National Planning Authority 2020

DYNAMIC ANALYSIS OF SUSTAINABLE DEVELOPMENT GOALS:

Achieving the SDGs with Uganda's Third National Development Plan

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Analysis finalized: March 2020 | **Report finalized:** July 2020

Foreword

Uganda has made significant progress towards achieving the Sustainable Development Goals (SDGs) and integrating SDGs into national planning and budgeting processes. The Second National Development Plan integrated 76% of SDGs and adapted them to the national context. In 2016, the Government of Uganda launched a guiding framework for the implementation of the 2030 Agenda and SDGs, under the leadership of the Office of the Prime Minister. In 2018, a National Road map to create an enabling environment for the implementation of SDGs was launched, to accelerate the attainment of the 2030 Agenda. These actions across Government have established an institutional coordination framework that brings together all players; both state and non-state actors, including local governments, to deliver the SDGs.

However, despite notable progress, there is a need to further integrate the SDGs into the Third National Development Plan (NDP III) and accelerate the achievement of SDGs. SDGs are interlinked in complex ways, both explicit and implicit. The Goals embody a complex system of interconnected feedback loops, lengthy-time lags between causes and effects, and nonlinear relationships that can lead to unforeseen or counter-intuitive policy outcomes. Interventions to achieve a particular SDG target may cause underachievement or failure in another, and interventions that have an immediate desirable effect may have an undesirable long-term impact. Likewise, a successful intervention in one sector might create synergies that further progress in others.

In this regard, this report presents the approach that has been used to better understand which interventions and activities can be leveraged to more rapidly achieve multiple SDGs simultaneously. Using the Integrated Sustainable Development Goals (iSDG) simulation model, the report identifies accelerators engrained in the NDP III and will be pursued to achieve the SDGs. Since the NDP III adopted the programme-based approach to planning, the report specifically determines which NDP III programmes and associated interventions have the highest potential to be SDG Accelerators to catalyse progress towards the achievement of NDP III and ultimately Vision 2040 goals, while ensuring equitable economic growth, social development and environmental protection.

Industry, Governance and Environment are accelerators for the attainment of NDP III targets and in particular SDGs. Firstly, the public investment in the industry contributes to a reduction in poverty; access to clean and

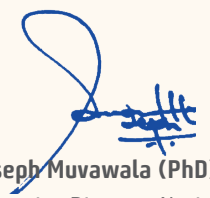
Foreword

safe water and sanitation; access to affordable energy; access to decent employment; resilient infrastructure; sustainable consumption and production; and combating the impacts of climate change. Secondly, good governance is key to the implementation of public expenditure and the facilitation of private investment. It also increases productivity with significant improvement on a number of SDGs. Governance directly contributes to the achievement of peaceful and inclusive societies. It facilitates private investment, reduces poverty and increases the effectiveness of the implementation of water and sanitation activities.

Thirdly, positively contributing to the environment accelerates the achievement of; sustainable cities, combating climate change and the protection and preservation of natural resources. It also helps significantly in the mitigation of the negative consequences of industrialization, which could otherwise hurt growth and increase vulnerability.

Investment in the SDG accelerators requires the adoption of a highly integrated approach that supports the implementation of various interventions in the accelerators simultaneously in conjunction with others to maximize the benefits arising from the synergies.

In this regard, this report enables the integration of SDGs into the NDP III. Additionally, it is a guide for the integration of the SDGs in the Sector Development Plans and Local Government Development Plans going forward.



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Abbreviations

BAU	Business as Usual
CNDPF	Comprehensive National Development Planning Framework
COVID-19	Corona Virus Disease 2019
DHS	Demographic and Health Survey
EIA	Energy Information Agency
EMDAT	The International Disasters Database
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Food and Agriculture Organization Corporate Statistical Database
FY	Financial Year
GDP	Gross Domestic Product
GMF	Global Material Flows Database
ICT	Information and Communication Technology
ILO	International Labour Organization
ILOSTAT	International Labour Organization Department of Statistics
IMF	International Monetary Fund
iSDG	Integrated-Sustainable Development Goals [Model]
IPCC	Intergovernmental Panel on Climate Change
KTOE	Kilotonne of oil equivalent
LVFO	Lake Victoria Fisheries Organization
MDA	Ministries, Departments and Agencies
MI	Millennium Institute
MTEF	Medium-term Expenditure Framework
NDP III	Third National Development Plan
NPA	National Planning Authority
ROI	Return on Investment
UBOS	Uganda Bureau of Statistics
UNDP	United Nations Development Program
UNPOP	United Nations Population Division
UNSD	United Nations Statistical Division
UGX	Ugandan Shilling
UWA	Uganda Wildlife Authority
WDI	World Development Indicators
WGI	Worldwide Governance Indicators

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Executive Summary

The primary objective of this report is to examine the potential medium- to longer-term impact of the Third National Development Plan (NDP III) on Uganda's sustainable development. The impact is measured using targets set both within the international framework of the Sustainable Development Goals (SDGs), and NDP III for Uganda. NDP III is the third of six five-year national development plans, covering the period 2020/21-2024/25 in fulfilment of Vision 2040. The Vision 2040 focuses on key sectors, resources and fundamentals to address strategic bottlenecks to encourage sustainable socio-economic transformation in the country (National Planning Authority, 2013).

This objective is met by developing a System Dynamics model to analyse policies contained within NDP III to test their effects on SDG and NDP III targets. First, the impact of the interventions contained within NDP III are identified. Then, further analysis helps to identify SDG accelerators, interventions that will accelerate the achievement of the SDGs and thus the leverage points for sustainable development.

The analysis in this report is performed using the integrated Sustainable Development Goals model (iSDG) for Uganda (hereafter iSDG-Uganda), an integrated long-term simulation model developed by the Millennium Institute (MI), in collaboration with the National Planning Authority of Uganda (NPA). In the model, the simulations for the analysis start in the year 1995. They reproduce historical behaviour until 2019, and project development trends into the future until 2030. These development trends are affected by the policy interventions that are introduced to the model, which are linked to the policy interventions of NDP III. In order to provide a reference for the comparison of effects of the NDP III interventions, a base-case scenario referred to as Business as Usual (BAU) has first been developed. This scenario assumes no policy change, maintaining the observed historical growth trends into the future as well as keeping constant the government and the private sector investment levels indexed to GDP, without any external shocks.

NDP III contains interventions that fit into the broad categories of agriculture, industry, services, transportation infrastructure, water and sanitation, health, education, environment, and governance. The SDG and NDP III target outcomes are compared to the BAU scenario both individually and together in the first component of analysis in order to assess their impact. Next, the comparison and further analysis across the 17 SDGs[1] provides insights that help to identify SDG Accelerators. These accelerators are then used to critique and assess the impact of NDP III as a whole.

The following three categories of interventions are key SDG accelerators: Environment, Governance and Industry. These categories of interventions can be mapped back to the eighteen programmes in NDP III and their responses. It should be noted, however, that the synergistic combination of cross-cutting programmes delineated in NDP III, which include investments in categories such as Health, Education and Infrastructure, would be necessary in addition to the SDG accelerators, to fully realize the potential of the investments. Meanwhile, the comparison across the primary goal and objectives of Vision2040[2] provides insights into which NDP III programmes have more potential in bringing Uganda closer to the achievement of its long-term vision.

1 There are 64 SDG indicators tracked within iSDG-Uganda. There are 78 when double-counting those that appear under multiple SDGs.
2 There are eighteen Vision 2040 indicators tracked within iSDG-Uganda.

Executive Summary

NDP III's Contribution to SDG Attainment

NDP III would improve the overall SDG attainment by 10.1% by the end of 2030, as compared with the case where NDP III were not implemented.

* Assuming a conservative scenario, where additional investment after 2025 is halved SDG 9 (Industry, Innovation and Infrastructure) improves the most of any goal

improves from 40.4% to 52.0% in the baseline scenario with NDP III

The improvement is driven primarily by investment into paved roads under the NDP III's Integrated Transport Infrastructure and Services Program and the Agro-industrialization, Mineral Development, Sustainable Development of Petroleum Resources, Private Sector Development, Manufacturing, and Sustainable Urbanization and Housing Programmes

improves under NDP III, from 34% for the Base scenario to 41.1% with NDP III for the former, and from 36.1% to 45.4% for the latter

The improvement is driven by a multitude of factors, including NDPIII programmes which emphasize the areas of Governance, Environment and Agriculture. Agricultural interventions contribute significantly to reducing poverty, as they typically target those earning the least, while environment programmes help minimize the impact of climate change. Governance interventions help implement these programmes, as well as improve the business environment.

improves from 40.4% to 52.0% in the baseline scenario with NDP III

The NDPIII Programmes that drive improvements in SDG6 are primarily Sustainable Urbanization and Housing, and Regional Development. However, Private Sector Development, Development Plan Implementation, Community Mobilization and Mindset Change, Governance and Security Programme, Public Sector Transformation, Human Capital Development, Regional Development, Agro-Industrialization and Climate Change, Natural Resources, Environment and Water Management programmes also drive improvement in SDG6, SDG1, and SDG9.

Although increased productivity improves SDG 8, it is driven down by material consumption that forms other indicators within this SDG. Even though there is some additional expenditure to terrestrial protection and reforestation, these are not enough to stem the downward trend of performance in SDGs 11, 13 and 15. This is driven in large part by the declining forest cover and the demand for biomass. Although there are measures in place in NDP III that target this issue through both reforestation and the diversification of the energy mix, the positive changes produced by these measures are out-stripped by the continued growth of demand for biomass.

SDG Accelerators and Key Leverage Points

Interventions belonging to the broad categories of Governance, Environment and Industry are identified as SDG accelerators. These link to 12 of the 18 NDP III programmes: Private Sector Development, Development Plan Implementation, Community Mobilization and Mindset Change, Governance and Security Programme, Public Sector Transformation, Human Capital Development, Regional Development, Mineral Development, Sustainable Development of Petroleum Resources, Manufacturing, Energy Development, and Climate Change, Natural Resources, Environment and Water Management. Although Governance, Environment and Industry interventions are notable accelerators, an analysis of synergies between interventions drop-out analysis finds that the most progress is made towards the achievement of the SDGs when investments are spread across all of the interventions since they synergize and work together to achieve these goals.

The cross-sectoral nature of the programmes means that they are all involved in helping towards the Vision's goal of increasing household incomes and quality of life. All interventions have significant positive synergistic spillovers and help reinforce the implementation of other interventions. This is particularly prominent in Environment, Water and Sanitation, Infrastructure, and Health, which work to mitigate the adverse effects of other interventions.

1 Introduction

In 2007, the Cabinet of Uganda approved the National Vision Statement, "A Transformed Ugandan Society from a Peasant to a Modern and Prosperous Country within 30 years." The National Planning Authority (NPA), in consultation with the government Ministries, Departments, and Agencies (MDAs) and additional stakeholders, developed the Uganda Vision 2040 to operationalize the Vision statement. Thereafter, Vision 2040 launched in 2013. The Comprehensive National Development Planning Framework policy (CNDPF) launched in 2010, provides for the development of the 30-year Vision to be implemented through six 5-year National Development Plans (NDPs) and three 10-year development plans.

> The SDGs focus on equitable economic growth, social development and environmental protection along five dimensions: People, Prosperity, Planet, Peace and Partnerships.

In addition to the national development planning processes as a part of the CNDPF, Uganda is also committed to the 2030 Agenda and Sustainable Development Goals. That commitment is built on prior engagements in the processes that culminated in the adoption of the 2030 Agenda by the UN General Assembly during Uganda's term holding the UN Presidency in 2015. The 17 SDGs were adopted within the framework of the 2030 Agenda for Sustainable Development by the members of the United Nations (UN) as a continuation of the concept of integrated goal-oriented planning captured previously by the Millennium Development Goals (MDGs). The SDGs focus on equitable economic growth, social development and environmental protection along five dimensions: People, Prosperity, Planet, Peace and Partnerships. To tackle the interconnected nature of the sustainability challenges faced globally, the scope of the SDGs has been expanded as compared to the MDGs, from 8 to 17 major goals, thus making the SDGs more comprehensive, but also increasing the complexity of the challenges of development planning.

The United Nations inter-governmental negotiations on the SDGs in 2015 coincided with the preparation of NDP II. Government used this opportunity to integrate the SDGs framework into the National Development Plan. This resulted in a 69% integration level.

In 2016, Uganda launched a framework to guide coordination of the implementation of the 2030 Agenda and its associated Sustainable Development Goals (SDGs) under the leadership of the Office of the Prime Minister. The framework is aimed at bringing together all players, both state and non-state actors, including local government, to deliver on SDGs and the 2030 Agenda. This framework spells out clear mandates for planning, coordination, monitoring, and reporting, in addition to resource mobilization, communication and advocacy, and data technical working groups. In 2018, a National Road map to create an enabling environment for implementation of SDGs was launched to accelerate the attainment of the 2030 Agenda. This established an institutional coordination framework that brings together all players, including both state and non-state actors, including local governments, to deliver the SDGs.

To facilitate the implementation of the framework, the government has undertaken several initiatives including developing and launching a casted National SDG Roadmap, which contains priority actions to catalyse the implementation of SDGs across the country, integrating SDGs indicators into national processes through the National Standard Indicator (NSI) Framework, earmarking of an SDG Focal Point Minister – Minister for General Duties in the Office of the Prime Minister — and creation of an SDG Secretariat in partnership with the United Nations Country Team.

However, despite notable progress as highlighted above, there are challenges faced in the implementation of the SDGs. This includes lack of adequate evidence-base on "accelerators," which constitute interventions associated with particular SDGs that would spur the achievement of other SDGs. Accelerators, therefore, are priority areas of action or intervention, where targeted investments could have a direct and positive impact on other development priorities, thus accelerating progress towards the SDGs.

1.1. Objectives of the study

This report domesticates the integrated Sustainable Development Goals simulation model (iSDG), in the pursuit of identifying SDG Accelerators in the framework of NDP III. In other words, the report aims to determine which NDP III programmes and associated interventions have the highest potential to be SDG Accelerators. Additionally, the report aims to determine which interventions can enable progress towards the achievement of NDP III and ultimately Vision 2040 goals, while ensuring equitable economic growth, social development and environmental protection. The report uses iSDG modelling to illustrate the extent to which NDP III interventions will help Uganda achieve both the NDP III targets themselves and SDG targets.

1.2. Structure of the report

Following the introduction, the report consists of three main sections:

Methodology - The initial description of the iSDG-Uganda model is in Section 2.1. It includes the model's history, purpose, the methodology on which it is based (System Dynamics), and an overview of its structure, including its modules and interconnections. There are details provided on the adaption of the model to represent the Ugandan economy, society and environment, through a calibration and validation process (Section 2.2). The sources of data are then provided, along with a brief description of the assumptions that have shaped the historical figures (Section 2.3). There is also a description of the mapping of NDP III programs to the interventions in iSDG-Uganda (Section 2.4). Finally, the section concludes with a description of the process followed in Section 3 to calculate SDG attainment stemming from planned NDP III investments and to identify the SDG Accelerators (Section 2.5).

Analysis and Results - First, this section provides the simulation results for overall SDG attainment (Section 3.1) and progress towards NDP III targets (Section 3.2). The interventions are then grouped into categories, and SDG performance analysis is provided by these categories (Section 3.3). The return on investment in terms of SDG attainment is also analysed through these categories individually (Section 3.4). Then, the SDGs with the highest synergistic potential are identified (Section 3.5). Finally, the focus shifts from partial analysis to drop-out analysis, whereby the synergistic effects of the investment categories are also identifiable (Section 3.6). The interpretation takes place for the identification of Accelerators (Section 3.7), other pertinent areas for acceleration (Section 3.8) and the integration of these interventions (Section 3.9).

Conclusions - The conclusion provides a summary of the key findings of the report (Section 4.1). It is then followed by "Outlook" (Section 4.2), that details ways in which iSDG-Uganda can contribute to furthering sustainable development into the future.

This report uses iSDG modelling to illustrate the extent to which NDP III interventions will help Uganda achieve both the NDP III targets themselves and SDG targets

2 Methodology

Policy design and planning for the SDGs presents a major challenge due in part to the interconnected and complex nature of the 17 goals. Actions geared towards the achievement of one SDG may cause underachievement or failure in another. However, at the same time, a successful initiative for one SDG might create synergies for improvements in another. Identifying SDG Accelerators implies the concurrent analysis of all 17 SDGs, the interactions between them, and the cascading and intersecting effects of the interventions across economic, social and environmental systems.

