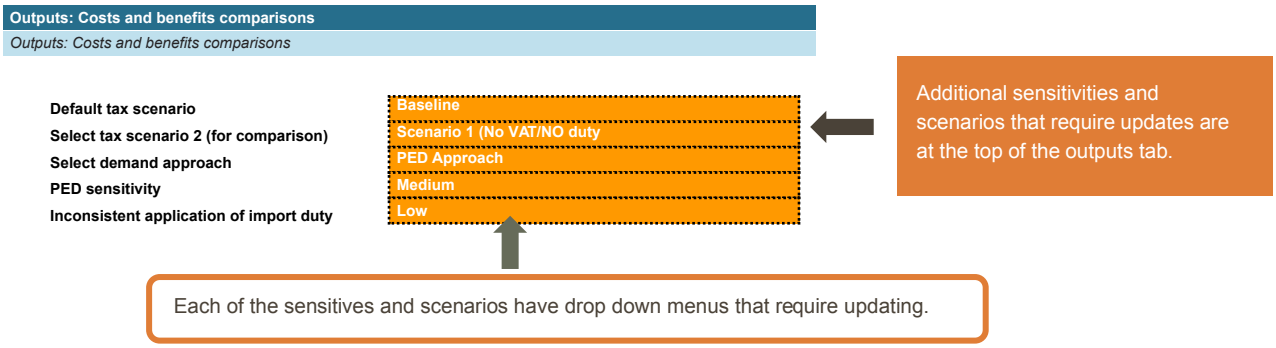
Important to update this section with the relevant tax regime per country.



2. **Update the *Affordability* tab with data for your respective country.**



3. **Go to the *Outputs* tab to compare the different tax scenarios and make selections from the drop-down menus for additional sensitivities and scenarios.**



Colour Coding

For ease of use, different inputs and variables are colour-coded depending on their use in the tool, ad based on the actions required by users of the tool. The colour coding is summarized as follows:

Colour coding	Explanation	Action to be taken
Blue text on grey background	Fixed inputs	Update only with latest figures, otherwise no action required
Gold text on grey background	Manual inputs	Placeholder assumptions; should be adjusted
Black text on grey background	Calculated values	None
Purple text on grey background	User defined inputs	Input required by user
Green text on grey background	Linked data	None
White text on gold background	Choice selection for scenarios	Input required by user

User Selections and Assumptions

The tool uses three major design elements to calculate the impact of taxation policies on SAS uptake. These elements are Value Added Tax (VAT), taxes from importation (such as duty, withholding taxes, and levies), and standalone solar products (for the purposes of the tool, only component-based and plug-and-play systems are considered)

Model inputs
These include supply side factors (such as margins) and demand side factors (such as price elasticity of demand). These factors are used to determine the change in uptake of SAS products under the different tax scenarios.

Model calculations
Given the change in uptake of SAS products, various calculations are performed in the tool to determine the net benefits of the changes to VAT and duties. These are done for each of the four scenarios, with a baseline scenario calculated to reflect the current situation in the respective countries. Calculations are not to be changed by users of the tool.

Model outputs
To assess the overall benefits of the different tax scenarios, the tool calculates fiscal and non-fiscal benefits that are accrued by different stakeholders. These include taxes gained/foregone and jobs created, household spending, increase in study hours, new businesses started, and reduction in CO2 emissions.

Tool Sections

The quantitative tool is divided into three main sections, described below:

1. Outputs

This contains a summary of the analysis from the tool with graphs and tables showing data from the four different taxation scenarios and a baseline scenario. Users may change the sensitivities of selected outputs in the orange-coloured boxes.

2. Assumptions

a. General assumptions:
This tab contains common parameters that apply across the original three countries in the study. These parameters include SAS share of value, energy consumption by income percentile, price elasticity of demand, and output assumptions that feed directly into the Outputs tab (study hours, environmental benefits, and employment assumptions). Specific changes to be made are covered in the next section.

b. Country-specific assumptions:
This tab contains inputs and assumptions that tailor the outputs to their respective country-specific contexts. Users are required to adjust assumptions on population, energy access targets, system pricing, sales proportions by system size, tax scenarios and output variables. Specific changes to be made by the users are covered in the next section.

3. Scenario Analysis

a. Affordability:
This tab contains income percentile analysis that is used to determine the number of households that can afford SAS systems at different price points. It creates demand curves for each country, using data from PovCalNet.

b. Scenario analysis
This tab contains calculations highlighting the impact of changes to taxation and duty regimes. It contains impact analysis on the costs and benefits under the four different tax scenarios and the baseline. Values are calculated and should not be changed by users of the tool.

