SAVi Sustainable Asset Valuation

Green Economy Analysis in Georgia:

Application of the Sustainable Asset Valuation (SAVi) methodology for the analysis of sustainable infrastructure investments

IISD International Institute for Sustainable Development

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About SAVi

SAVi is a simulation service that helps governments and investors value the many risks and externalities that affect the performance of infrastructure projects.

The distinctive features of SAVi are:

- Valuation: SAVi placed a financial value on the material environmental, social, and economic risks and externalities of infrastructure projects. These variables are ignored in traditional financial analyses.
- Simulation: SAVi combines the results of systems thinking and system dynamics simulation with project finance modelling. We engage with asset owners to identify the risks material to their infrastructure projects and then design appropriate simulation scenarios.
- Customization: SAVi is customized to individual infrastructure projects.

For more information on SAVi:

https://www.iisd.org/project/SAVi-sustainable-asset-valuation-tool

Glossary

Development planning: a range of public and private planning and decision-making processes. These range from a national land-use plan to the annual budgetary process and include infrastructure projects as well as sectoral policy formulation exercises that typically involve trade-offs between competing demands for scarce resources and have implications for nature.

Econometrics: a methodology that measures the relationship between two or more variables, running statistical analysis of historical data and finding correlations between specifically selected variables.

Feedback loop: "a process whereby an initial cause ripples through a chain of causation ultimately to re-affect itself" (Roberts et al., 1983).

Green economy (GE): an economy that results in improved human well-being and social equity while significantly reducing environmental risks and ecological scarcities (United Nations Environmental Programme, 2011).

Indicator: an instrument that provides an indication that is generally used to describe and/or give an order of magnitude to a given condition.

Internal rate of return (IRR): an indicator of the profitability prospects of a potential investment. The IRR is the discount rate that makes the net present value of all cash flows from a particular project equal to zero. Cash flows net of financing gives us the equity IRR.

Methodology: the underlying body of knowledge for the creation of different types of simulation models. It includes theoretical foundations for the approach and often encompasses both qualitative and quantitative analyses and instruments.

Model transparency: a transparent model is one for which equations are available and easily accessible and for which it is possible to directly relate structure to behaviour (i.e., numerical results).

Model validation: the process of deciding whether the structure (i.e., equations) and behaviour (i.e., numerical results) are acceptable as descriptions of the underlying functioning mechanisms of the system and data.

Net present value (NPV): the difference between the present value of cash inflows net of financing costs and the present value of cash outflows. It is used to analyze the profitability of a projected investment or project.

Optimization: a simulation that aims to identify the best solution from a set of available alternatives and is based on several defined criteria.

Policy cycle: the process of policy-making, generally including issue identification, policy formulation, policy assessment, decision making, policy implementation, and policy monitoring and evaluation.

Real gross domestic product (GDP): a price-change-adjusted (inflation and deflation), macroeconomic measure that reflects the value of all goods and services produced by an economy in a given year, expressed in base-year prices.

Scenarios: expectations about possible future events used to analyze potential responses to these new and upcoming developments. Consequently, scenario analysis is a speculative exercise in which several future development alternatives are identified, explained, and analyzed for discussion on what may cause them and the consequences these future paths may have on our system (e.g., a country or a business).

Simulation model: a simplification of reality, a representation of how the system works, and an analysis of (system) structure and data.

Stock and flow variables: a stock variable represents accumulation and is measured at one specific time; a flow variable is the rate of change of the stock and is measured over an interval of time.

System Dynamics: a methodology to create descriptive models that focus on the identification of causal relations influencing the creation and evolution of the issues being investigated. Its main pillars are feedback loops, delays, and nonlinearity through the explicit representation of stocks and flows.

Value added: the contribution of a private industry or government sector to overall GDP is the value added of an industry. It is the difference between the total revenue of an industry and the total cost of inputs purchased from other businesses within a reporting period.

Vertical/horizontal disaggregation of models: vertically disaggregated models represent a high degree of sectoral detail; horizontal models instead include several sectors and the linkages existing among them (with a lesser degree of detail for each of the sectors represented).