> The model integrates the economic, social, and environmental aspects of development. Its comprehensiveness and level of aggregation make it an appropriate tool to support a detailed analysis of different government strategies

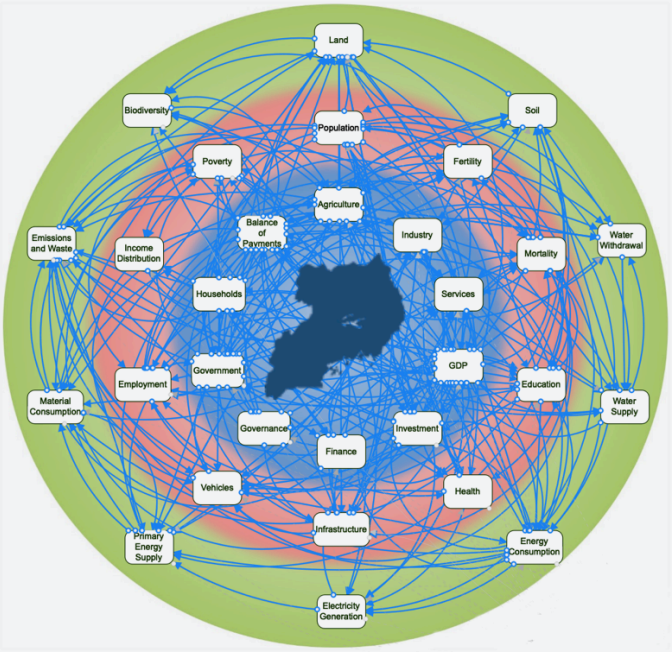
2.1. The iSDG-Uganda model

The iSDG-Uganda model's design supports national development planning. It is structured to analyse medium- and long-term development issues at the national level. The model integrates the economic, social, and environmental aspects of development. Its comprehensiveness and level of aggregation make it an appropriate tool to support a detailed analysis of different government strategies (Allen et al., 2016; UNEP, 2014). The analysis itself does not provide a forecast. Instead, it aims at improving the understanding of policy-makers of the complex intersectoral connections, thereby enabling them to approach the design of public policies with a holistic perspective.

Based on the Threshold 21 model by MI, the iSDG-Uganda stems from long line of models that have been continuously developed over the last 30 years as a tool for policy development (Pedercini, Zuellich, Dianti & Arquitt, 2018). These models have been implemented in over 40 countries around the world and have been used to develop plans for national development, green economy and sustainable agriculture (Millennium Institute 2018). The model is built according to the System Dynamics (SD) methodology, which excels in the deconstruction and analysis of complex socio-economic environments and political systems (Sterman, 2000). This simulation method provides a better understanding of the complex relationships between modules (Davis, Eisenhardt & Bingham, 2007). In addition to the many previous applications of the iSDG model and T21 to different contexts (Pedercini et al., 2018; Pedercini & Barney, 2009), sustainability researchers have refined methods for modelling and policy analysis in areas such as climate change (Fiddaman, 2007), encouraging the formation of healthy food markets (Struben, Chan & Dubé, 2014), government health policies (Homer, Hirsch & Milstein 2007), and the introduction of alternative fuel vehicles (Struben & Sterman, 2008).

Figure 1 provides a conceptual overview of the core iSDG-Uganda model structure, comprising 30 interacting modules. After dividing the modules into economic (blue), social (red) and environmental (green) each module could be considered as an individual model, linking to other modules, calculating certain outcome variables based on inputs from other modules and historical data. Linking the modules together enables the analysis of dynamic interactions across modules. The dynamic interactions capture feedback loops, non-linearity and delays, all of which are fundamental elements of complex social/economic/environmental systems and are necessary for understanding development issues. Economic activities take place within society, from which social resources drawn can generate economic value, limiting and feeding back into the carrying capacity of the natural environment.

Figure 1 – Structural overview of iSDG-Uganda



The economic modules include the production areas (agriculture, industry and services), which are characterized by expanded Cobb-Douglas production functions with inputs of resources, labour, capital, and endogenous total factor productivity. The government module generates taxes based on economic activity and allocates expenditures by major categories. Public expenditure impacts the delivery of public services. Standard budget categories are employed, and essential macro balances incorporated into the model. The governance module comprises the six indicators of a composite index of governance that affects the productivity and effectiveness of public expenditure. The household module traces household revenue and disposable income (based on economic activity, government's subsidies and transfers, remittances, etc.), used to support private saving and consumption. In the investment module, private and public investments are allocated to agriculture, industry and services production (and their disaggregation, if available). The balance of payments module traces trade, the current, capital, and financial account transactions, and the finance module comprises capital flows (including public debt management).

The social modules include detailed population dynamics by sex and age cohorts (age 0 to age 99 and age 100 and above); health and education challenges and programs; basic infrastructure (roads and rails) and vehicles; employment; poverty levels and income distribution. The modules consider, for example, the interactions between income, healthcare, nutrition, and adult literacy rates, and the effect this interaction has on fertility and life expectancy, which in turn determine population growth. Population determines the labour force overtime, which shapes employment, in addition to education and capital levels. Further, employment, education and saving levels affect income distribution and consequently, poverty. Education and health, together with other factors, influence labour productivity and life expectancy. Similarly, infrastructure and vehicles have an impact on productivity, but at the same time cause fossil fuel demand and emissions, thus affecting health levels.

The environmental modules track the consumption of natural resources – both renewable and non-renewable – and estimate the impact of the use and depletion of such resources on production, health and other modules. They cover changes in land use (for example from forest to agricultural land or settlement land); in resource stocks (such as fish stocks and forest cover); in the quality of soil based on their nutrient levels; and assess their impacts on other modules, such as agricultural productivity, nutrition and biodiversity. Additional issues addressed are the demand and supply of fossil fuel, electricity and water, with their impacts on several factors, such as productivity, access to electricity affecting education, access to water and sanitation facilities affecting health levels, and emissions. Population and production levels determine the demand of those natural resources, and the generation of waste and air pollution (e.g. PM2.5, GHG), but investment decisions can influence the level of waste treatment, and the efficiency levels and capacities for renewable energy use.

2.2. Calibration and validation

The model was subject to extensive structural and behavioural validation exercises, both as a part of this project and from previous implementations of the model (Barlas, 1996). The structure of the iSDG-Uganda model and of the models it replicates, was validated primarily through peer-reviewed research by the modelling team.[3]

iSDG-Uganda is the version of the model that has been customized to the conditions of Uganda, through a specific calibration process, relying on historical data from 1995 until the present moment. The calibration was performed by way of partial model calibration cycles (Homer, 2012), also including rounds of multi-parametrical optimization. The calibration of some modules, such as population, fertility and mortality, is based primarily on absolute values. In contrast, the calibration of other modules, such as agriculture, industry and services, takes into account the growth patterns of various elements in the structure, relative to themselves and other elements as well. One of the different tests to be conducted to validate the results of a model is to compare the results of the model simulation with real historical data. If the model reproduces the historical data well and for the right reasons, it creates a degree of confidence in its usefulness for making future projections. These comparisons have shown satisfactory results for the main indicators.

2.3. Data

Data was collected from both international and national data sources. National data sources were prioritized, with international data filling gaps where national data was not available or exist for specific indicators. Collection and analysis of data took place in close coordination with NPA and UNDP-Uganda technical experts, and external experts when existing data was insufficient. Where data was still missing, there were assumptions made to fill in the gap. All of the historical data, parameters and assumptions were discussed with and ultimately confirmed by the partners from NPA and UNDP. In some cases, the available historical data has been adjusted, to better reflect reality. Additional details on the sources of data by module, as well as the major assumptions related to the data are provided in Appendix 1. Although best efforts have been made to replicate all of the historical data, in some cases the historical datasets are not internally consistent, partly due to the fact that many data sources are used to cover a long period of time. As a consequence, trade-offs and compromises are occasionally necessary to ensure that the model overall simulates reality as best as possible, in some cases at the expense of the replication of certain indicators. A limitation of this approach is that this can potentially change the results if different sets of assumptions were to be made. Key limitations are described in Section 2.3.1. below, while a more thorough discussion is provided in Appendix 2.

iSDG-Uganda is the version of the model that has been customized to the conditions of Uganda, through a specific calibration process, relying on historical data from 1995 until the present moment

3. The documentation and references for the core model structure can be found at https://www.millennium-institute.org/documentation.

2.3.1. Limitations

A detailed explanation of limitations of the analysis is provided in Appendix 2. A brief overview of the most important limitations is provided below.

Forested areas and biomass: Following historical data and trends, the forestry production is expected to collapse in 2025, and use of informal biomass is expected to no longer be available to most of the population by 2029. This is due to the fact that a large proportion of household, industry and services energy demand is met through biomass. The share of energy supply from other sources is growing (from 11% to 16%) because population, industrial production and services production are going to increase at an exponential rate, faster than the rate of growth of energy supply from other sources. This means that the overall demand for biomass will also grow at an exponential rate. Due to the reliance of households and production areas on biomass energy, there will still be a demand for biomass even with no forests, and the model assumes that residents will import to meet their needs. This assumption, however, fails to take into account the economic cost in terms of purchasing biomass that was previously unpurchased, the limitations on quantities of imported biomass, and the potential lack of access of specific regions. Without information on coping mechanisms, the model currently has no other way of accounting for the energy gap. Steps should be taken as soon as possible towards understanding the effects of the upcoming energy gap so that there are appropriate measures taken before it is too late.

Rebased GDP: In October 2019, UBOS rebased the GDP of Uganda and re-estimated the overall production of the country, resulting in higher nominal GDP. The model is calibrated on the GDP, budget and balance of payments data before this rebasing, due to the full availability of historical data for the required timeframe. Generally, because the modules in question are run mostly on relative terms rather than absolute terms, the consequences of this are minor. However, through analysis of the new GDP data, where some expenditure categories have shifted from services to industry, industry production results should be viewed as conservative, whereas the results for services production are optimistic. For the presentation of the analysis results, the rebased GDP figures become relevant when production numbers are reported in absolute terms, such as GDP per capita in Appendix 4. In this case, absolute values have been increased proportionally to the ratio between the GDP figures before and after rebasing.

Water and Sanitation: Figures for SDG indicators 6.1.1 and 6.2.1 match the old definitions of access to improved water sources and sanitation rather than the new definition of access to safely managed water sources and sanitation. This choice to use old definitions was due to data availability considerations and because those definitions and the figures better matched those used by the Ministry of Water and Environment Uganda. Because the new definitions are more stringent, the overall attainment of SDG 6 is likely over-estimated in the results.

Further details on the limitations mentioned above are in Appendix 2, along with the following: aggregation level of industry and services production, employment figures, water demand, regional development, and return on investment analysis

2.4. Harmonizing NDP III and iSDG-Uganda

A list of interventions used for analysis within the iSDG-Uganda, along with their costing, is shown in this section. Herein, the process of deriving interventions from NDP III programmes (Section 2.4.1) is described, along with the costs associated with these interventions, based on National Budget Framework Papers (Section 2.4.2), and how these interventions are treated within the analysis (Section 2.4.3).

2.4.1. NDP III Programmes and iSDG-Uganda interventions

The first step was to derive interventions from the NDP III programmes. Many NDP III programmes are cross-cutting (e.g. Human Capital Development covers health, education and water and sanitation access) and certain interventions are covered in multiple programmes (e.g. Paved Road infrastructure is a part of both the Agro-Industrialization Programme and of the Integrated Transport Programme). As such, it is often difficult to identify the effect of the overall programmes on specific indicators. Therefore, to ensure clarity in terms of cause and effect, the analysis focuses on the effect of the interventions themselves.

Some aspects of the programmes are outside of the scope of the model. For example, because the model does not disaggregate industry, the capital investment into industry intervention is assumed to cover the Mineral Development, Sustainable Development of Petroleum Resources and Manufacturing Programmes. The analysis averages their relative effects.

Using the objectives of the programmes in NDP III, the interventions in iSDG are mapped to the programmes in NDP III, and interventions in the Plan. The programmes and their corresponding interventions in the iSDG model are presented in Table 1 below.

Table 1 - NDP III Programmes and associated interventions within iSDG-Uganda

NDP III Programme	Targeted SDG	Intervention in iSDG-Uganda
1. Agro-industrialization	2, 9, 12	Public investment into agriculture for crops, livestock, and fisheries (incl. aquaculture) Public investment into industry Fertilizer subsidies Sustainable agriculture training Irrigation Paved road infrastructure Large-scale hydro
2. Mineral Development	9, 9.2, 12	Public investment into industry Paved roads Railways
3. Sustainable Development of Petroleum Resources	9, 9.2, 12	Public investment into industry Paved roads Railways
4. Tourism Development	8. 8.9	Public investment into services Terrestrial protection (Including wetlands)
5. Climate Change, Natural Resources, Environment and Water Management	6, 13, 14, 15	Reforestation Terrestrial protection (Including wetlands) Marine protection Climate adaptation
6. Private Sector Development	8, 9, 9.3	Governance (e.g. Regulatory Quality) Direct taxes, indirect taxes, foreign grants, international trade taxes Paved roads Railways Public investment into industry Public investment into services Public investment into agriculture
7. Manufacturing	7, 8, 9, 12, 13	Public investment into industrial development Paved roads Large-scale hydro

NDP III Programme	Targeted SDG	Intervention in iSDG-Uganda
8. Integrated Transport Infrastructure and Services	9, 12	Paved roads Railways
9. Energy Development	7, 12	Small-scale solar Large-scale hydro Industrial energy efficiency
10. Digital Transformation	17	Public investment into services Education
11. Sustainable Urbanization and Housing	11	Safely managed water Sanitation Paved roads Governance (Rule of Law, Political Stability and Absence of Violence) Implementation of Agro-industrialization, Manufacturing Waste management
12. Human Capital Development	3, 4, 5, 6, 8, 10	Health Education (all levels) Family planning Safely Managed Water Sanitation
13. Innovation, Technology Development and Transfer	17, 17.6	Public investment into services Education
14. Community Mobilization and Mindset Change	16, 16.7, 16.10	Governance (Control of Corruption, Government Effectiveness, Voice and Accountability)
15. Governance and Security Programme	16	Governance (Rule of Law, Political Stability and Absence of Violence, Voice and Accountability)
16. Public Sector Transformation	16, 17	Governance (Control of Corruption, Government Effectiveness, Rule of Law, Political Stability and Absence of Violence)
17. Regional Development	16, 17	Implementation of Agro-industrialization, Mineral Development, Manufacturing and Tourism Development Programmes Subsidies and Transfers
18. Development Plan Implementation	1, 1.2, 2, 2.3, 8, 8.2	Governance (Government Effectiveness) Direct taxes, indirect taxes, international trade taxes

Source: NDP III and iSDG-Uganda

Table 2 presents interventions by category: Agriculture, Industry, Services, Infrastructure, Water and Sanitation, Health, Education, Environment, and Governance, illustrating the mapping of these intervention categories back to the NDP III Programmes. Therefore, the final results can be interpreted as the effect of NDP III interventions by category on SDG achievement, but these can be directly linked back to overall Programmes in NDP III.

Table 2 - Mapping of iSDG-Uganda interventions to NDP III Programmes

iSDG Intervention	Programme Mapped	Primary Programmes for Interventions
Agriculture (Agr)		
Public investment into crops	Agro-industrialization	Agro-industrialization
Public investment into livestock	Agro-industrialization	
Public investment into conventional fisheries	Agro-industrialization	
Public investment into aquaculture	Agro-industrialization	
Fertilizer subsidies	Agro-industrialization	
Sustainable agriculture training	Agro-industrialization	
Irrigation	Agro-industrialization	
Industry (Ind)		
Public investment into industry	Agro-industrialization Mineral development Sustainable development of petroleum resources Manufacturing Energy development	Agro-industrialization Mineral development Sustainable development of petroleum resources Manufacturing Energy development
Services (Ser)		
Public investment into services	Tourism development Digital transformation Innovation, technology development and transfer Private sector development	Tourism development Digital transformation Innovation, technology development and transfer Private sector development
Infrastructure (Inf)		
Paved road infrastructure	Agro-industrialization Integrated transport infrastructure and services Energy development	Agro-industrialization Integrated transport infrastructure and services Energy development
Railways	Integrated transport infrastructure and services	
Water and Sanitation (Was)		
Safely managed water	Human capital development. Sustainable urbanization and housing.	Human capital development. Sustainable urbanization and housing Integrated transport Infrastructure and services Regional development
Sanitation	Human capital development. Sustainable urbanization and housing Regional development	
Paved road	Sustainable urbanization and housing	

iSDG Intervention	Programme Mapped	Primary Programmes for Interventions
Health (Hlt)		
Health	Human capital development	Human capital development
Family planning	Human capital development	
Education (Edu)		
Education	Human capital development	Human capital development
Environment (Env)		
Reforestation	Climate change, natural resources, environment and water management	Climate change, natural resources, environment and water management
Terrestrial protection	Climate change, natural resources, environment and water management	
Climate adaptation	Climate change, natural resources, environment and water management	
Governance (Gnc)		
Average governance index	Private sector development Development plan implementation Community mobilization and mindset change Governance and security Programme Public sector transformation Regional development Human capital development	Private sector development Development plan implementation Community mobilization and mindset change Governance and security Programme Public sector transformation Regional development Human capital development

Source: iSDG-Uganda and NDP III, for the purposes of this analysis

2.4.2. Interventions and their costing

Table 2, as previously mentioned, shows nine categories of interventions. Eight are calibrated to their actual costs and effects, while the ninth, Governance, is estimated from historical data.[4] Additionally, revenue and GDP assumptions used in the model are detailed.