Required User Inputs

The quantitative tool is driven by two main sets of inputs – General assumptions and Country-Specific inputs. Users of the tool are hence required to change certain values to obtain a clearer picture of the impact of taxation changes in the specific countries. These variables and their impact on the tool are described below:

General Assumptions

1. Energy consumption by percentile
Affordability plays a major role in the uptake and payment of SAS systems by consumers. The assumptions used in the tool provide a breakdown of sales by payment type (Cash or PAYGo) and offer placeholder assumptions for the terms customers will use to pay for the SAS systems. Changing the assumptions here will directly impact the Affordability tab, thus impacting the number of people who can afford units at different price points. For example, changing cell F26 (PAYGO deposit savings duration) will impact the maximum deposit that can be paid by people in the lowest income percentile (Affordability tab, cell P120) .

2. Price elasticity of demand (PED)
PED is a key driver for the tool, as it assigns different demand elasticities for SAS products, which then impacts the sales of the products. This tool uses PED values as calculated by Duke University in a similar study on households in Uganda and Kenya.[61] While these PED figures present a relatively robust assumption for how elastic demand for SAS products would be in the 3 study countries, users of the tool may change the values based on nationally calculated PED values. For instance, users may change the low, medium, and high values for PED in the General Assumptions tab on row 45.

3. Additional sensitivities
In addition to PED, supply-side factors are also used to determine the prices of SAS products for

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61 Robert Fetter, Jonathan Phillips, The True Cost of Solar Tariffs in East Africa, DUKE University, 2019

62 Technical assistance to model and analyse the economic effects of fiscal policy options for off-grid technologies in Zambia, ECA, May 2018

63 Walker et al, Scoping of Opportunities and Institutional Assessment for Malawi's Engagement in the Carbon Markets, WinRock International, August 2012, link GOGLA Powering

consumers. These include the extent to which companies pass on taxes to consumers, which is set at 100% in this tool. This value may be changed by users of the tool (General Assumptions row 51) and will directly impact the prices of SAS products, and hence the uptake of products. Other sensitivities include the net margins exhibited by SAS private operators. This reflects the situation on the ground for many private businesses which often experience very low margins (often 0%) on the sales of their products. This tool offers higher values of margins to reflect scenarios where private operators may achieve economies of scale, and thus higher margins allowing them to pay higher corporation taxes.

The tool also provides assumptions for inconsistent application of duties at points of entry. From consultations with private operator, this was determined to be a cost borne by companies, which is then passed on to consumers in the form of price changes. The tool sets three levels of this variable, and can be adjusted by the users on row 64 of the General Assumptions tab.

4. Output assumptions

The output assumptions are used to calculate the net benefits to households and businesses. These include educational outcomes, environmental benefits, and employment and productivity outcomes as a result of increased uptake of SAS products. Educational outcomes have been drawn from a similar ECA study conducted in Zambia but may be adjusted to reflect the identified impact of SAS products on study hours for children (General Assumptions, row 69) and the number of school-going children per household (General Assumptions, row 70). [62]

The environmental benefits of switching to SAS products are drawn from a WinRock report in Malawi and may be adjusted to reflect nationally identified reductions in CO2 emissions that are directly linked to SAS product use. [63]

In addition, placeholder assumptions for salaries are used to calculate the income taxes due to governments (General Assumptions, rows 93 and 94). These can be changed by user where more robust income information is provided.

Country-Specific Assumptions

1. Basic inputs

The basic inputs are used to determine the baseline figures for population and SAS uptake over the life of the tool. Users are able to adjust the assumptions for household size based on latest household census data (Row 20). Similarly, users may adjust the figures for on-grid connectivity and national access targets to better reflect set targets for off-grid connectivity (Rows 28, 29, 34, and 35).

Users are also required to update the pricing assumptions used for the different capacities of products (rows 46-55). These figures will directly impact the affordability of the products and will be used to calculate direct government income from taxes levied on the products and corporation taxes. An annual decline in pricing of 1.15% is used to reflect the impact of technological advancement driving down the costs of batteries and other components (rows 60-61).

The tool assumes an even share of sales between component-based and plug-and-play systems (row 75). Users may update this proportion based on historical sales data. Similarly, the proportion of sales by system capacity may be validated by national revenue authorities (rows 80-87).