Abbreviations

BAU	business as usual
EAP GREEN	Greening Economies in the European Union's Eastern Neighbourhood
GDP	gross domestic product
GE	green economy
GoG	Government of Georgia
IISD	International Institute for Sustainable Development
IRR	internal rate of return
MoESD	Ministry of Economy and Sustainable Development of Georgia
NPV	net present value
SAVi	Sustainable Asset Valuation methodology
S-IRR	sustainable internal rate of return
S-NPV	sustainable net present value
UNEP	United Nations Environment Programme

Executive Summary

In 2017–2018, the United Nations Environment Programme and the Georgian Ministry of Economy and Sustainable Development collaborated on the preparation of a study that would inform the National Green Economy Strategy as part of the Greening Economies in the European Union's Eastern Neighborhood (EaP GREEN) project (2018). This study focused on greening the building, agriculture, and tourism sector and estimated the outcomes of green economy (GE) investments at the sectoral and macroeconomic levels. This study was conducted at the national level and presented results across sectors, for different economic actors, and over time.

The GE model developed for Georgia includes modules (or sub-components) for buildings, irrigation infrastructure, and wastewater infrastructure based on the International Institute for Sustainable Development's (IISD's) Sustainable Asset Valuation (SAVi) methodology.

Building on this work, after the completion of the EaP GREEN modelling work and project, IISD has updated the infrastructure modules, adding a more detailed financial analysis to the Georgia GE model. The SAVi methodology and models are continually evolving, with new features being added on an ongoing basis. The Georgia GE model was equipped with a full project-financing module connected to the analysis carried out by EaP GREEN. This module allowed the authors to estimate indicators such as the sustainable internal rate of return (S-IRR) and the sustainable net present value (S-NPV) for each investment included in the analysis. Further, estimates have been made for the economic performance of the investment for project developments, government, and the whole of society.

As indicated in the EaP GREEN report, results show that GE investments would lead to (i) positive economic returns, some in the short term and others in the medium term; (ii) higher economic growth and job creation; and (iii) lower emissions in the building sector but higher emissions overall (due to higher economic growth).

Furthermore, the financial assessment demonstrates that the GE investments under consideration pay for themselves and generate a significant positive return for taxpayers when externalities and additional GDP growth are factored in. The S-IRR reaches 84%, while the S-NPV is about GEL 20.4 billion. This is a significant improvement compared to the base case, where the IRR is around 4%, and the NPV is negative (GEL -489 million). This means that, without factoring in the externalities or the additional GDP generated as a result of the GE intervention, the discounted benefits do not cover the investments required. However, when these economic, societal, and environmental benefits are considered, the high S-IRR and S-NPV demonstrate that the GE investments planned in Georgia are justified.

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1.0 Introduction

Georgia is exploring the use of the green economy (GE) as a strategy to support national development. The United Nations Environment Programme (UNEP) and the Georgian Ministry of Economy and Sustainable Development (MoESD) collaborated in the preparation of a study that would inform the creation of the National Green Economy Strategy as part of the Greening Economies in the European Union's Eastern Neighbourhood (EaP GREEN) project. This study (EaP GREEN, 2018) has estimated the social, economic, and environmental outcomes of GE investments for buildings, agriculture, and tourism using a systemic approach. It was conducted at the national level and presented results across sectors for different economic actors and over time.

The GE model developed for Georgia includes modules (or sub-components) for buildings, irrigation infrastructure, and wastewater infrastructure based on IISD's Sustainable Asset Valuation (SAVi) methodology. These modules represent both physical and economic infrastructure performance in detail.

Building on this work carried out by EaP GREEN under the coordination of the United Nations Environment Programme, the International Institute for Sustainable Development has updated the infrastructure modules by adding a more detailed financial analysis to the Georgia GE model. The SAVi methodology and models are continuously evolving, with new features being added on an ongoing basis. The Georgia GE model was equipped with a full project financing module that is connected to the analysis carried out by EaP GREEN. This allowed authors to estimate indicators such as the sustainable internal rate of return (S-IRR) and sustainable net present value (S-NPV) for each investment included in the analysis. Further, estimations have been made for the economic performance of the investment for project developments, government, and the whole of society.