Category of intervention

The costs of the interventions listed in the previous section are derived from the National Budget Planning Framework Papers. The costs of the interventions are input into the analysis on an "additional investment" basis; this way, the effects of the interventions can be compared with the Business as Usual (BAU) assumptions, where results are found assuming present-level investments indexed to GDP growth continue into the future. Comparative cases are simulated by increasing certain budgets. The interventions are then grouped into eight categories, following consultation with NPA and UNDP-Uganda: Agriculture, Industry, Services, Infrastructure, Water and Sanitation, Health, Education, and Environment.[5] These interventions are grouped by similarity in function, taking into account similarity in ministerial responsibility and intended effect. This categorization facilitates the identification of SDG accelerators as well (described further in Section 2.5.2).

4. Because many policies and cultural shifts can affect governance, it is not possible to estimate the costs involved and link them to shifts in outcomes in the model.
5. In Appendix 3, the costs that are included in each estimate are presented intervention by intervention, along with a description. The top line of each table shows the investment level, while the rest of the table shows the summary of the projects that led to that figure. Further description and justification of the process is provided there as well.

As the model functions on an additional investment basis, adjusted to GDP, the total investment amounts derived in the previous section transform for representation as a proportion of GDP. Therefore, the additional expenditure is made relative to the base year (2017/18), which is the last year full data is available. Table 3 shows public investment by category and year. Not shown here, are the negative investments as calculated in this manner (i.e. diminishing investments). The table also eliminates Large Hydroelectric Power, when adjusting for these factors, as this intervention does not represent any additional investment when compared to the base year. Additionally, interventions such as Health and Education will receive declining investments over time.

For the years post 2025/26, a conservative scenario is employed in the key analysis, where additional investments are assumed to be half of those used on average during the period 2020/21-2024/25 (as a percentage of GDP). However, the full investment scenario post 2025/26 is also tested in Section 3.1.

Table 3 - Additional investment as a percentage of GDP for each intervention tested by category. The average additional investment until 2024/25 is used for the years afterwards.

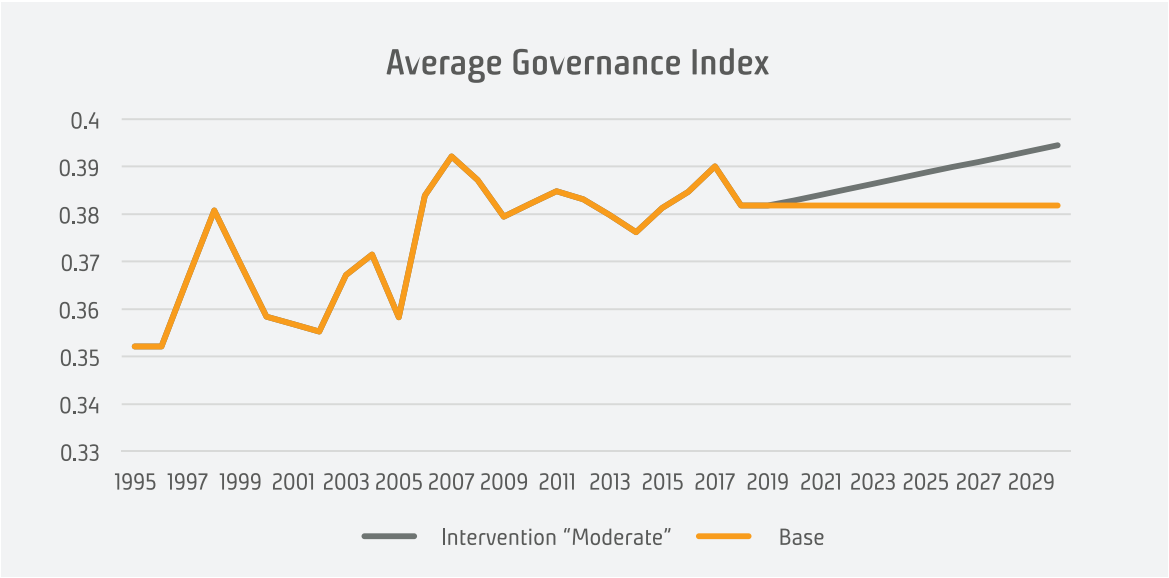
Intervention	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26+
Agriculture (Agr)									
Public investment into agriculture (crops)	0.000	0.000	0.000	0.000	0.000	0.000	0.052	0.000	0.010
Public investment into agriculture (livestock)	0.000	0.000	0.082	0.083	0.110	0.130	0.190	0.046	0.112
Public investment into agriculture (conventional fisheries)	0.000	0.001	0.009	0.020	0.024	0.024	0.019	0.009	0.019
Public investment into agriculture (aquaculture)	0.000	0.000	0.003	0.006	0.007	0.007	0.006	0.003	0.006
Fertilizer Subsidies	0.000	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030
Sustainable Agriculture Training	0.000	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Irrigation	0.000	0.000	0.072	0.346	0.646	0.628	0.621	0.332	0.514
Industry (Ind)									
Public Investment into Industry	0.000	0.020	0.066	0.030	0.021	0.020	0.019	0.019	0.022
Services (Ser)									
Public Investment into Services	0.000	0.013	0.223	0.165	0.221	0.263	0.217	0.117	0.197
Infrastructure (Ifr)									
Paved Road Infrastructure	0.000	0.639	2.029	1.277	0.648	0.000	0.000	0.450	0.475
Railways	0.000	0.000	0.000	0.000	0.339	0.602	0.633	0.549	0.425
Water and Sanitation (Was)									
Safely Managed Water	0.000	0.278	0.126	0.213	0.393	0.245	0.186	0.000	0.207
Sanitation	0.000	0.078	0.035	0.059	0.110	0.069	0.052	0.000	0.058
Health (Hlt)									
Health	0.000	0.350	0.862	0.029	0.039	0.000	0.000	0.000	0.014
Family Planning	0.000	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Education (Edu)									
Education	0.000	0.198	0.459	0.142	0.029	0.000	0.000	0.000	0.034
Environment (Env)									
Reforestation	0.000	0.259	0.370	0.355	0.392	0.445	0.414	0.333	0.388
Terrestrial Protection	0.000	0.143	0.404	0.242	0.171	0.116	0.086	0.086	0.140
Marine Protection	-	-	-	-	-	-	-	-	-
Climate Adaptation	0.000	0.028	0.032	0.022	0.013	0.005	0.000	0.000	0.008
Governance (Gnc)									
Average Governance Index	Not costed. Assumed to go from 0.381 to 0.395 in primary investment scenario "Moderate".*								
Payment									
Foreign grants	0.000	0.005	0.420	0.000	0.000	0.000	0.000	0.000	0.000
Direct Taxes	0.000	0.287	0.196	0.302	0.442	0.546	0.703	0.865	0.571
Indirect Taxes	0.000	0.456	0.311	0.479	0.703	0.867	1.116	1.374	0.908
Taxes on Foreign Trade	0.000	0.097	0.066	0.102	0.149	0.184	0.238	0.292	0.193
Loans	0.000	0.192	1.330	0.476	0.140	-0.584	-1.082	-1.657	-0.542

** The "Moderate" scenario is equivalent to the "All" scenario starting in Section 3.*
Source: Adapted from MTEF and NDP III (see Appendix 3 for details).

Governance

Governance, related to many NDP III programmes, serves as the ninth category of intervention. It is not costed in the model, as assumptions related to the effectiveness of additional investments can vary greatly depending on project and context. The Governance intervention seeks to improve the functioning of regional and national institutions to improve economic efficiency and social and environmental programmes. There are six indicators or measures in the model that constitute changes in Governance by the average effect: Regulatory quality, control of corruption, government effectiveness, voice and accountability, the rule of law, political stability and absence of violence (Kauffmann and Kraay, 2019). Over the 25 years between 1995 and 2020, the average of the six indicators improved from 0.352 to 0.381. In the best-case scenario (scenario "Optimist" presented in the analysis) it is assumed that over the period 2020-2030, the indicators will improve 50% as much as they have over the previous 25 years. However, in the moderate scenario ("Moderate" presented in the analysis)[6] it is assumed the indicators will improve 37.5% as much as they have over the previous 25 years. Figure 2 below shows this latter improvement.

Figure 2 – Assumption on the future development of governance (scale from 0 to 1)



Financing

The financing of the interventions can take place in five ways: Foreign grants, direct taxes, indirect taxes, taxes on international trade, and loans. The first four can be manipulated, while the fifth, loans, is the residual of the additional expenditure. Their representation in the model and description is presented below.

Foreign grants - Additional foreign grants increase the size of the government's budget. Over-reliance on these brings risks of discontinuity of funding, since funding may stop from one year to the next for reasons beyond the control of the recipient country.

Direct taxes: Direct taxes are sourced from household income and increase the size of the national budget. If direct taxes increase, household savings decrease.

Indirect taxes: These are taxes on goods and services, which could be increased or decreased. Decreasing indirect taxes: (1) increases consumption, (2) redis-

6. The Moderate scenario is used as the "All" scenario in the analysis in section 3.

tributes income in society (the poorer strata tend to benefit more from the lower propensity to save), (3) reduces government revenue.

Taxes on international trade - The effects are similar to taxes on goods and services but target international trade specifically.

Loans - Either domestic or foreign loans taken out by the government in order to fill gaps in their payment. This is calculated as a residual of the additional spending less the increased revenues from possible increased grants or taxes.

Tax revenue will increase through better enforcement and broadening the tax base.[7] The revenues mark a significant increase from the previous years, and this tax revenue assumption is retained in the analysis.[8] Additionally, because only 62.4% of expenditures are public, while the rest is private, only 62.4% is included as public expenditure (for all interventions).[9] The results are presented in Table 4.

Table 4 - GDP, grant and tax revenue

Item	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
GDP	119 907	128 499	142 284	158 775	178 350	200 667	225 883
Foreign grants	642	695	1360	544	240	232	228
Tax Revenue	14 076	16 163	17 517	20 040	23 245	26 761	31 162
• Taxes on Income and Profits	4 809	5 522	5 985	6 847	7 942	9 143	10 647
• Taxes on Goods and Services	2 610	2 997	3 248	3 716	4 311	4 963	5 779
• Taxes on International Trade	301	346	375	429	497	573	667

Source: iSDG-Uganda model results.

2.5. Process of analysis

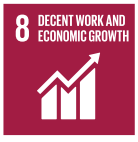
2.5.1. Calculation of performance

The global framework of indicators adopted by the United Nations Statistical Commission brings together 169 indicators, which makes it possible to monitor the progress made by countries on an internationally comparable scale. However, the same indicators are not necessarily applicable to all national contexts, because of the characteristics specific to each country and because of the availability of the data required for their calculation.

iSDG-Uganda tracks 64 unique SDG targets, 78 if counting the multiple times that some appear in multiple SDGs. The 78 indicators are a part of 51 targets.[10] There is at least one target representing each SDG. Table 5 below shows the complete list. The targets included were selected based on the criteria of quantifiability and data availability.

7. NDP III Draft 4, p. 202.
8. Because there are no exact figures, and both direct and indirect taxes are described, the figures in table 3.1 (ibid, p. 23) are used to determine the relative tax increase in the five-year span until 2024/25. The increase is divided proportionally into direct and indirect taxes based on the last available data.
9. ibid, p. 202
10. As of early 2020, UBOS has national data to track progress against 43 targets. The figures will be up to date in 2020.

Table 5 - SDG targets and indicators tracked in iSDG-Uganda

Goal	Indicators
	1.1.1[1] Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural) 1.2.1 Proportion of population living below the national poverty line, by sex and age 1.4.1 Proportion of population living in households with access to basic services 1.5.1 Number of deaths, missing and persons affected by disaster per 100,000 peopled 1.5.2 Direct disaster economic loss in relation to global GDP
	2.1.1 Prevalence of undernourishment 2.2.1 Prevalence of stunting among children under 5 years of age 2.2.2 Prevalence of malnutrition among children under 5 years of age, by type (wasting and overweight) 2.3.1 Volume of production per labour unit by classes of farming/pastoral/forestry enterprise size 2.4.1 Proportion of agricultural area under productive and sustainable agriculture
	3.1.1 Maternal mortality ratio 3.1.2 Proportion of births attended by skilled health personnel 3.2.1 Under-five mortality rate 3.2.2 Neonatal mortality rate 3.4.1 Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease 3.6.1 Death rate due to road traffic injuries 3.7.1 Proportion of women of reproductive age who have their need for family planning satisfied with modern methods 3.7.2 Adolescent birth rate per 1,000 women in that age group 3.8.1 Coverage of essential health services
	4.1.1 Proportion of children and young people achieving at least a minimum proficiency in reading and mathematics, by sex 4.3.1 Participation rate of youth and adults in formal and non-formal education and training in the previous 12 months, by sex 4.5.1 Parity indices (female/male, rural/urban, bottom/top wealth quintile and others such as disability status, indigenous peoples and conflict affected as data become available) 4.6.1 Percentage of population in a given age group achieving at least a fixed level of proficiency in functional (a) literacy and (b) numeracy skills, by sex
	5.5.1 Proportion of seats held by women in national parliaments and local governments 5.6.1 Proportion of women aged 15-49 years who make their own informed decisions regarding sexual relations, contraceptive use and reproductive health care
	6.1.1 Proportion of population using safely managed drinking water services[2] 6.2.1 Proportion of population using safely managed sanitation services, including a handwashing facility with soap and water[13] 6.4.1 Change in water use efficiency over time 6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources
	7.1.1 Proportion of population with access to electricity 7.2.1 Renewable energy share in the total final energy consumption 7.3.1 Energy intensity measured in terms of primary energy and gross domestic product
	8.1.1 Annual growth rate of real GDP per capita 8.2.1 Annual growth rate of real GDP per employed person 8.4.1 Material footprint (MF) and MF per capita, per GDP 8.4.2 Domestic material consumption (DMC) and DMC per capita, per GDP 8.5.2 Unemployment rate, by sex, age and persons with disabilities 8.6.1 Proportion of youth (aged 15-24) not in education, employment or training

Goal	Indicators
	9.1.1 Proportion of the rural population who live within 2 km of an all-season road 9.2.1 Manufacturing value added as a proportion of GDP and per capita 9.2.2 Manufacturing employment as a proportion of total employment 9.4.1 CO2 emission per unit of value added
	10.1.1 Growth rates of household expenditure or income per capita among the bottom 40 per cent of the population and the total population 10.2.1 Proportion of people living below 50 per cent of median income, by age, sex and persons with disabilities 10.4.1 Labour share of GDP, comprising wages and social protection transfers
	11.5.1 Number of deaths, missing and persons affected by disaster per 100,000 peopled 11.5.2 Direct disaster economic loss in relation to global GDP, including disaster damage to critical infrastructure and disruption of basic services 11.6.1 Percentage of urban solid waste regularly collected and with adequate final discharge with regard to the total waste generated by the city 11.6.2 Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population weighted)
	12.2.1 Material footprint (MF) and MF per capita, per GDP 12.2.2 Domestic material consumption (DMC) and DMC per capita, per GDP
	13.1.2 Number of deaths, missing and persons affected by disaster per 100,000 people
	14.4.1 Proportion of fish stocks within biologically sustainable levels 14.5.1 Coverage of protected areas in relation to marine areas
	15.1.1 Forest area as a proportion of total land area 15.1.2 Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type 15.5.1 Red List Index
	16.1.1 Number of victims of intentional homicide per 100,000 population, by sex and age 16.5.2 Proportion of businesses who had at least one contact with a public official and who paid a bribe to a public official, or were asked for a bribe by these public officials, during the previous 12 months 16.6.2 Proportion of the population satisfied with their last experience of public services
	17.1.1 Total government revenue as a proportion of GDP, by source 17.1.2 Proportion of domestic budget funded by domestic taxes 17.3.1 Foreign direct investments (FDI), official development assistance and South-South Cooperation as a proportion of total domestic budget 17.4.1 Debt service as a proportion of exports of goods and services

Source: Developed by the United Nations General Assembly, adapted by the Millennium Institute for iSDG-Uganda.

For each indicator, the performance of the interventions is defined in terms of the progress towards achieving the SDGs linked to this intervention. Each SDG consists of a number of indicators with a target value agreed on by the international community. The model compares the value that each indicator has in 2030 in each scenario with the value in 2015, the base year measurement. The model then calculates the ratio of this difference to that between the target values and the values in 2015.

$$\frac{Value\ 2030_i - Value\ 2015}{Target\ - Value\ 2015}$$

where i represents a scenario

For this reason, the impact of a policy is evaluated based on how far these values are from the corresponding target values. For some indicators, the goals are absolute (e.g. for indicator 1.1.1, the goal is to reach 0, therefore performance improves as this indicator reaches zero), while others are set relative to 2015 value attainment (e.g. for indicator 8.6.1, the goal is set to halve the unemployment rate of youths from the 2015 level).

SDG attainment levels are calculated from 0 to 100%, where 100% is having the target achieved. The target attainment levels are weighted equally in the calculation of the indicator attainment levels. The indicator attainment levels, in turn, are weighted equally in the calculation of the SDG attainment levels. Finally, all SDGs are weighted equally when calculating the overall achievement of Agenda 2030. It is worth mentioning that attainment towards the goal is expressed in absolute terms in this report, not relative terms. Thus, for example, when the performance increases from 10.0% to 16.5%, the performance is 6.5% higher.