2. Tax scenario inputs

This section calculates the effective VAT and duties applicable to different SAS products based on their capacity and proportion of solar generating components (rows 119-173). Users are required to input non-zero values of VAT and duty (rows 128 and 129) which will then feed into the different taxation scenarios. The values in rows 121, 122, 125 and 126 may not be changed by the users of the tool.

3. Additional sensitivities

The tool also includes additional taxes that are typically charged at points of entry. From consultations with governments, they have been identified as taxes that are charged to private businesses but can be reclaimed by the businesses. These taxes therefore do not have a direct impact on the price of SAS products, but are calculated as additional revenue to the respective governments. Users have the

option of switching these taxes on or off (Outputs tab cell E44). The values may also be changed to reflect the actual percentage charged at points of entry (Country specific inputs rows 184-189).

4. Output variables

The output variables are used to calculate household spending on energy sources other than SAS products. They include the Gross National Income (GNI) Index for the respective countries (row 194) which should not be changed unless it is being used in a country other than the original three study countries. National estimates for household energy spend (row 198) may be changed by the users where more robust data is available. Similarly, the proportion of spend on battery-powered devices, candles and kerosene may be changed by users (rows 201-203). Users may also adjust the proportion of spend displaced by SAS products (rows 211-213). These figures help calculate the overall household spend on energy once households begin using SAS products.

Outputs and Sensitivities

Outputs in the tool are categorized by the primary stakeholders to whom they relate. This is broken down as follows:

1. SAS product uptake

This section consists of two graphs showing the SAS uptake under the different tax scenarios, compared to the baseline scenario. Users may switch between different scenarios from the drop-down selection on cell E6. Similarly, they may assess the change in uptake using either the PED or affordability approach using the dropdown selection on cell E7. PED sensitivity (cell E8) may only be used when the PED approach is selected in cell E7, with option of high, medium, and low applicable. Finally, users may also assess the impact of inconsistent application of taxes on uptake by switching cell E9.

2. Government revenues gained and costs incurred.

This section analyses the direct revenues gained by governments under the different tax scenarios, compared to the baseline scenario. First, overall direct taxes are calculated (VAT and duty). Users may opt to assess the impact of additional importation taxes (e.g. withholding taxes) on government gross revenues by selecting the drop-down on cell E44. In addition, users may assess the net corporation taxes due under the different scenarios. Further sensitivities for net margins are included here (cell E67) which allow users to assess corporation taxes where companies are making higher margins on the SAS products. Income taxes are also calculated for upstream and downstream jobs, being directly influenced by the uptake of SAS products. [64]

3. Employment opportunities and outcomes

The tool also assesses the number of jobs created due to increased uptake of SAS products. These jobs are divided into upstream jobs (directly within the value chain) and downstream (not directly linked to the value chain). These figures are driven by uptake and will vary by scenario selected. Employment for women is also calculated, driven by the GOGLA report finding that 27% of jobs in the solar sector are held by women. [65]

4. Household benefits and costs

Finally, the tool assesses the benefits and costs accrued by households due to increased (or reduced) uptake of SAS products. Expenditure on energy is calculated and compared to the baseline scenario. Similarly, reductions in CO2 emissions are calculated, driven by uptake in SAS products. Hours of study is also driven by the increased uptake of SAS products, and this is calculated on a per household basis. These outputs are also dependent on the selected scenario and will vary based on the selection on cell E6.

64 GOGLA Powering Opportunity report

65 Ibid

Appendix 5: Institutions Consulted during Tool Development

The objective of the study was to develop a quantitative tool that will provide estimates on fiscal and socioeconomic cost / benefit of tax exemptions on both the government and stakeholders. As a result, majority of the organizations that reviewed the tool were government institutions that will likely be the primary users of the tool.

Sierra Leone

1. **Ministry of Energy**
2. **Ministry of Finance**
3. **Sierra Leone Standards Bureau**
4. **Sierra Leone National Revenue Authority**
5. **Renewable Energy Association of Sierra Leone**
6. **Easy Solar – Private SAS Operator**

Malawi

1. **Ministry of Energy**
2. **Malawi Bureau of Standards**
3. **Malawi Revenue Authority**

Rwanda

1. **Ministry of Infrastructure**
2. **Rwanda Development Bank**
3. **Energy Development Corporation Limited**
4. **Energy Private Developers**
5. **East African Power – Private SAS Operator**

Africa Clean Energy

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International Development

UKaid
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