This report presents the new results emerging from the project financing assessment and explains how these results are estimated based on the systemic (physical and economic) analysis carried out by the EaP GREEN project.

1.1 Application of the SAVi Methodology

The IISD's SAVi methodology, a bottom-up and technology-rich model, was used to support the GE assessment conducted by EaP GREEN, UNEP and MoESD (EaP GREEN, 2018). SAVi was applied to conduct a supplementary financial assessment of the interventions proposed. This assessment highlighted to what extent GE policies and investments contribute to the social, economic, and environmental sustainability of Georgia. Several components of the SAVi methodology were combined for this systemic assessment:

- SAVi Irrigation was applied to assess the impacts of using drip irrigation for agriculture in conjunction with other sustainable land management practices.
- SAVi Buildings was used to estimate the impact of greening the building sector by investing in more resource-efficient technologies.
- SAVi Wastewater was applied to assess options to treat sewage from tourism using a centralized vs. decentralized approach, with the former being used in coastal areas and the latter being more suitable for rural areas where eco-tourism opportunities could emerge.

Several scenarios were simulated with these interconnected SAVi components, also for the project financing analysis.

2.0 National Context for Infrastructure in Georgia

With an average GDP growth rate of 4.5% between 2007 and 2017, Georgia's economy is exhibiting moderate economic growth over the last decade. In 2017, Georgia's real GDP totalled USD 15.9 billion, or GEL 28.38 billion, with an average USD 4,271 per capita (World Bank, 2019; in 2010 USD). Between 2000 and 2017, Georgia's GDP per capita (in Purchasing Power Parity) grew on average by 6.2% per year, increasing from $3,527 per person in 2000 to $9,702 per person in 2017 with an intervening drop after the 2008 financial crisis from $6,710 in 2008 to $6,523 in 2009 (World Bank, 2019). Despite moderate economic growth, employment creation is lagging behind. Georgia's unemployment rate increased from around 10.8% in the year 2000 to approximately 13.9% in 2016, with a spike of 18.3% in 2009 as a consequence of the financial crisis (World Bank, 2019). Since 2009, however, unemployment is decreasing steadily: it went from 16.9% in 2013 to 13.9% in 2017.

Manufacturing, construction, and services are the strongest contributors to Georgia's economic growth. While manufacturing and construction grew on average by 8.7% and 7.4% respectively between 2009 and 2016, the growth rate of services averaged 8.8% per year during the same period (Government of Georgia, 2016a). According to Georgia's Economic Outlook (GoG, 2017), a key driver underlying this growth trends over the last decade is the increase in private investment that more than outweighed the decrease in public investment. While public investment (as a share of GDP) decreased by around 2% between 2010 and 2016, from 9% to 7%, the share of private sector doubled, increasing from 12.5% to 25% (as a share of GDP). Infrastructure investments are required to support the equitable growth of the economy. This also requires infrastructure to be sustainable.

2.1 Georgia's Green Growth Ambitions

Georgia's political landscape is undergoing a transformation of strategies and policies toward a more sustainable development trajectory, focusing on green growth and the sustainable management of natural resources. This process is fuelled by domestic green growth ambitions that focus on development interventions that allow achieving synergies through well-aligned policies across departments, sectors, and actors. Additional drivers for the shift toward a green development pathway are the European Union Accession Agreement and the requirement to align national policies to European Union standards. Georgia's green growth ambitions aim to curb its annual carbon dioxide emissions and increase the number of green jobs in the long run. Between 2000 and 2013, Georgia's carbon dioxide emissions increased by more than 50%, from 10.86 million tonnes in 2000 to 16.68 million tonnes in 2013 (GoG, 2016b). According to UNEP, the implementation of GE interventions between 2020 and 2030 have the potential to abate 6.9 million tonnes of carbon dioxide emissions by 2040, or around 343,830 tonnes per year over 21 years (EaP GREEN, 2018).