2.5.2. Identifying accelerators

SDG accelerators are leverage points where improvement in one area can trigger improved performance across multiple SDG indicators. These leverage points can take the form of development priorities or areas that are lagging. After identifying potential leverage points by using the categories of interventions, stemming from NDP III (Section 2.4.1.), investment scenarios are developed based on the categories of interventions, then tested within iSDG-Uganda to ascertain their potential impact on SDG performance. Several methods of analysis are employed to identify key leverage points as SDG accelerators through their impact on SDG performance. A combination of the results from these methods informs the selection of accelerators. These methods of analysis are framed around four questions (see Table 6):

(1) Which areas have the greatest performance increase?

The interventions developed in Section 2.4.1 through the reconciliation with NDP III are tested within iSDG-Uganda to analyze their dynamics and test their potential impact on all of the SDGs. The performance for each SDG is calculated using the method described in Section 2.5.1, along with the average of the 17 SDGs. The performance of each category of intervention is measured both separately and together. The results of this analysis are presented in Section 3.3 (Partial performance by category of intervention).

(2) Which areas experience the greatest performance relative to the investment necessary?

For those scenarios that have costs associated with them in the model (all scenarios but Gnc), the performance can be calculated relative to their cost. Some interventions are relatively less costly than others, and given their cost for implementation, could offer good returns for relatively lower investment levels even if the overall performance may not be as high as in the case of other interventions. Additionally, the return on investment patterns can vary in case of non-linear returns. For example, in the case of health coverage, it typically becomes more expensive to go from 95 to 100% coverage rather than 50 to 55% as they are more likely to be in harder to reach areas.

The calculation of the return on investment is made by dividing the performance improvement (or decline) relative to the base performance by the yearly average percentage GDP expenditure for the implementation of that scenario:

$$Return\ on\ investment_{ij} = \frac{Performance_{i,j} - Performance_{Base,j}}{\%\ GDP\ Expenditure_i}$$

where i represents a specific scenario and j represents a particular SDG

The results of this analysis are presented in Section 3.4. (Return on Investment).

$$Synergy_j = All\ Scenario\ Performance_j - \sum_{i=1}^{9} Contribution_j$$

(3) Which SDGs have the greatest synergistic return?
By combining the individual performance of each scenario, and comparing the individual scenarios with the scenario that combines all of the interventions – the All scenario, the interaction between the scenarios can be analyzed. This method is used to identify cost-effective SDG strategies and potential redundancies.

Contributions are calculated from the performance of each scenario versus the performance of the scenario which includes all interventions (scenario All). This value represents the relative performance of the scenario in question compared to the performance of the scenario that combines all interventions.

$$Contribution_{ij} = Individual\ Scenario\ Performance_{ij} - Base\ Performance_{j}$$

where i represents a specific scenario and j represents a particular SDG

The synergies between the scenarios (interventions) for each indicator are specified as one minus the linear sum of the contributions of all individual scenarios. If positive (contributions sum to more than 1), this value represents a situation where, implementing all of the scenarios together, the contribution to performance is stronger. If negative (contributions sum to less than 1), it represents a redundancy (the performance of the individual scenarios is stronger than that of the combined scenario including all the interventions). This redundancy can arise for three possible reasons. First, the return on investment on that particular goal could fall as greater performance is achieved. Second, there could be negative effects between certain scenarios. Finally, this redundancy can also occur if goals are fully achieved (e.g. reaching 100 percent).

$$Synergy_{ij} = Individual\ Performance_{ij} - (All\ Performance_{j} - Dropout\ Performance_{ij})$$

By knowing which SDGs have the highest performance increase through the interaction of different scenarios, interventions targeting those SDGs can be studied further. The results of this analysis are presented in Section 3.5 (Synergies by SDG).

(4) Which areas are most vital in supporting other areas for SDG achievement?
A second type of synergy analysis can be conducted through dropout analysis. Although interventions may not be important in and of themselves, they could be important in supporting other interventions in achieving SDG goals. In support of this question, a dropout analysis is conducted, calculating what the effects would be if one scenario is excluded. This is done by comparing the combined scenario (All) with the case where each of the nine scenarios are excluded individually.

This synergy is calculated for each intervention and goal. The dropout performance (i.e. the All scenario less the interventions in the focal scenario) is subtracted from the All performance for each goal. This is then subtracted from the individual performance (from Question 1) for the focal scenario.

$$Synergy_{ij} = Individual\ Performance_{ij} - (All\ Performance_{j} - Dropout\ Performance_{ij})$$

where represents a specific scenario and j represents a particular SDG

Accelerators can also be identified through this method. The results of this analysis are presented in Section 3.6. (Synergies by intervention category).

Table 6 - Summary of methods to identify accelerators

	Question	Method Employed to Answer	How does the question help identify SDG accelerators?
1	What area has the greatest performance increase?	Individual Scenario Performance	Identifies interventions that have strong impact across many SDGs.
2	What area experiences the greatest performance relative to the investment necessary?	Return on Investment	Identifies interventions that have a strong impact on SDG attainment relative to their cost.
3	Which SDGs have the greatest synergistic return?	Synergies by SDG	Understanding the SDGs that have stronger synergies across interventions can help identify combinations of interventions that work well together to achieve the SDGs. It can also help identify and avoid potential negative synergies.
4	Which interventions are most vital in supporting other categories of interventions for SDG achievement?	Synergies by Intervention Category	Some interventions may not have a strong effect in and of themselves, they may be important in unlocking the full potential of other interventions in achieving the SDGs.

Source: Methodology developed by the authors within the framework of SDG accelerators analysis (UNDP 2017).

3 Analysis and results

The analysis, as described in section 2.5.2, and its interpretation presented below, beginning with a summary on the progress towards the NDP III targets (Section 3.1.) then progress towards the SDGs (Section 3.2.). This section goes further into analysis and presents key findings using the SDG analysis results. While this report mainly highlights the results from the SDG Accelerators analysis, further analysis on the attainment of NDP III targets shows in Appendix 4.

> By comparing to the Base scenario, it is possible to see how NDP III can improve SDG performance.

3.1. Progress towards NDP III targets

The model tracks 23 NDP III indicators. Of the 20 indicators that have explicit targets within NDP III, 16 show positive progress towards the targets. Four indicators meet or exceed the 2025 target: GDP income per capita, exports as a proportion of GDP (as a percentage), the proportion of households dependent on subsistence agriculture (as a percentage), and domestic revenue as a share of GDP. The consistent economic growth observed in the past couple of decades is expected to continue, further contributing to the growth four indicators mentioned above. However, because of the anticipated collapse of the forestry sector in 2025 (detailed in Section 2.3.1 and further in Appendix 2), the real GDP growth and agricultural production growth rates are expected to dip in that year with a quick rebound the following year, while forest cover continues to decline. Additionally, the Gini coefficient drops slightly between 2020 and 2030. This is due to higher growth across the time period studied in industry and services, which have higher average incomes than in agriculture.

All indicators are detailed further in Appendix 4. Note that because the model takes fluctuations and internal consistencies across datasets into account (as detailed in Section 2.3.), the baseline simulation values for 2020 may differ from the actual data. This is why the analysis focuses on the trends as well as the values attained.

3.2. Progress towards the SDGs

The first analysis presented is the progress towards the SDGs with all the interventions combined. The investment patterns until 2024/25 are derived from NDP III (Table 3). Because NDP III ends at this point, two scenarios have been developed for the investment patterns between 2025/26 to 2030/31:

Optimist: In this scenario, the assumption is that after 2024/25, the average level of additional investment from the period 2020/21 to 2024/25 continues, on a percentage GDP basis.

Moderate (also referred to as "All" later in the analysis): In this scenario, the assumption is that after 2024/25, half of the average level of additional investment from the period 2020/21 to 2024/25 is maintained, on a percentage GDP basis.
These scenarios are hereafter compared with the baseline (Base) scenario, where no additional investments are made; i.e. no NDP III investments take place, so 2019 investment levels as a percentage of GDP continue to 2030. Given this, in 2020, performance levels are the same for the Optimist, Moderate and Base scenarios, as an additional investment are only just starting.

By 2025, in the case of both the Optimist and Moderate scenarios, NDP III will have been implemented, and the behaviour of the Optimist and Moderate scenarios would still be the same at this point, as there are no differences in the investment patterns until 2025. However, following the NDP III, the Optimist and Moderate scenarios diverge from each other and lead to different SDG attainment levels by 2030. By comparing to the Base scenario, it is possible to see how NDP III can improve SDG performance. The overall performance (i.e. SDG performance score from 0 to 100% where 100% is the goal attained for each SDG) is displayed in Table 7. Table 8 presents the difference between the scenario

and the Base 2020 results, to focus on the improvement resulting from the additional investment.

In 2020, progress towards the SDGs is on average 25.2%. Attainment differs depending on the SDG but is particularly high for SDGs 12 (74.7%), 17 (73.7%), 15 (69.2%) and 10 (50.3%). Attainment is particularly low for SDGs 2 (2.1%), 5 (2.9%), 11 (6.7%), 16 (6.8%), 7 (7.5%), and 9 (9.7%). Attainment is non-existent for SDG 14 throughout, as it is composed of two indicators: the proportion of fish sustainably captured and protection of marine areas (or lakes in the case of Uganda) – none of which improve their performance due to the lack of intervention specifically to these.

On average, there is an improvement in goal attainment of 10.8% between 2020 and 2030 in the Optimist scenario (35.9% compared to 25.1%), and an improvement of 10.1% in the Moderate scenario, which costs 25% less than the Optimist scenario. In the Base scenario, where no additional investment is made through NDP III, the average SDG progress in absolute terms is 7.0 %. Although none of the goals are fully achieved by 2030, in the Base scenario, SDGs 1, 3, 4, 9 and 10 experience significant improvement already without additional investments. This shows that given current growth patterns, socio-economic effects, and successes of previous National Development Plans, improvement will already take place towards the SDGs. As illustrated in Figures 2, 3 and 4, the performance of SDGs 8, 11, 13 and 15 shows a decline for all scenarios. This is related to the deterioration of environmental indicators. Concerning SDG 8, several indicators related to material consumption decline (namely, indicators 8.4.1 and 8.4.2) as Uganda's economy becomes more heavily industrialized. In the case of SDG 11, its absolute level of performance is particularly low. It is composed of indicators that include mortality and economic loss stemming from disasters, as well as urban waste collected and mean levels of fine particulate matter, all of which will likely worsen with increasing population and industrialization. At the same time, the lack of investment specifically into climate adaptation hampers progress on SDG 13, and environmental policies that are unable to keep pace with the utilization of resources contribute to the decline of SDG 15.
SDG 2 attainment may improve slowly, due to the rapid population growth, diminishing agricultural productivity resulting from climate change, further limited by slow growth in total factor productivity and land limitations.

The subsequent section presents the analysis based on the investment levels from the Moderate scenario (referred to as "All," as it includes interventions from all categories).

Table 7 - SDG performance

Performance score from 0 % to 100% (where 100 % is goal achieved) in two scenarios, Optimist and Moderate ("All") compared with 2020 base for 2020, 2025 and 2030.

	2020	2025	2025	2030	2030	2030
Goal	Base	Optimist and Moderate ("All")	Base	Optimist	Moderate ("All")	Base
1	**11.2%**	25.7%	**21.7%**	41.8%	41.1%	**34.0%**
2	**2.1%**	4.3%	**3.3%**	7.0%	6.6%	**4.5%**
3	**10.9%**	22.5%	**20.0%**	31.5%	31.1%	**28.1%**
4	**7.1%**	15.9%	**15.6%**	25.3%	25.3%	**24.8%**
5	**2.9%**	8.4%	**7.0%**	19.1%	18.8%	**16.8%**
6	**23.9%**	30.5%	**27.5%**	48.9%	45.4%	**36.1%**
7	**7.5%**	14.1%	**13.6%**	21.3%	21.1%	**20.5%**
8	**46.8%**	51.4%	**50.4%**	38.6%	36.8%	**36.2%**
9	**9.7%**	29.6%	**22.7%**	53.2%	52.0%	**40.4%**
10	**50.3%**	62.5%	**62.9%**	71.6%	71.6%	**71.6%**
11	**6.7%**	8.5%	**6.3%**	3.6%	3.4%	**2.2%**
12	**74.7%**	81.2%	**80.8%**	83.1%	83.3%	**84.1%**
13	**23.0%**	26.2%	**22.3%**	14.3%	13.7%	**8.6%**
14	**0.0%**	0.0%	**0.0%**	0.0%	0.0%	**0.0%**
15	**69.2%**	63.8%	**58.6%**	55.5%	54.9%	**51.6%**
16	**6.8%**	15.4%	**10.7%**	20.8%	19.3%	**12.6%**
17	**73.7%**	75.9%	**73.1%**	75.4%	74.2%	**72.9%**
Avg	**25.1%**	31.5%	**29.2%**	35.9%	35.2%	**32.0%**

Source: iSDG-Uganda simulation results.

Table 8 - SDG relative performance

Performance based on difference between 2020 base and Optimist and Moderate ("All") scenarios for 2020, 2025 and 2030.

	2020	2025	2025	2030	2030	2030
Goal	Base	Optimist and Moderate ("All")	Base	Optimist	Moderate ("All")	Base
1	**0.0%**	14.5%	**10.6%**	30.6%	30.0%	**22.8%**
2	**0.0%**	2.2%	**1.2%**	4.9%	4.5%	**2.4%**
3	**0.0%**	11.6%	**9.0%**	20.5%	20.1%	**17.1%**
4	**0.0%**	8.8%	**8.5%**	18.2%	18.2%	**17.7%**
5	**0.0%**	5.5%	**4.1%**	16.1%	15.8%	**13.9%**
6	**0.0%**	6.6%	**3.5%**	25.0%	21.5%	**12.2%**
7	**0.0%**	6.6%	**6.1%**	13.8%	13.6%	**13.0%**
8	**0.0%**	4.5%	**3.6%**	-8.2%	-10.0%	**-10.7%**
9	**0.0%**	19.8%	**12.9%**	43.4%	42.3%	**30.7%**
10	**0.0%**	12.1%	**12.6%**	21.3%	21.3%	**21.3%**
11	**0.0%**	1.8%	**-0.4%**	-3.1%	-3.3%	**-4.5%**
12	**0.0%**	6.5%	**6.1%**	8.4%	8.6%	**9.4%**
13	**0.0%**	3.2%	**-0.7%**	-8.7%	-9.3%	**-14.4%**
14	**0.0%**	0.0%	**0.0%**	0.0%	0.0%	**0.0%**
15	**0.0%**	-5.4%	**-10.6%**	-13.7%	-14.3%	**-17.6%**
16	**0.0%**	8.6%	**3.9%**	14.0%	12.5%	**5.7%**
17	**0.0%**	2.3%	**-0.6%**	1.8%	0.5%	**-0.8%**
Avg	**0.0%**	6.4%	**4.1%**	10.8%	10.1%	**7.0%**

Source: iSDG-Uganda simulation results.

Figures 2, 3 and 4 present the scenario analysis results graphically. Notably, in the Base scenario (Figure 2), attainment of all SDGs increases over time except for SDGs 11, 13, 15. The Moderate scenario leads to a performance increase of 3.2% averaged across all the SDGs in 2030 as compared to the Base scenario (35.2% as compared to 32.0%), while the Optimist investment scenario leads to an additional improvement of 0.7% resulting in an average performance of 35.7%. The SDG with the greatest improvement by 2030 within the Moderate scenario is SDG 9, with an additional 11.6% improvement over the Base scenario. This improvement is driven primarily by road and rail infrastructure investment. The Optimist scenario generally results in only marginal improvement over the Moderate scenario and offers the most improvement on SDG 6, given developments in water and sanitation infrastructure. SDG 12 suffers in both of the scenarios due to increased material consumption, while environmental interventions are not strong enough to mitigate the negative effects.