Regarding jobs, the emphasis is on the development of the agriculture sector. It is the most important contributor to employment in Georgia, providing employment to approximately 45% of the total workforce (World Bank, 2019). Around 80% of the workforce employed in agriculture is self-employed, which indicates a high share of subsistence agriculture. The level of mechanization remains relatively low, which causes the agriculture sector to perform below its full potential (Georgia Center for Agribusiness Development, 2015). Tourism represents a synergy that links sustainable buildings and infrastructure, including natural infrastructure and the consideration of existing natural capital in the country, with the possibility to support local and sustainable food production.

3.0 Model Overview

3.1 Systems Model

The SAVi tool was used to contribute the biophysical assessment to the Georgia GE study carried out by the EaP GREEN project (EaP GREEN, 2018, p. 17) and to estimate sectoral impacts of policies related to buildings, irrigation, and wastewater. The SAVi modules used in the Georgia study are directly linked to a project-financing component that was developed in-house by IISD.

The SAVi modules are integrated into the larger GE model for Georgia. The system dynamics-based GE model for Georgia is a macroeconomic assessment model with detailed sectoral models for buildings, tourism, and agriculture. The Georgia GE model captures a range of socioeconomic and environmental indicators—such as public and private investment, GDP, employment, land use and land-use change, and emissions—and is used to estimate the impacts and contributions of GE policies and investments on both the national and sectoral levels, capturing policy impacts across sectors and actors.

The detailed sectoral SAVi modules are fully customized to Georgia's national context, using data from various national data sources supplemented by regional and international data. The three modules (agriculture, buildings, and tourism) were chosen due to their current relevance in the Georgian economy and their susceptibility to potential negative side effects and cross sectoral feedbacks (e.g., the long lifetime of investments in these sectors may determine the success of failure of investments). There are several crucial interconnections between these three sectors, such as the reliance of the tourism sector on buildings for providing accommodation or on the agriculture sector for providing food for tourists. The fact that most of the food used for tourism is currently imported indicates the potential for increasing local production and generating additional jobs in rural and mountainous areas of the country.

The SAVi modules enable the testing of specific policy interventions at the sectoral level. On the other hand, the macroeconomic outcomes of such investments can only be estimated if sectoral modules are connected with macroeconomic ones. The Georgia GE model includes key inputs for the sectoral models, such as total population, demand for floor space, tourism arrivals, and demand for food, both from Georgia's population and from tourism, and receives input from the sectoral models in return (for example, energy use in buildings, demand for power generation, and related employment creation and emissions).

This in-depth assessment of sectoral performance generates valuable inputs for the development of GE strategies by sector, including strategies for financing. This is essential even if models forecast the benefits of GE investments in the medium and longer term. Issues may remain in relation to the required upfront capital investment and the cost of capital, with the latter being an indicator that it is often not considered in policy assessments.

3.2 Project Financing Model

The main purposes of a project financing model are: 1) to identify the optimal capital structure, 2) to assess the financial viability of the project, and 3) to calculate the expected return on investment under different operational and risk scenarios.

1. Project sponsors use financial models to determine the optimal debt-equity split that should be used in the financing of the project. This largely depends on the project's revenue and cost profile: the timing and size of incoming cash flows during operations and the associated costs in each period. Most infrastructure projects follow a so-called "J-curve": having high upfront costs and relatively small but steady revenue streams. The "J" represents the fact that it takes a certain number of years before the project breaks even and generates a return on investment.
2. Project finance models can also calculate whether the cash flows generated by the project will be sufficient to service the debt and generate an attractive risk-adjusted return for both equity and debt investors. This assessment includes the calculation of key profitability and credit indicators, such as the IRR, NPV, debt service coverage ratio, and loan life coverage ratio.[1]
3. Project finance models are also well placed to stress test projects and assess how the expected return changes under certain operational and risk scenarios. This is calculated by a so-called "scenario table," which modifies key project assumptions and shows how key financial indicators react to these changes. Scenarios could be simple operational events, such as an increase in the price of feedstock, disruption in operation, or more complex climate events, such as heatwaves, sea-level rise, or a carbon tax.