In the Base scenario, where no additional investment is made through NDP III, the average SDG progress in absolute terms is 7.0 %. Although none of the goals are fully achieved by 2030

Figure 3 – SDG attainment under the Base scenario

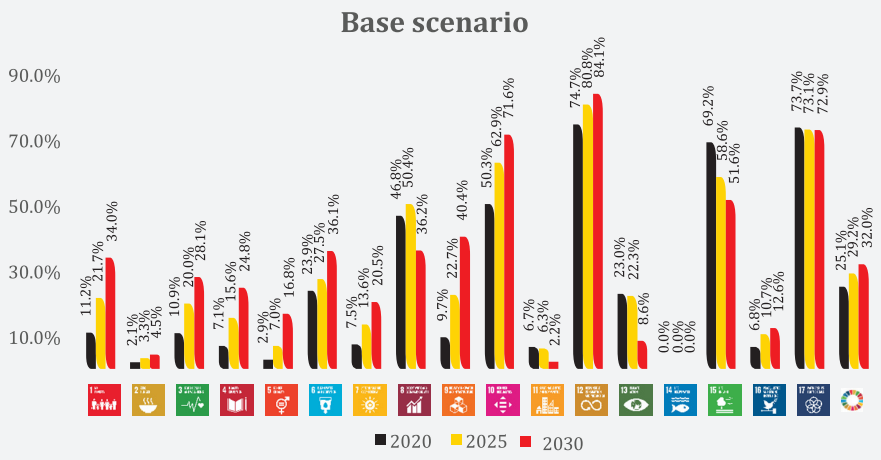


Figure 4 – SDG attainment under the Moderate scenario

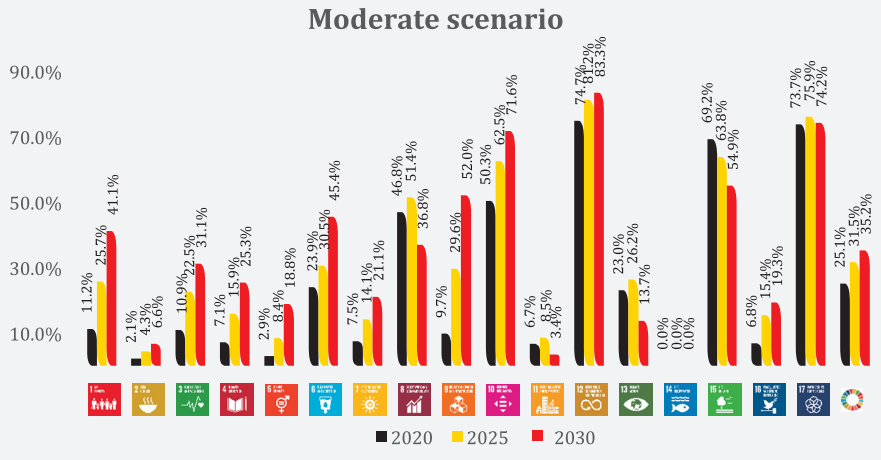
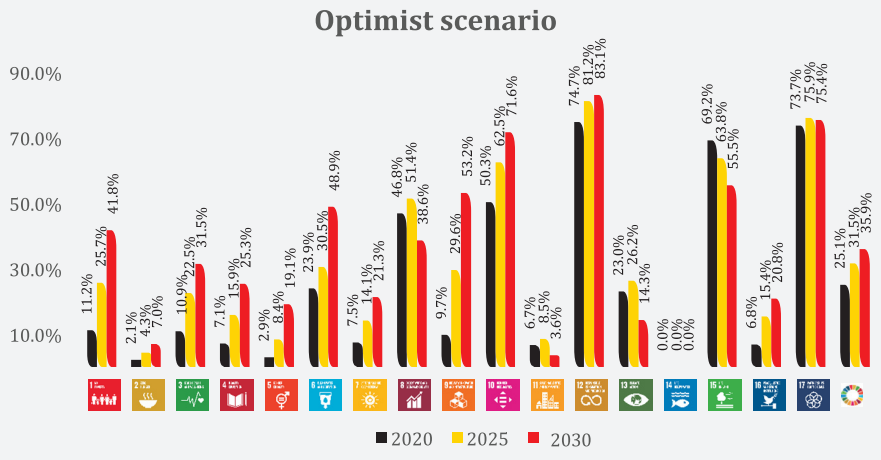


Figure 5 – SDG attainment under the Optimist scenario



3.3. Partial performance by category of intervention

In the next stage of analysis, the interventions are separated into nine broad functional categories. Table 9 shows the categories, while Table 10 shows their performance scores, and the improvement seen relative to the Base scenario in 2020 is presented in Table 11. This helps to better understand the effects that each category of intervention has on SDG attainment, and forms the basis of analysis.

NDP III improves SDG performance by an average of 3.17% (Table 11). Except for SDG 12, all goals are closer to being achieved through this investment plan. The reason for the lack of progress towards the achievement of SDG 12 is increased economic activity, which fosters material consumption. Since the rate of economic growth is higher than improvements in material consumption efficiency, overall material consumption increases, leading to a decline of SDG 12 performance.

The category of interventions with the greatest positive impact on any SDG (when implemented by itself) is Infrastructure, which leads to an attainment increase of 10.45% for SDG 9 (Table 11). This result is driven primarily by the increased access to roads in rural areas. Improvements stemming from investment into Industry also helps SDG 9 attainment, while other categories of interventions, such as Agriculture or Services may lower its performance marginally if applied in isolation

Table 9 - Interventions included in partial simulation analysis

Each separate simulation by category in partial simulation analysis (values as described in section 2.4.3.).

Intervention	Agr	Ind	Ser	Inf	Was	Hlt	Edu	Env	Gnc
Agriculture									
Public investment into agriculture (crops)	X								
Public investment into agriculture (livestock)	X								
Public investment into agriculture (conventional fisheries)	X								
Public investment into agriculture (aquaculture)	X								
Fertilizer Subsidies	X								
Sustainable Agriculture Training	X								
Irrigation	X								
Industry									
Public Investment into Industry		X							
Services									
Public Investment into Services			X						
Transportation Infrastructure									
Paved Road Infrastructure				X					
Railways				X					
Water and Sanitation									
Safely Managed Water					X				
Sanitation					X				
Health									
Health						X			
Family Planning						X			
Education									
Education							X		
Environment									
Reforestation								X	
Terrestrial Protection								X	
Climate Adaptation								X	
Governance									
Average Governance Index									X
Payment									
Foreign grants	X	X	X	X	X	X	X	X	X
Direct Taxes	X	X	X	X	X	X	X	X	X
Indirect Taxes	X	X	X	X	X	X	X	X	X
Taxes on Foreign Trade	X	X	X	X	X	X	X	X	X
Loans	X	X	X	X	X	X	X	X	X

Scenarios: Agriculture (Agr), Industry (Ind), Services (Ser), Infrastructure (Inf), Water and Sanitation (Was), Health (Hlt), Education (Edu), Environment (Env), and Governance (Gnc).

Source: Analysis conducted with iSDG-Uganda.

Conversely, the category of interventions with the greatest negative impact on an individual goal is Agriculture. It is the primary driver of the 4.15% decrease in SDG 6 attainment (Table 10) when compared with the Base scenario. The main reason for this is the growth in water consumption incurred by increased agricultural productivity. In the Return on Investment analysis (Section 3.4.), where the relative contribution to each goal attainment is analysed, Water and Sanitation is able to more than reverse the negative impact SDG 6 caused by agriculture when they are implemented simultaneously.

Investment into Industry can be a double-edged sword, and this may improve productivity, which is important for there are also negative spillovers in terms of increased material consumption and environmental effects. These effects are captured especially in SDG 8, as the goal includes both productivity and material consumption indicators.

In the implementation of Industry interventions, when analysing SDG 8, the negative effects (i.e. the increased material consumption, represented by Indicators 8.4.1., material footprint per capita, 8.4.2., domestic material consumption per capita) outweigh the positive effects (i.e. the increased production and employment, represented by Indicators 8.1.1., annual growth rate of real GDP per capita, 8.2.1., annual growth rate of real GDP per employed person, 8.5.2, the unemployment rate, and 8.6.1., the youth unemployment rate).

The highest average impact is produced by interventions belonging to the category of Governance, which has an average of 0.99 % improvement across all goals. Additionally, it has a positive effect on 12 of the 17 goals, indicating a widespread impact. Hence, Governance is identified as the first Accelerator, given its importance in ensuring efficient implementation and expansion of the tax base, and its cross-cutting effect across many of the SDGs.

Table 10 - SDG partial performance

Performance for each SDG for each intervention category (run separately) and for all interventions combined, compared with 2020 and Base, where no interventions are run.

Goal	2020	Base	Agr	Ind	Ser	Ifr	Was	Hlt	Edu	Env	Gnc	All
1	11.2%	34.0%	35.3%	34.3%	34.4%	34.7%	33.7%	35.0%	34.3%	35.5%	37.0%	41.1%
2	2.1%	4.5%	6.1%	4.5%	4.5%	4.5%	4.4%	4.5%	4.5%	4.6%	4.8%	6.6%
3	10.9%	28.1%	28.6%	28.2%	28.2%	28.7%	28.0%	28.8%	28.2%	28.4%	29.0%	31.1%
4	7.1%	24.8%	24.8%	24.8%	24.8%	24.9%	24.8%	24.8%	25.1%	24.8%	24.9%	25.3%
5	2.9%	16.8%	17.1%	16.9%	16.9%	17.0%	16.8%	17.2%	17.1%	17.0%	17.4%	18.8%
6	23.9%	36.1%	32.0%	36.5%	36.6%	36.6%	40.5%	36.6%	36.3%	37.1%	39.4%	45.4%
7	7.5%	20.5%	21.1%	20.5%	20.6%	19.3%	20.4%	20.6%	20.6%	20.7%	21.4%	21.1%
8	46.8%	36.2%	36.6%	35.7%	35.8%	33.7%	36.3%	36.1%	36.1%	33.4%	33.4%	36.8%
9	9.7%	40.4%	40.2%	41.4%	40.3%	50.9%	40.4%	40.5%	40.5%	40.7%	41.1%	52.0%
10	50.3%	71.6%	71.6%	71.6%	71.6%	71.6%	71.6%	71.6%	71.6%	71.6%	71.6%	71.6%
11	6.7%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	2.2%	3.4%	2.2%	3.4%
12	74.7%	84.1%	83.9%	84.0%	84.0%	83.8%	84.1%	84.1%	84.1%	84.0%	83.7%	83.3%
13	23.0%	8.6%	8.6%	8.6%	8.6%	8.6%	8.6%	8.6%	8.6%	13.7%	8.6%	13.7%
14	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
15	69.2%	51.6%	51.8%	51.7%	51.7%	51.7%	51.6%	51.6%	51.7%	54.4%	52.1%	54.9%
16	6.8%	12.6%	12.7%	12.6%	12.6%	12.6%	12.5%	12.5%	12.6%	12.6%	21.7%	19.3%
17	73.7%	72.9%	73.2%	72.9%	72.9%	73.4%	73.0%	72.8%	72.9%	73.0%	73.1%	74.2%
Avg	25.1%	32.0%	32.1%	32.1%	32.1%	32.6%	32.3%	32.2%	32.1%	32.6%	33.0%	35.2%

Source: iSDG-Uganda simulation results.

Table 11 - SDG partial relative performance

Difference of Performance for each SDG in each scenario compared with the Base in 2030.

Goal	Base	Agr	Ind	Ser	Ifr	Was	Hlt	Edu	Env	Gnc	All
1	0.00%	1.31%	0.36%	0.43%	0.70%	-0.22%	1.00%	0.31%	1.52%	3.01%	7.17%
2	0.00%	1.61%	0.05%	0.06%	0.01%	-0.03%	0.07%	0.03%	0.17%	0.35%	2.13%
3	0.00%	0.49%	0.12%	0.14%	0.61%	-0.05%	0.70%	0.13%	0.30%	0.96%	3.00%
4	0.00%	0.05%	0.01%	0.02%	0.06%	-0.01%	0.01%	0.28%	0.04%	0.12%	0.52%
5	0.00%	0.34%	0.08%	0.09%	0.22%	-0.04%	0.37%	0.25%	0.19%	0.63%	1.95%
6	0.00%	-4.15%	0.36%	0.49%	0.47%	4.45%	0.51%	0.19%	1.00%	3.33%	9.34%
7	0.00%	0.57%	0.04%	0.14%	-1.15%	-0.04%	0.11%	0.15%	0.27%	0.87%	0.57%
8	0.00%	0.48%	-0.48%	-0.40%	-2.42%	0.11%	-0.01%	-0.04%	-2.76%	-2.76%	0.69%
9	0.00%	-0.18%	0.96%	-0.13%	10.45%	-0.04%	0.04%	0.04%	0.31%	0.71%	11.60%
10	0.00%	-0.01%	0.00%	0.00%	-0.01%	0.00%	-0.01%	0.03%	0.00%	0.04%	0.03%
11	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.27%	0.00%	1.27%
12	0.00%	-0.15%	-0.04%	-0.04%	-0.23%	0.01%	0.04%	-0.02%	-0.10%	-0.35%	-0.78%
13	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	5.10%	0.00%	5.08%
14	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
15	0.00%	0.15%	0.01%	0.02%	0.02%	0.00%	0.01%	0.02%	2.77%	0.47%	3.28%
16	0.00%	0.12%	0.03%	0.04%	0.06%	-0.01%	-0.07%	0.02%	0.08%	9.18%	6.76%
17	0.00%	0.36%	0.02%	0.02%	0.55%	0.14%	-0.02%	0.01%	0.11%	0.21%	1.33%
Avg	0.00%	0.06%	0.09%	0.05%	0.55%	0.25%	0.16%	0.08%	0.60%	0.99%	3.17%

Source: iSDG-Uganda simulation results.

3.4. Return on investment

Using the results from the partial analysis conducted in Section 3.3. in addition to the average additional investment necessary to realize these results, it is possible to calculate the relative Return on Investment for each category of intervention. The calculation involves dividing the improvement towards SDG attainment by the average additional investment required, expressed as a percentage of GDP. Because Governance is not costed, there is no ROI shown for Governance (Table 12).

The category of intervention with the highest return on investment is Environment, with an average of 26.81% return for every percentage GDP spending. Except for SDGs 8 and 12, it contributes positively to all goals. However, further analysis will show that Environment can work in conjunction with other categories of interventions, especially Industry, to improve attainment in SDG 8. Environment interventions are especially helpful in alleviating poverty, as it reduces water usage, material consumption, the economic effect of climate change, and contributes positively to climate action and the protection of the environment and biodiversity. Also, worth noting, although SDG 6 is focused on water, the Environment interventions have a higher contribution to the attainment of SDG 6 than the Water and Sanitation interventions. Additionally, because they reduce the negative effects of climate change, Environment interventions also contribute more to SDG 1 attainment than investment directly into production areas. Because of its high return across many goals, Environment is the second accelerator.

The category of intervention offering the second-highest returns is Industry, with 6.87% improvement percentage GDP spent. Because of this, it is identified as an accelerator as well. It catalyses development and has positive spill-over effects onto other SDGs, for example, by increasing investment into water infrastructure.

Table 12 - Return on investment on SDG performance for each category of intervention

	Agr	Ind	Ser	Ifr	Was	Hlt	Edu	Env	Gnc	All
Spending (%GDP/yr)	0.29%	0.01%	0.09%	0.49%	0.13%	0.07%	0.05%	0.02%		0.99%
Goal 1	4.55	27.41	4.84	1.42	-1.68	14.36	6.54	67.43		7.27
Goal 2	5.57	3.90	0.69	0.02	-0.22	0.97	0.66	7.46		2.16
Goal 3	1.70	9.15	1.61	1.24	-0.40	10.11	2.70	13.37		3.04
Goal 4	0.18	1.09	0.17	0.12	-0.11	0.20	5.87	1.57		0.53
Goal 5	1.17	6.01	1.05	0.45	-0.30	5.33	5.29	8.54		1.97
Goal 6	-14.34	27.58	5.48	0.96	34.08	7.27	4.10	44.35		9.46
Goal 7	1.98	3.27	1.52	-2.34	-0.33	1.58	3.11	11.82		0.58
Goal 8	1.65	-37.07	-4.45	-4.94	0.88	-0.07	-0.93	-122.78		0.70
Goal 9	-0.61	73.71	-1.49	21.34	-0.34	0.61	0.94	13.83		11.76
Goal 10	-0.02	0.26	0.02	-0.03	-0.02	-0.16	0.66	0.02		0.03
Goal 11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	56.65		1.29
Goal 12	-0.51	-3.03	-0.50	-0.46	0.10	0.63	-0.33	-4.62		-0.79
Goal 13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	226.59		5.15
Goal 14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00
Goal 15	0.52	1.04	0.22	0.03	-0.04	0.12	0.38	123.25		3.32
Goal 16	0.43	2.27	0.41	0.12	-0.08	-0.95	0.45	3.41		6.85
Goal 17	1.26	1.25	0.19	1.12	1.05	-0.32	0.27	4.94		1.35
Avg	0.21	6.87	0.57	1.12	1.92	2.33	1.75	26.81		3.22

Source: iSDG-Uganda simulation results.

3.5. Synergies by SDG

This section presents the synergies by SDG analysis, showing how the investments into each category of intervention can work together towards achieving the SDGs. (Table 13).

For the majority of SDGs, there are negative synergies between the interventions. Most of these negative synergies stem from either redundancy when SDG indicators are achieved or diminishing returns as additional policies are implemented that affect the same SDG indicator. The exceptions are SDGs 6 and 8 where the overall synergies are positive. SDG 6 benefits from positive synergies as Water and Sanitation interventions help mitigate the negative effects of Agriculture interventions. SDG 8 depends on both material consumption and economic growth, two types of indicators that often work against each other. Although investment in Industry increases economic growth, it also leads to increased material consumption. Environment interventions, on the other hand, help with controlling material consumption but do not promote economic growth to the same extent. This leads to a situation where the interventions can work together to produce positive synergies and mitigate each other's negative effects. It further reinforces the idea that Environment and Industry, both accelerators, should be implemented together.

Note that Environment is the only category of interventions responsible for the achievement of goals 11 and 13. It is also the primary category of intervention driving SDG 15 performance, along with Governance.

Table 13 - Contribution to SDG performance and goal synergies

Goal	Agr	Ind	Ser	Ifr	Was	Hlt	Edu	Env	Gnc	Sum	Syn
1	18.3%	5.0%	6.0%	9.7%	-3.1%	13.9%	4.3%	21.2%	41.9%	117.3%	-17.3%
2	75.5%	2.4%	2.9%	0.5%	-1.4%	3.2%	1.5%	7.9%	16.3%	108.6%	-8.6%
3	16.4%	4.0%	4.8%	20.2%	-1.7%	23.5%	4.3%	10.0%	31.9%	113.2%	-13.2%
4	9.8%	2.7%	3.0%	11.6%	-2.7%	2.7%	53.7%	6.8%	23.8%	111.3%	-11.3%
5	17.4%	4.0%	4.8%	11.4%	-2.0%	19.1%	12.9%	9.9%	32.6%	110.1%	-10.1%
6	-44.4%	3.8%	5.2%	5.1%	47.6%	5.4%	2.1%	10.7%	35.7%	71.2%	28.8%
7	100.5%	7.4%	23.8%	-201%	-7.5%	19.3%	25.8%	46.6%	152%	167.3%	-67.3%
8	69.2%	-70.0%	-57.7%	-352%	16.7%	-0.8%	-6.4%	-402%	-401%	-1204%	1304%
9	-1.5%	8.2%	-1.1%	90.1%	-0.4%	0.4%	0.4%	2.7%	6.1%	104.8%	-4.8%
10	-18.2%	11.1%	5.9%	-43.4%	-6.9%	-37.1%	104%	1.5%	122%	138.8%	-38.8%
11	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%	0.0%	100.3%	-0.3%
12	19.0%	5.0%	5.8%	29.2%	-1.6%	-5.7%	2.0%	13.3%	44.6%	111.7%	-11.7%
13	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%	0.0%	100.3%	-0.3%
14											
15	4.6%	0.4%	0.6%	0.5%	-0.1%	0.2%	0.5%	84.6%	14.4%	105.7%	-5.7%
16	1.8%	0.4%	0.5%	0.8%	-0.2%	-1.0%	0.3%	1.1%	136%	139.7%	-39.7%
17	27.4%	1.2%	1.2%	41.4%	10.4%	-1.7%	1.0%	8.4%	15.9%	105.2%	-5.2%
Avg	1.9%	2.8%	1.6%	17.3%	7.9%	5.1%	2.6%	19.0%	31.1%	89.4%	10.6%

Source: iSDG-Uganda simulation results.

3.6. Synergies by intervention category

This section assesses the synergies between different categories of intervention by conducting a dropout analysis to complement the synergies by SDG analysis presented in the previous section. The results of the dropout analysis are presented in Table 14, which shows the effects obtained should one category of intervention be excluded. Figure 6 combines this with the return on investment analysis shown in Section 3.4, where the cost of the intervention is plotted on the X-axis, while the direct effect (from Table 11) and the synergy effect (from Table 14) are on the Y-Axis. In this way, the graph shows the relative return on investment, where projects at or above the trend lines tend to have greater returns.

In SDGs 6 and 8 the overall synergies are positive. SDG 6 benefits from positive synergies as Water and Sanitation interventions help mitigate the negative effects of Agriculture interventions.

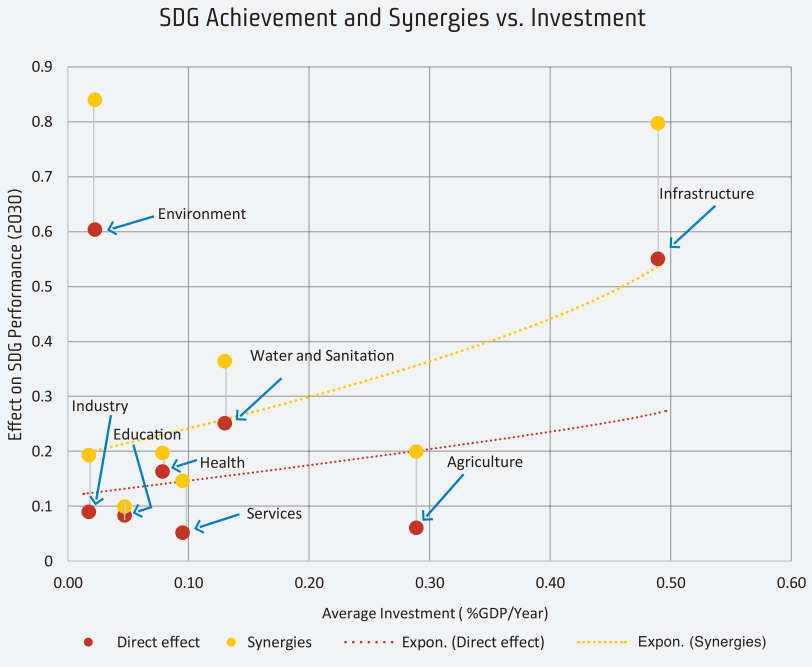
Table 14 - Dropout analysis
Larger positive numbers demonstrate greater losses when run in conjunction with other categories of interventions.

Goal	No Agr	No Ind	No Ser	No Ifr	No Was	No Hlt	No Edu	No Env	No Gnc
1	1.2%	0.4%	0.5%	0.8%	-0.2%	0.9%	0.2%	1.4%	1.6%
2	1.6%	0.1%	0.1%	0.0%	0.0%	0.1%	0.0%	0.1%	0.2%
3	0.5%	0.2%	0.2%	0.7%	0.0%	0.7%	0.1%	0.3%	0.5%
4	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.3%	0.0%	0.1%
5	0.4%	0.1%	0.1%	0.3%	0.0%	0.4%	0.2%	0.2%	0.4%
6	-2.5%	0.8%	0.9%	0.7%	6.5%	0.9%	0.3%	1.4%	2.5%
7	0.5%	0.1%	0.2%	-1.1%	0.0%	0.1%	0.1%	0.2%	0.5%
8	1.3%	0.8%	0.8%	1.4%	-0.2%	0.3%	0.4%	1.4%	2.9%
9	-0.1%	0.9%	-0.2%	10.3%	0.0%	0.0%	0.0%	0.1%	0.0%
10	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
11	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%
12	-0.2%	-0.1%	-0.1%	-0.3%	0.0%	0.0%	0.0%	-0.1%	-0.2%
13	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.1%	0.0%
14	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
15	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.8%	0.3%
16	0.1%	0.0%	0.0%	0.1%	0.0%	-0.1%	0.0%	0.1%	6.5%
17	0.4%	0.0%	0.0%	0.6%	0.2%	0.0%	0.0%	0.1%	0.1%
Avg	0.2%	0.2%	0.1%	0.8%	0.4%	0.2%	0.1%	0.8%	0.9%

Source: iSDG-Uganda simulation results.

As Figure 6 illustrates, Environment interventions have low costs and high returns, while Infrastructure interventions stand out as having high costs and high returns. The remainder of interventions vary in their costs and returns, but several demonstrate high levels of performance relative to their costs, such as water and sanitation. The high synergies seen with Agriculture, Environment and Industry relative to their cost also further reinforce their identification as accelerators.

Figure 6 – Value invested vs direct effect and synergy effect



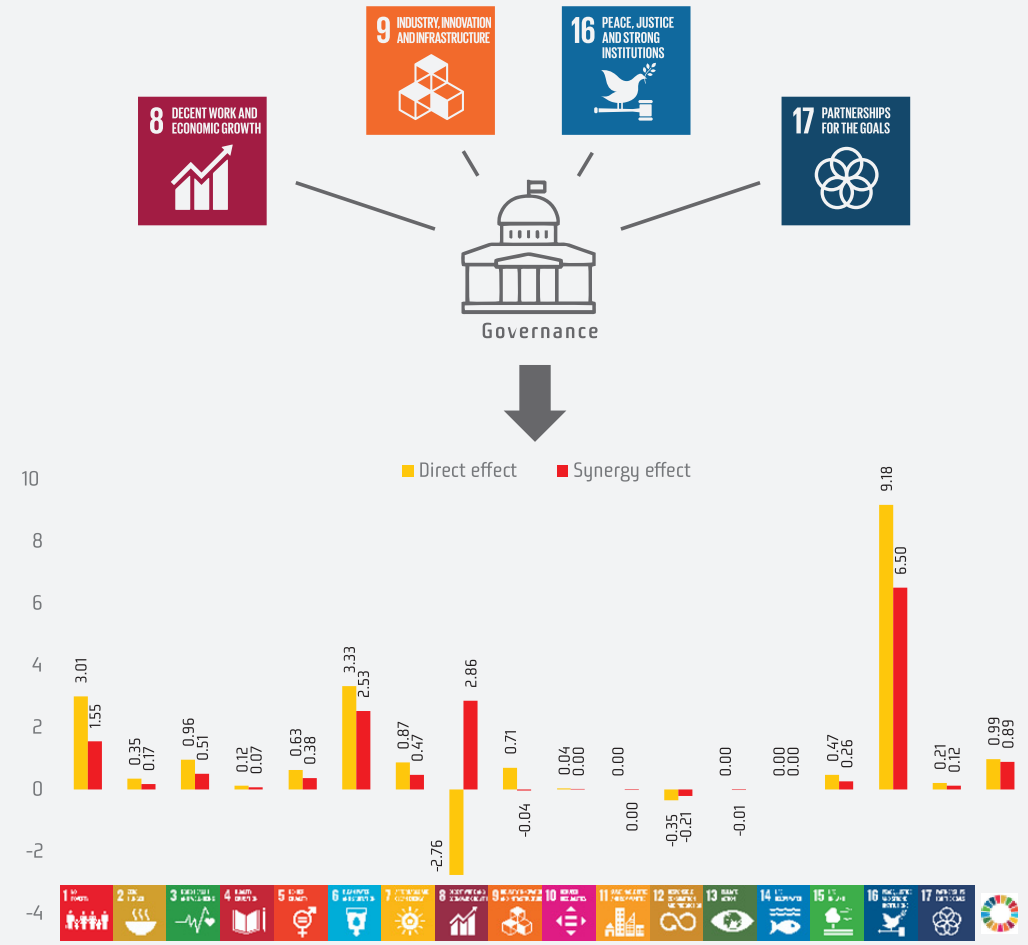
Value invested (x-axis) vs direct effect (red on the y-axis) and synergy effect (yellow on the y-axis) of each category of intervention. The corresponding synergy for each direct effect is represented by the yellow dot directly above the direct effect (red dot).

3.7. Accelerators

The analytical process identifies three Accelerators: Governance, Industry and Environment. These are described in further detail in the subsections below and in Figures 7, 8, and 9, respectively. The charts in Figures 7, 8 and 9 present the direct (yellow bars) and synergistic (red bars) effects of investment in each respective intervention category on SDG attainment. In cases where the red bar is higher than the yellow bar, this indicates that the intervention's synergistic effect is greater than the direct effect for the SDG in question. These Accelerators, described further below, constitute critical investment areas for efficient and effective progress toward SDGs.

Governance contributes to SDG 1 and SDG 6, facilitating private investment to bring people out of poverty, and improving access to water supply and sanitation facilities.

Figure 7 – The direct and synergy effects of Governance interventions on SDG attainment



3.7.1. Governance

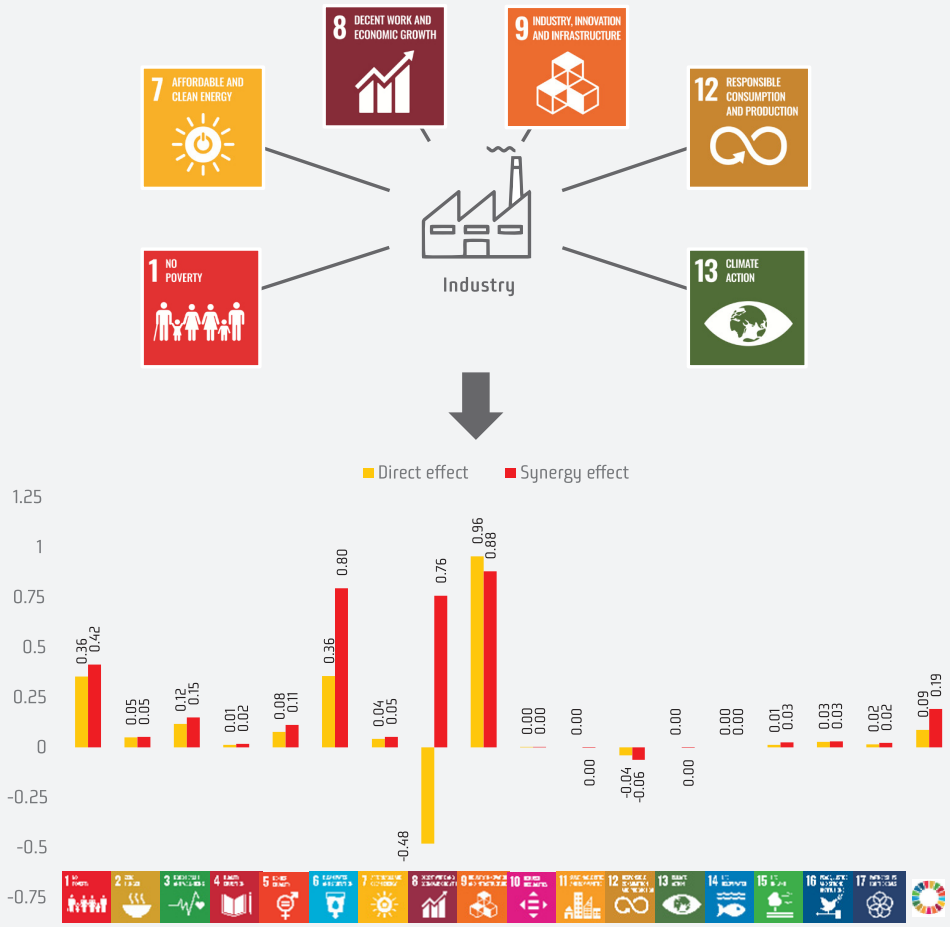
As illustrated in Figure 7, good governance holds the key to the implementation of public expenditure and the facilitation of private investment. This leads to increased overall productivity and a significant improvement on multiple SDGs. The interventions covered by Governance include the programmes: Private Sector Development; Community Mobilization and Mindset Change; Governance and Security Programme; Public Sector Transformation, Human Capital Development, and Development Plan Implementation. The key goals targeted by these programmes are SDGs 8, 9, 16, and 17, however, the effects transcend goals.

Interestingly, Governance contributes negatively to SDG 8 when implemented alone; however, in conjunction with other categories of interventions, Governance is highly beneficial for SDG achievement, indicating a strong synergistic effect. It is also practically the sole driver of achievement towards SDG 16 but does not contribute significantly to SDGs 9 and 17. In fact, Industry drives SDG 9 and multiple categories of interventions contribute equally to SDG 17 .

In addition to the SDGs mentioned above, Governance also contributes to SDG 1 and SDG 6, facilitating private investment to bring people out of poverty, and improving access to water supply and sanitation facilities. In light of these attributes, good governance can have a widespread positive effect on SDG attainment. Because of its positive effect on multiple SDGs, it works favourably as an Accelerator.

The NDP III programmes that are related to Governance aim to reinforce community structures, increase security, and encourage private sector investment through the overhaul and simplification of government processes and regulations. The achievement of these aims would serve well as a catalyst for SDG attainment.

Figure 8 – The direct and synergistic effects of Industry interventions on SDG attainment

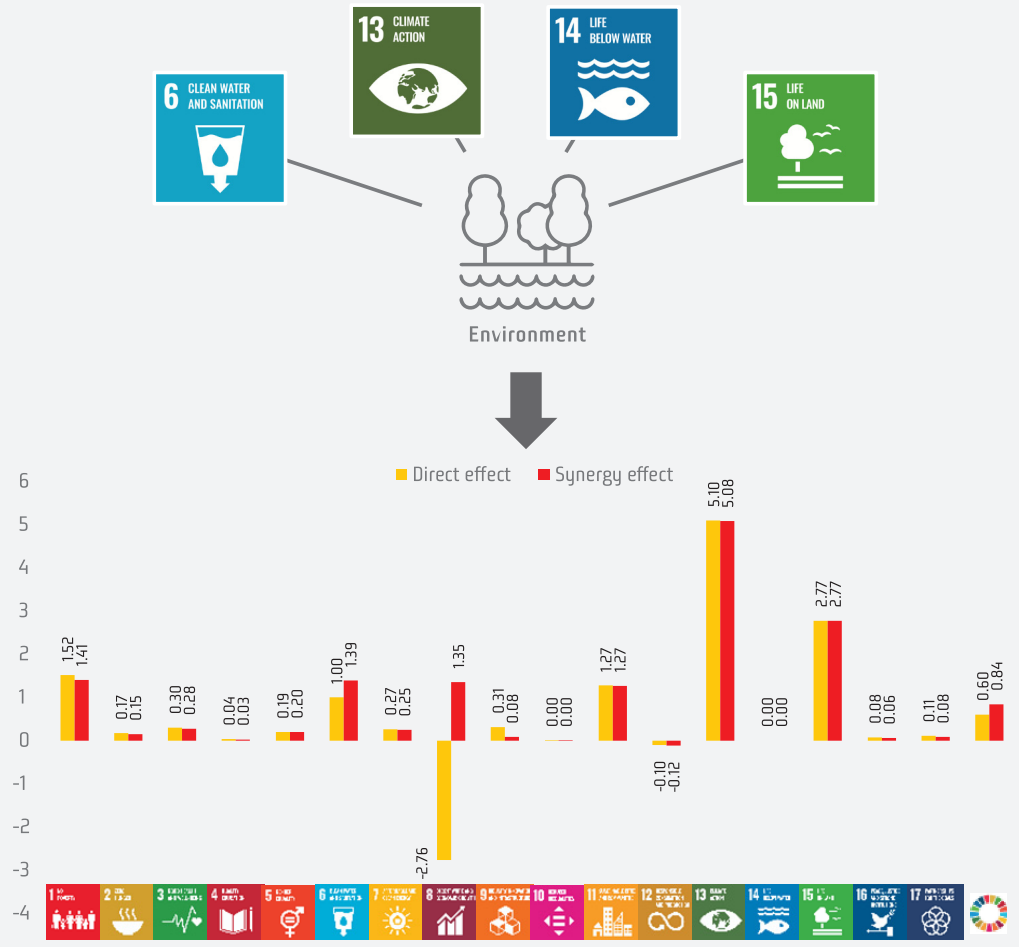


3.7.2. Industry

Public investment into Industry specifically targets SDGs 1, 7, 8, 9, 12 and 13, and is accomplished through the Mineral Development, Sustainable Development of Petroleum Resources, and Manufacturing Programmes, along with the Agro-industrialization Programme, which aims to increase agro-processing.