The project finance model used in SAVi is built in Microsoft Excel and follows Corality SMART best practices to improve the readability and auditability of the model by a third party. The outputs of the system dynamics model in SAVi are used as inputs in the project finance model and vice versa. The system dynamics model quantifies and monetizes the relevant environmental, social, and economic externalities associated with the project. It also helps to identify the scenarios used in the scenario table. Depending on the purpose of the assessment and the target audience, some of the externalities are included as costs or benefits in the scenario table. Outputs of the system dynamics model can also change some of the key assumptions of the project finance model.

The main outputs of the project finance model are the financial indicators mentioned earlier. However, we renamed these indicators to S-IRR and S-NPV to reflect that they are applied to policies and include externalities. During the customization of the model, the list of indicators can be changed or extended as needed. Project-specific data, such as the cost of financing, can also be extracted from the project finance model and fed back into the system dynamics model.

[1] Definitions for these terms can be found in the glossary.

4.0 Scenarios for the GE Analysis

The scenario assumptions used for the SAVi project financing assessment are the same as those defined for the EaP GREEN study (EaP GREEN, 2018). This is to ensure the consistency and complementarity of the analysis. As indicated in the EaP GREEN report (2018), these scenarios have been carefully defined based on extensive research about the local context, on-site exchange with local stakeholders, and feedback from policy-makers. The SAVi assessment results are presented and compared in Part 5.

The results are based on two main scenarios:

1. A business-as-usual (BAU) scenario that assumes the continuation of historical trends.
2. GE scenarios that simulate additional policy interventions for each of the three sectors of interest (agriculture, building, and tourism). The GE scenarios are used to assess the net impacts of GE interventions compared to the BAU scenario.
    - Buildings: assuming that 30% of new constructions will be green buildings by 2030.
    - Agriculture: assuming that 20% of farmland will be managed with sustainable practices by 2030, the yield will increase by 10% as a result, a premium price of 20% will apply to this production, and labour intensity will increase by 10% when using sustainable practices.
    - Tourism: assuming that 50% of newly constructed hotels will be green starting from 2030, tourists pay a premium of 20% for green hotels, and 50% of food consumed in green hotels will be sourced locally from land that is sustainably managed.

As discussed above, the results of the analysis presented in the EaP GREEN (2018) Georgia country study serve as the starting point for the financial assessment (see Table 1). However, a small modification was made concerning the accounting of labour income. Instead of including the total additional labour income generated, the share of income considered in the financial assessment is reduced to 30%,[2] accounting only for the non-discretionary spending generated by implementing GE measures.

In order to demonstrate the societal and economic returns of the GE interventions, we built a financial model similar to the ones used for large-scale infrastructure projects. This approach basically aggregates the different GE projects across tourism, buildings, and agriculture into one large cross-sectoral project.

The model assumes a 30% equity and 70% debt capital structure, ongoing construction during the whole operation time of 23 years, and a base interest rate of 7%. We also used a discount rate of 9%, which reflects the high interest rate for the Georgian lari (GEL).

The following costs are included in the analysis:

- Capital expenditures: the overall cost of the GE intervention.
- Operating expenditures: the ongoing operating and maintenance costs of the GE projects for 23 years.

[2] The 30% share of non-discretionary income is based on the country statistics published by Numbeo **Invalid source specified**. According to their statistical model, expenses are distributed as follows: rent per month 24.3%, utilities 6.3%, markets (assumed food and beverages) 30.2%, transportation 9.9%, restaurants 14.7%, sports and leisure 8.8%, and clothing and shoes 5.7%. The categories rent, transportation, utilities, and markets are considered non-discretionary, and these items sum up to 70.7% of total expenditure. Therefore, a 30% share was applied to consider the additional discretionary spending in the economy only.

- Financing costs: the cost of debt financing, bank fees, and other costs associated with the financing of a project of this size. The loan is assumed to have a tenor of 20 years.

We included the avoided budgetary costs as revenues. This is to ensure that the value of avoided costs can be captured with a positive connotation in the financial model. The underlying rationale is that, in the presence of a fixed budget (or constrained funding availability), avoided costs represent additional resources for other investments. Specifically:

- Capital expenditures: savings in the cost of developing the projects needed without the GE intervention (e.g., investments in energy efficiency reduce the need to invest in power generation in the future).
- Operations costs: savings in the cost of operating existing projects without the GE intervention (e.g., energy-efficiency investments reduce the cost of energy for buildings, and retrofits reduce maintenance costs).