Figure 8 presents the contribution of Industry interventions to SDG attainment. Although the additional derived cost for this intervention category as compared with the base year is relatively low when compared to other categories of interventions, it does have a profound effect on SDGs 1, 6 and 9 in particular. This is evident in its ROI, illustrated in Figure 6. This result, in combination with its synergistic effect, indicates that Industry is among the intervention categories key to achieving SDG 8. In addition to the core manufacturing programmes that include both light and heavy manufacturing industries, the agro-processing aspects of the Agro-industrialization Programme help reinforce agricultural production by providing a source of stable demand for agriculture. This, in turn, also helps augment industrial production as seen through increased synergies when these are implemented together. Also, Industry investment can have a positive effect on health outcomes (SDG 3) and reduce inequalities (SDG 5). However, note that Industry interventions should be implemented in conjunction with others, particularly Environment, to help mitigate some of the negative spillovers. Because of its high ROI and its synergy with other categories of interventions in achieving the SDGs, Industry is an Accelerator.

Figure 9 – The direct and synergy effects of Environment interventions on SDG attainment



3.7.3. Environment

The Climate Change, Natural Resources, Environment and Water Management Programme is the primary driver for the attainment of SDGs 11, 13 and 15. Additionally, interventions associated with this programme help significantly in the mitigation of the negative consequences of increased industrialization and economic output stemming from Industry and Governance-related programmes.

As presented in Figure 9, it is evident that the Environment interventions work synergistically with Industry and Infrastructure specifically. As the economic and social effects of climate change become increasingly prominent, adaptation, such as building emergency water reservoirs or developing alternative energy sources, would contribute substantially to the mitigation of the negative consequences of climate change. The high return on investment and overall impact on SDGs of the Environment category of interventions, along with the mitigation of the negative consequences of added industrialization makes it an Accelerator.

3.8. Other pertinent areas

Although this analysis has identified Governance, Industry, and Environment as key Accelerators, there are certain areas that, although not Accelerators, are also important to the achievement of certain SDGs. Namely, interventions that target Human Capital Development, Infrastructure and Agriculture.

3.8.1. Human Capital Development

Human Capital Development is vital to the attainment of the SDGs. This encompasses Health, Education and Water and Sanitation interventions, which provide the foundation for achieving prosperity. These policies ensure that social protection and a social safety net are available to as many as possible. Health interventions contribute significantly to multiple SDGs, notably SDGs 1, 3, 5 and 6, and contribute to the progress of SDG 7 as well. They also reinforce the effect of Water and Sanitation interventions (see Figures 10-12).

Though the effects of the investments in Education are small, they gain importance into the future as current students begin entering the labour force. While the effects of investments into Education on SDG attainment are not as significant as that of other categories of interventions within the timeframe of 10 years (see Figure 10), they have positive synergies with other interventions and will begin to prepare the labour force for the predicted future economic changes. It is well known that the time delay for seeing benefits of investment in education is longer than that of other shorter-term investments.

The effect of the Human Capital Development Programme is intertwined with other programmes in the attainment of SDGs, and a forward-looking National Development Plan will put into consideration these as an investment towards the Vision 2040 targets as well.

Figure 10 – Direct and synergy effects of Health interventions on SDGs

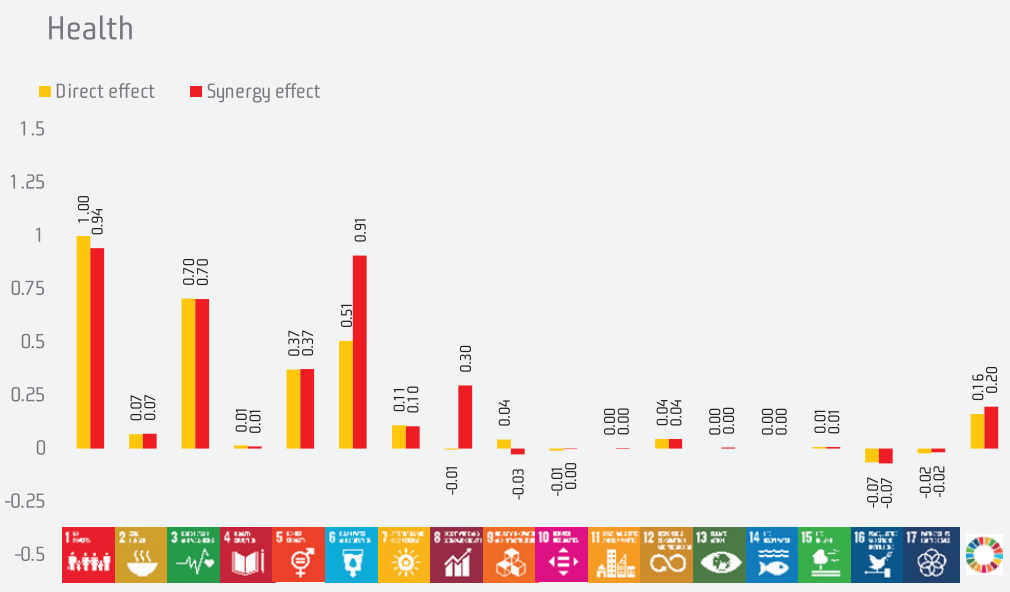


Figure 11 – Direct and synergy effects of Water and Sanitation interventions on SDGs

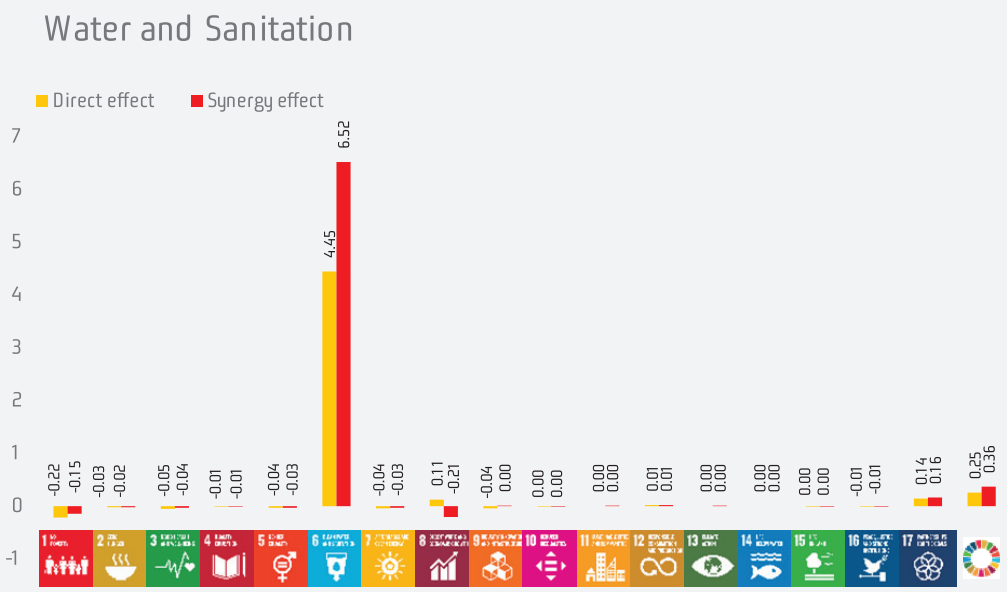
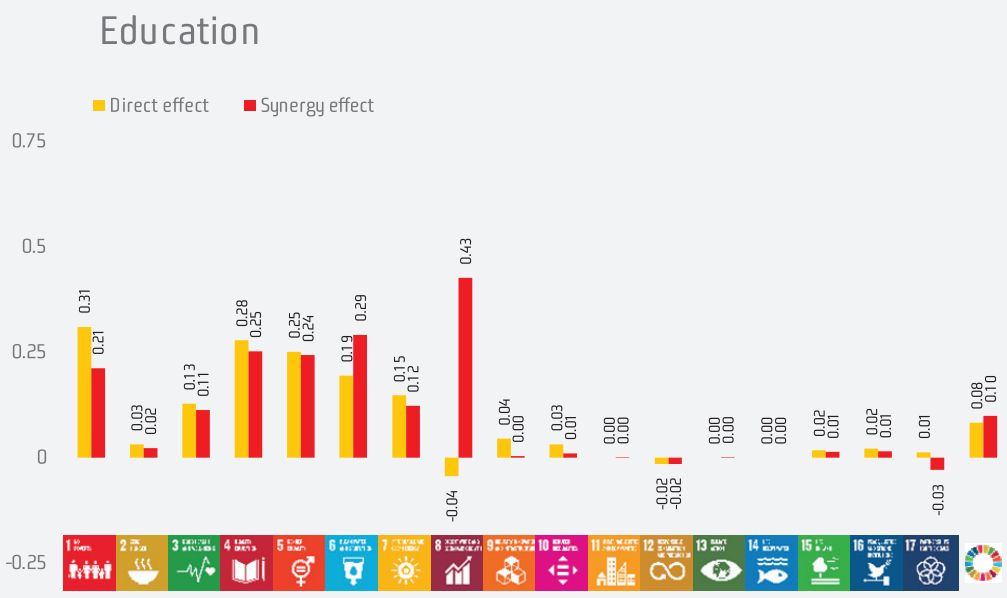


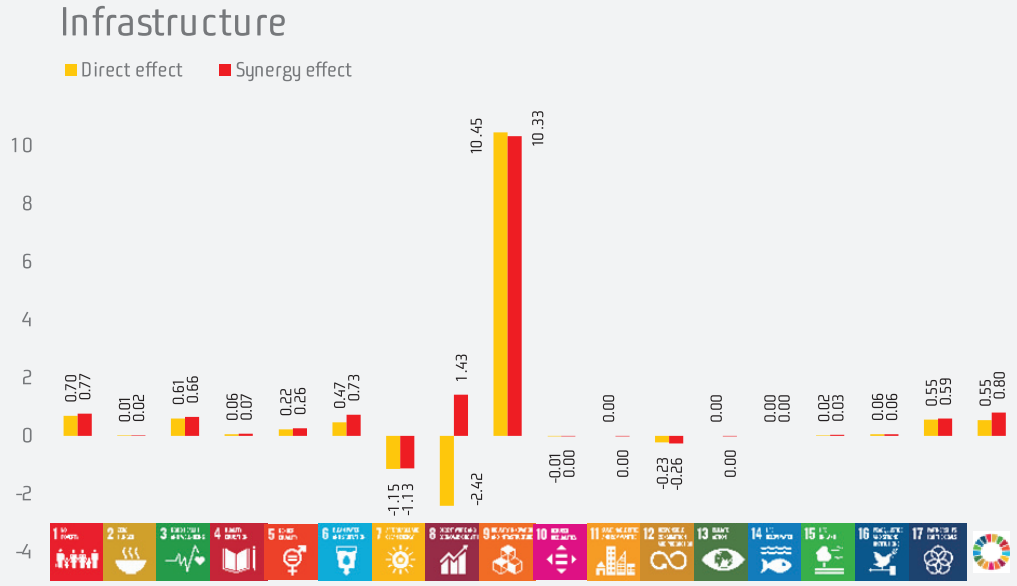
Figure 12 – Direct and synergy effects of Education interventions on SDGs



3.8.2. Infrastructure

Infrastructure interventions, primarily included in the Integrated Transport Infrastructure and Services Programme, and in the Agro-Industrialization, Mineral Development, Sustainable Development of Petroleum Resources, Private Sector Development, Manufacturing, and Sustainable Urbanization and Housing Programmes, are critical for SDG 9 (see SDG 9, Figure 13). Effects on other SDGs tend to be spillover in nature, with the impact reinforced by other interventions within these programmes, such as agriculture interventions in Agro-Industrialization or Industry capital investment for Mineral Development.

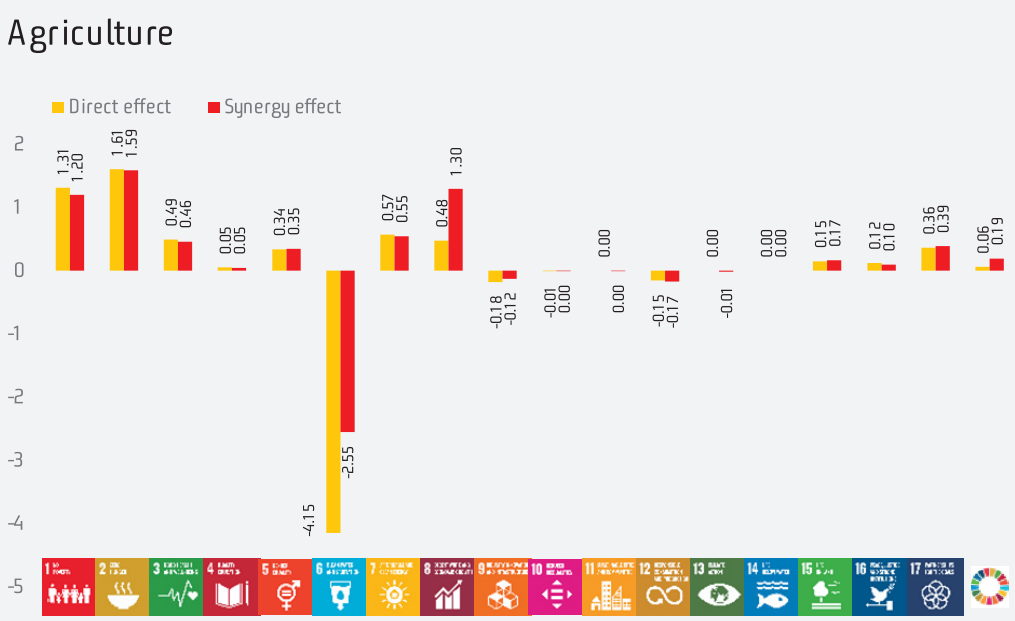
Figure 13 – Direct and synergy effects of Infrastructure interventions on SDGs



3.8.3. Agriculture

Lastly, Agriculture interventions, entirely contained within the Agro-industrialization Programme, are also fundamental to the attainment of many SDGs. In particular, Figure 12 demonstrates that Agriculture interventions support the achievement of (a) SDG 1, as it promotes production in the agricultural sector, which accounts for a large part of existing employment, especially of low-wage earners; (b) SDG 2, as agricultural production increases food security; and (c) SDG 8, as the increase in agricultural production does not necessitate as much added material consumption as increases in industry production as a result of Industry interventions. Agriculture interventions do, however, lower the attainment level of SDG 6 significantly, as they increase water usage (see SDG 6, Figure 14). However, this is counteracted by Water and Sanitation interventions in the Sustainable Urbanization and Housing, Integrated Transport, Infrastructure and Services, and Regional Development Programmes.