5.0 Analysis Results of GE Investments in Georgia

This section presents SAVi's contribution to the UNEP GE assessment by sector. An overview of all the key results of the EaP GREEN (2018) analysis is presented first since these results are used as the starting point for the financial assessment.

Table 1 provides an overview of the results for the Georgia GE study (EaP GREEN, 2018). It summarizes the total investments, avoided costs, and added benefits related to GE interventions by sector, including the SAVi modules. The Combined GE scenario reports the results for each of the aforementioned categories if all GE interventions are simulated at the same time.

Table 1. Integrated cost–benefit analysis for GE scenarios

		Scenarios			
Indicator	**Unit**	**Tourism**	**Buildings**	**Agriculture**	**Combined GE**
Cumulative difference in GDP GE vs. BAU	Mn. GEL	10,190.0	47,500.2	3,633.5	61,655.1
Investment for GE interventions[3]					
Buildings[4]					
Construction	Mn. GEL	841.5	- 13,612.8	0.0	- 11,499.2
Technology	Mn. GEL	35.5	2,020.5	0.0	2,123.8
Retrofits	Mn. GEL	98.2	30,826.3	0.0	31,333.6
Agriculture					
Irrigation	Mn. GEL	47.6	0.0	2,184.4	2,231.0
Organic farming	Mn. GEL	8.7	0.0	496.0	504.6
Sum of additional investments	**Mn. GEL**	**1,031.5**	**19,234.0**	**2,680.4**	**24,693.8**

[3] The investments for GE interventions represent the additional investment necessary to realize the avoided costs and benefits mentioned in the latter part of the table. For buildings, additional investment covers (i) construction of energy-efficient buildings, (ii) technology costs, and (iii) retrofitting of existing buildings. Negative investments indicate avoided costs in the GE relative to the BAU scenario.

[4] Achieving the ambition of a 30% share of energy-efficient buildings requires the retrofitting of conventional buildings in addition to replacing conventional buildings. Retrofitting reduces the need to construct new buildings. This leads to a reduction in investments for construction in the GE scenario compared to the BAU scenario.

Indicator	Unit	Scenarios			
		Tourism	Buildings	Agriculture	Combined GE
Avoided costs[5]					
Operation costs	Mn. GEL	- 87.6	3,328.8	- 36.3	3,130.9
Investments in power generation	Mn. GEL	80.9	489.2	0.0	535.0
Investments in wastewater treatment	Mn. GEL	96.7	0.0	0.0	96.7
Total avoided costs	**Mn. GEL**	**90.0**	**3,818.0**	**- 36.3**	**3,762.7**
Added benefits[6]					
Additional labour income	Mn. GEL	5,817.9	18,000.4	4,216.6	28,519.8
Avoided social cost of carbon	Mn. GEL	- 14.3	522.2	7.0	505.1
Additional carbon sequestration	Mn. GEL	0.0	0.0	312.7	312.7
Avoided costs of $PM_{2.5}$, SO_2, and NO_x	Mn. GEL	20.2	- 232.0	6.5	- 203.5
Total added benefits	**Mn. GEL**	**5,803.6**	**18,522.6**	**4,536.3**	**29,337.6**
Sum avoided costs and added benefits	Mn. GEL	5,893.6	22,340.6	4,500.0	33,100.3
Net benefit of GE intervention	Mn. GEL	4,862.0	3,106.6	1,819.7	8,406.4
Economy-wide cost-to-benefit ratio	**%**	**571%**	**116%**	**168%**	**134%**

Source: EaP GREEN, 2018

[5] Avoided costs refer to net savings achieved through the implementation of GE ambitions. In all cases, a negative avoided cost indicates a net increase in costs compared to the BAU scenario. The category "operations costs" summarizes the net cumulative avoided operations and maintenance costs from buildings (e.g., reduced operations and maintenance cost for efficient technology; lower energy expenditure) and agriculture (e.g., an increase in operations cost through technology upgrade; a reduction in water cost).

[6] Added benefits are those that would not be realized in the BAU scenario and that represent indirect and induced outcomes of investments. Additional labour income refers to the cumulative total additional income generated by green jobs compared to the BAU scenario. The avoided social cost of carbon represents the cumulative value of reduced carbon dioxide emissions, using the social cost of carbon of USD 31 per tCO_2 based on Nordhaus (2017). The avoided cost of air pollution ($PM_{2.5}$, SO_2, and NO_x) represents the health benefits (or impacts) caused by changes in air pollution generated, for example, from electricity generation and energy use from heating.

IISD used a financial model to demonstrate whether the positive externalities of the GE scenarios justify the costs and deliver a positive "return" to taxpayers. The financial assessment was conducted for the Combined GE scenario only but used sectoral results on investment, avoided costs, and added benefits. Financial performance was assessed using the following indicators:

- **S-NPV**
- **S-IRR**

The basic GE scenario (scenario 1) excludes the measurement of externalities. While the S-IRR of this scenario is positive based on our financial assessment, the negative S-NPV suggests that discounted benefits do not cover the investments required when the wider economic, societal, and environmental benefits of a GE investment scenario are ignored.

Table 2. Results of the financial performance assessment: S-NPV and S-IRR

Scenarios	S-IRR (%)	S-NPV (GEL million)
1. GE	4.21%	(489)
2. GE + Externalities	29.90%	3,771
3. GE + Additional GDP generated	71.00%	16,863
4. GE + Externalities + GDP generated	84.39%	20,394

However, when the externalities measured by SAVi are factored in the calculations (scenario 2), both the S-IRR and the S-NPV increase significantly. Externalities include the additional tax revenues and labour income generated, the reduced social cost of carbon, and the decreased health costs of emissions.

Similarly, when the additional GDP generated by the GE investments is included as revenue into the financial performance assessment (scenario 3), the S-IRR increases to 71% with the S-NPV reaching almost GEL 17 billion. Finally, when both the externalities and additional GDP generated are factored in (scenario 4) the S-IRR climbs above 84% with the S-NPV exceeding the GEL 20 billion mark.

This high-level financial assessment demonstrates that the GE investments under consideration pay for themselves and generate a significant positive return for taxpayers in the long run. Even though GE investments may seem unprofitable if only direct costs and benefits are assessed, the integration of economic, environmental, and social externalities demonstrates a positive investment case.

IRR and NPV are usually not used for policy-level analysis but rather for assessing the financial performance of standalone projects. However, when applying systemic thinking to policy-making, the economy can be considered as a large project with its own sets of costs and revenues. In this case, the revenues would be the increased economic activity, taxation and other societal and economic benefits generated as a result of the investment made by the government. By following this more holistic approach of defining revenues, IRR and NPV can provide invaluable insight into whether a policy decision can indeed deliver sufficient economic and social returns to justify its costs.

6.0 Conclusions

The main goal of this study is to highlight the SAVi contributions to the preparation of a National Green Economy Strategy for Georgia conducted by the EaP GREEN project (EaP GREEN, 2018). SAVi modules can support the quantification (i) of key physical indicators required for the assessment of selected GE interventions and (ii) of project financing indicators that can support the creation of a financing strategy. The latter is the core contribution of this report.

SAVi was integrated into the Georgia GE model used for the country assessment conducted by the EaP GREEN project and the MoESD. Three modules (buildings, agriculture, and industry) were customized through consultations with several ministries, civil society, and academia. The project financing assessment was instead carried out in-house by IISD.

The financial assessment revealed that the proposed GE interventions not only pay for themselves, but also generate a significant positive return for taxpayers in the long run when the economic, environmental, and social externalities are included in the assessment. On the other hand, when only direct outcomes are considered (excluding externalities and macroeconomic multipliers), the IIR is only slightly positive, and the S-NPV is negative.

Our analysis shows that GE investments in Georgia for buildings, agriculture, and tourism should not be assessed with a conventional approach that only considers direct economic impacts. In fact, important synergies and opportunities for sustainable growth may be missed if a more systemic and integrated approach is not utilized.

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