Figure 14 – Direct and synergy effects of Agriculture interventions on SDGs

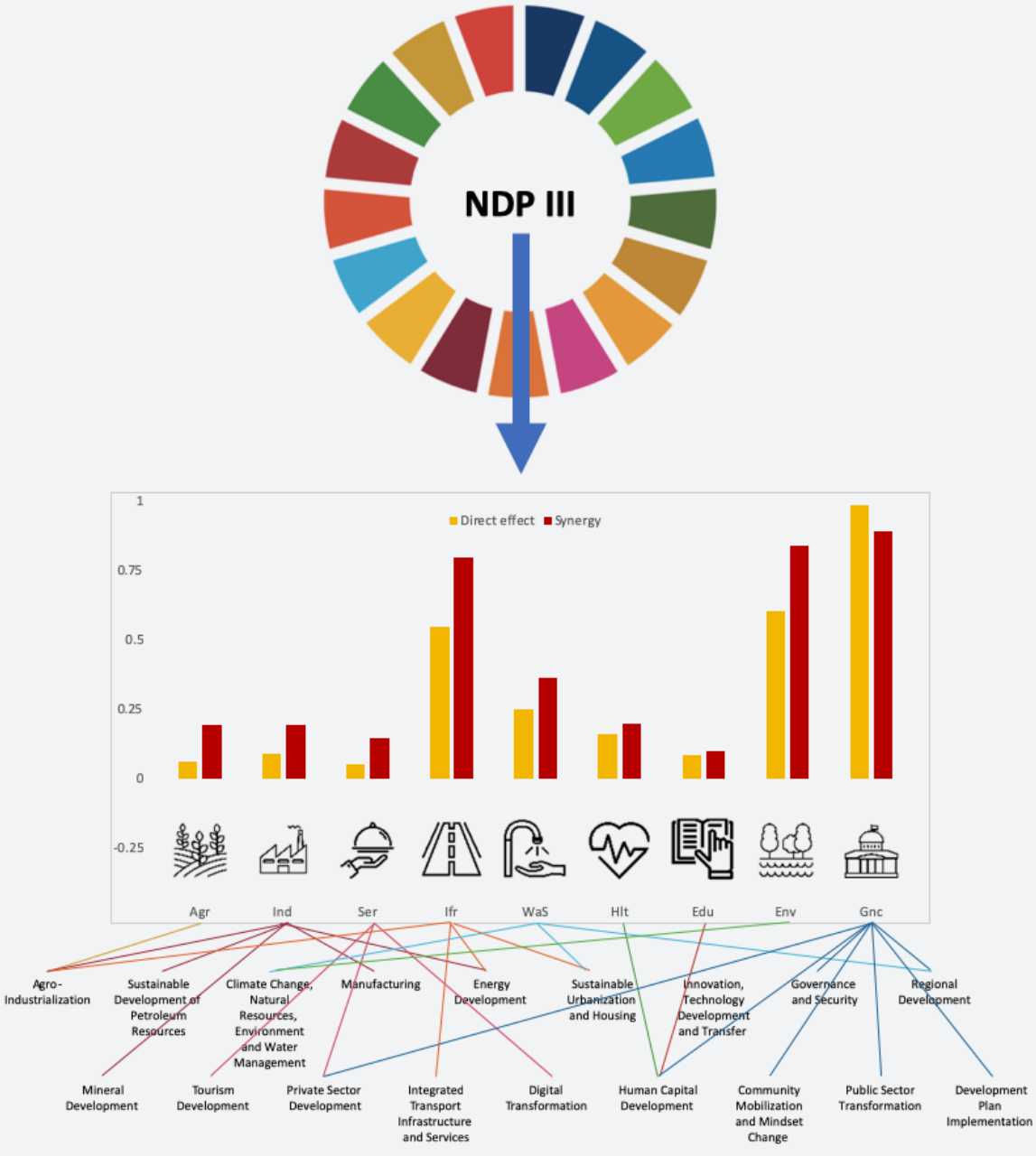


3.9. Integration

By themselves, the interventions tested can effectuate change and progress towards the SDGs; however, when implemented together, the interventions reinforce each other, thus increasing progress towards the SDGs even more. As illustrated in Figure 15, all intervention categories, except for Governance, have stronger synergy effects than direct effects. In this figure, the direct effects and the synergy effects (averaged across all the SDGs) are shown for each category of intervention, along with their related NDP III programmes. Notably, the Agro-Industrialization, Climate Change, Natural Resources, Environment and Water Management, Sustainable Urbanization and Housing, Energy Development, Human Capital Development, Regional Development and Private Sector Development Programmes have linkages to many of the high performing interventions.

By themselves, the interventions tested can effectuate change and progress towards the SDGs; when implemented together, the interventions reinforce each other

Figure 15 – Direct and synergy contributions
Contributions towards SDG attainment of intervention categories, along with their related NDP III programmes.



4 Summary of Findings and Conclusions

4.1. Key findings

To summarize, this report has used the iSDG-Uganda model to identify the effect of NDP III interventions on the achievement of SDGs. It has identified SDG Accelerators – priority investment areas that increase SDG performance. The analyses conducted for the purposes of this report have also identified the effect of NDP III interventions on achieving NDP III and Vision 2040 targets (results in Appendix 4).

> The programmes proposed in NDP III should be implemented together because of synergies observed in their implementation.

Analysis of the results have identified the intervention categories of Governance, Environment, and Industry as Accelerators for SDG attainment.

- Governance interventions in NDP III have the highest overall impact on the SDGs (an average of 0.99%) and a positive effect on 12 of the 17 SDGs.
- Environment interventions have the highest average return on investment (26.81% improvement for every percentage of GDP spending) and a positive effect on 14 of the 17 SDGs.
- Industry interventions have the second highest average return on investment (6.87% improvement for every percentage of GDP spending) and a positive effect on 12 of the 17 SDGs.
- Environment and Industry work synergistically together to eliminate their negative effects on SDG 8 in particular.

Additionally, interventions in Human Capital Development (which includes Health, Education and Water and Sanitation), and Infrastructure and Agriculture categories of interventions, are important for the achievement of specific SDGs. The programmes proposed in NDP III should be implemented together because of synergies observed in their implementation.

The NDP III is a well-rounded plan that targets overall sustainable development. For the attainment of both the SDGs and the goal of NDP III, there is no silver bullet, and the cross-cutting programmes of the NDP III work harmoniously together. Because of its integrated nature, where programmes cross many investment areas, it should be implemented in its entirety.

4.2. Outlook

Along with the analysis of NDP III and its effects on sustainable development in Uganda, this project has developed a fully calibrated model reflective of key sector dynamics. This model includes an easy-to-use interface that allows introduction of different combinations of interventions to show their effects on SDG and other indicator achievements. It is an effective tool to facilitate discussion between stakeholders with different perspectives and show trade-offs and synergies between different policies.

Additionally, iSDG-Uganda can serve as a starting point for more detailed analysis of specific sectors in the future, by constructing specialized modules for production sectors such as tourism, oil or mining. This could also be done by extending existing modules, such as the electricity generation module, to include further details on elements such as microgrids, or extending the agriculture module to add on the effects of Agro-industrialization.

Further disaggregation of the model can help reveal the differing risk exposures to global forces of the various sectors of the economy, as well as reveal the areas with the highest potential for creating prosperity. The process of construction of such modules can itself become an exercise to develop a shared understanding between actors from various sectors and overcome silo mentality. Whether future development plans have a sectoral or cross-sectoral focus, they can be developed and communicated through a central node, ensuring that they share the same data and assumptions.

Furthermore, in late 2019 the Uganda Bureau of Statistics released rebased GDP figures that provided an updated view on the structure of Uganda's economy in recent years. However, due to limitations in applying the new methodology to pre-2008 figures, this report has used the previous GDP figures with mathematical correction to ensure the figures are as similar as possible to the rebased figures. As further data becomes available with the rebased GDP, these figures can begin to be introduced into the model, thus refining results to be more in line with current production sector definitions. Furthermore, policy makers can test different development paths during the implementation of NDP III, thus providing them with additional feedback before the implementation of specific projects. In addition, the continued use of iSDG-Uganda can transform the model from being the methodology behind the analysis for this report, into becoming a familiar tool for the policy makers that plays a key role in the development of future plans from the outset. Thus, iSDG-Uganda can make it easier to manage the development of such plans, by clarifying key focus areas early on in the process.

In times of crisis, such as with the COVID-19 pandemic, the ability to quickly simulate various scenarios becomes increasingly important, as the longer-term impacts and consequences of different scenarios can be rapidly tested within the model. The model can, therefore, serve as an additional tool for the development of effective policies to mitigate the effects of the pandemic. Beyond responding to crises by gaining a systemic understanding of such crises, effective and cost-efficient solutions can be adopted to increase the resilience of social and economic systems to future shocks, while protecting finite environmental resources. Additionally, systemic issues can be addressed by using the model to plan for potential future crises and develop policy responses that enhance resilience to future shocks, fostering inclusive, equitable and sustainable development.

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The NDP III is a well-rounded plan that targets overall sustainable development. For the attainment of both the SDGs and the goal of NDP III, the cross-cutting programmes of the NDP III work harmoniously together.

Appendices

Appendix 1: Data sources and assumptions

This section summarizes the data sources and highlights major assumptions made for the data. The primary sources of data are summarized in Table A.1.

Table 15 - A1 - Primary sources of data used in the iSDG-Uganda by module

Module	Sources
Population	NPA, 2018; UBOS; UNPOP
Fertility	1995 DHS; 2000-2001 DHS; 2006 DHS; 2011 DHS; 2016 DHS; UNPOP
Mortality	2011 DHS; EMDAT; UNPOP; WDI
Education	Barro Lee; Human Development Report 2019; WDI
Health	2006 DHS; 2011 DHS; 2016 DHS; WDI; WHO
Road and Rail Infrastructure	EMDAT; FAO; IMF; Uganda Ministry of Works and Transport: Annual Sector Performance Report FY 2017/2018; WDI
Vehicles	IMF Statistical Appendix 1998; UNPOP;UNSD;WDI
Employment	ILO; UBOS; WDI
Income distribution	WDI
Poverty	UNDP; WDI
Agriculture	FAO; UNDP; WDI
Industry	WDI
Services	WDI
Aggregate Production	IMF; FAO; UNSD; WDI
Investment	WDI
Households	IMF; WDI
Government	IMF; Ministry of Finance; National Forestry Authority Yearly Reports 2012-2016; UNSD; WDI;
Governance	WDI; WGI
Finance	IMF; Ministry of Finance; WDI
Balance of Payments	IMF; WDI
Land	FAO; NDP III Draft 1; National Forestry Authority Yearly Reports 2012-2016; State of Uganda's Forestry 2016; Water and Environment Sector Performance Report 2019; WDI
Soil	FAO
Water Demand	Aquastat (FAO)
Water Supply	Aquastat (FAO); NPA, 2017; Global Historical Climatology Network (data processed by University of Delaware, Department of Geography); Water and Environment Sector Performance Report 2017; WDI
Final Energy Consumption	UNSD; WDI
Electricity Generation	EIA; UNSD
Primary Energy Supply	UNSD
Material Consumption	EIA; GMF; Wiedmann et al., 2015; UNSD;
Emissions and Waste	EIA; IPCC, 2006; FAO; WDI
Biodiversity	LVFO; UNSD; WDI

Population

Population levels indicated by UNPOP World Population Prospects exceeds the levels indicated by UBOS by several million people. UBOS and the Demographic Dividend Report (DDR) for total population values is used. The figures by age-group from UNPOP are scaled down to match the total population figures indicated by UBOS and DDR.

Fertility

Figures for the total fertility rate are taken from Demographic and Health Surveys (1995, 2000-2001, 2006, 2011, 2016); meanwhile, figures for the fertility distribution by age group are taken from UNPOP World Population Prospects.

Health

The indicator Births attended by skilled health staff (% of total) from WDI is used as a proxy for average access to basic health care. Figures on Body Mass Index from the 2006 and 2011 Demographic and Health Surveys are used to determine the prevalence of undernourishment. The 1995 and 2000-2001 Demographic and Health Surveys do not contain figures on Body Mass Index. The assumption is therefore made that the prevalence of undernourishment during the period 1995-2006 changed proportionally with the prevalence of malnutrition.

Road and rail infrastructure

Data on total road network length is taken from Uganda Ministry of Works and Transport: Annual Sector Performance Report FY 2017/2018. Historical values for earlier years are estimated based on recurrent expenditures for roads (IMF Statistical Appendix 1998), and GIS (Geographic Information System) data on artificial surfaces (FAOSTAT). The proportion of paved to unpaved roads is estimated based on a few assumptions: Firstly, that all cities have the same ratio of paved to unpaved roads as Kampala; secondly, that all district and community access roads can be regarded as unpaved (this last assumption is based on discussion at a workshop with government experts that took place in November).

Employment

Data on employment is sourced from ILOSTAT. Disaggregated agricultural data is not available for crops, livestock, fishing and forestry, respectively. The retained assumption is that employment is proportional to the production shares of these areas within agriculture. Furthermore, because ILOSTAT has estimated the total employment figures based on population figures from UNPOP, and because the total population figures are scaled down to match the figures from UBOS, the employment figures are also scaled down for each area.

Agriculture

A major shift in the agricultural data supplied by FAOSTAT is visible in the year 2008 for areas harvested and production figures of various crops. This is due to the 2008 Agricultural Census, which properly assessed the areas harvested and the production in tonnes for various crops and livestock. The previous set of Agricultural Censuses took place in the period 1990-1993 and are used to define the assumed harvested areas and production levels since 1990.
It is assumed that the major shifts in 2008 occurred due to accumulating errors in estimation since 1990, in lack of repeated measurements. The data has therefore been adjusted in the manner shown in the graphs A.1-A.2 below.

Figure 16 - A1 - Production of beans in tonnes, original and adjusted values

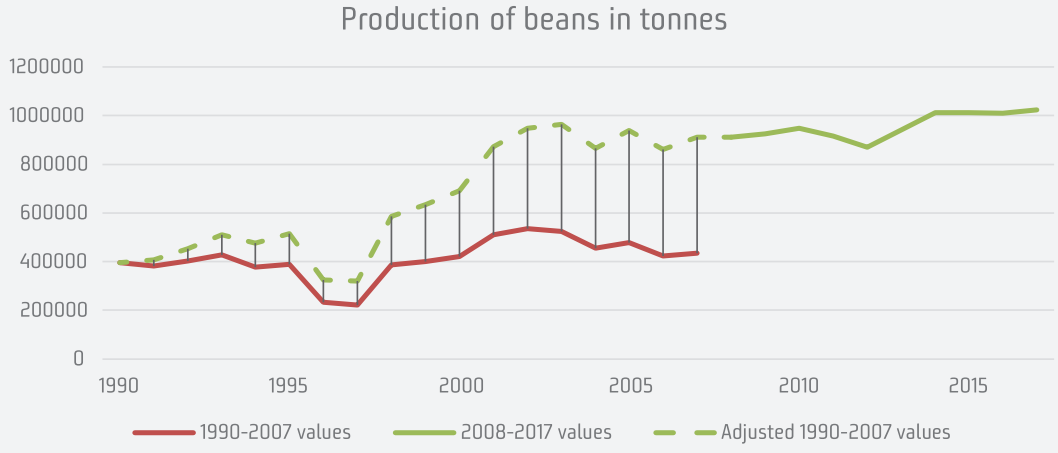
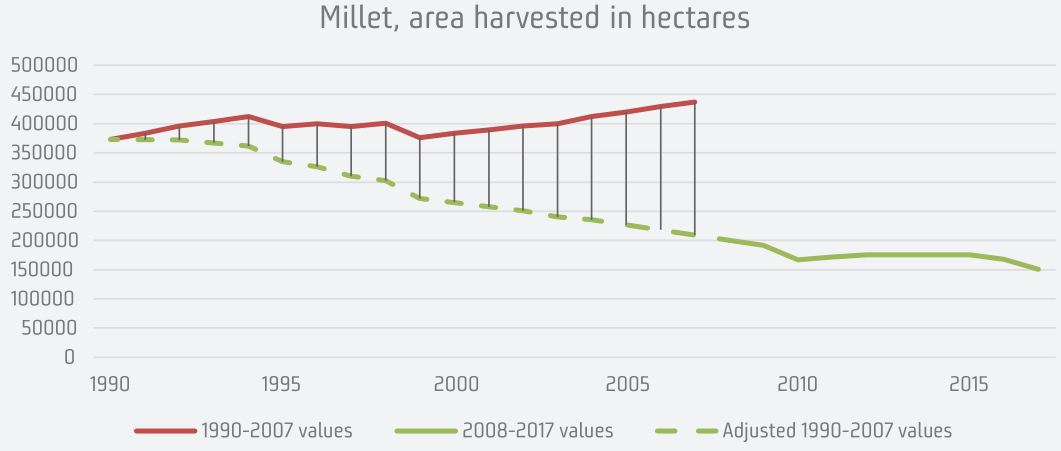


Figure 17 - A2 - Millet, area harvested in hectares, original and adjusted values



As Figures A.1 and A.2 show, the large gaps from 2007-2008 are bridged by adjusting the figures to 1990, while preserving the variation of the years in between.

Land

The fraction of forest lands protected is based on figures from the Water and Environment Sector Report 2019. Further differentiation is made between those forests that are formally protected, and those forests that are effectively protected; only the latter category is assumed to be able to withstand biomass demand pressures completely. Based on data from State of Uganda's Forestry 2015, and Water and Environment Sector Report 2019, it has been assumed that no private forests are effectively protected, and of the public forests, only those under the management of the Uganda Wildlife Authority are effectively protected. The cost of reforestation per hectare is derived from the first draft of NDP III, based on figures for trees/hectare, and reforestation cost/tree.

Water demand

Agriculture water withdrawal is not available separately for irrigation and livestock. They are therefore estimated to be proportional to the production shares of crops and livestock.

Water supply

Instead of the SDG indicators access to safely managed water source and access to safely managed sanitation facility, the analysis relies on figures for access to improved water sources and access to improved sanitation facility respectively, which is the previous definition used for the SDGs. The differences between the figures for the old and new indicators are substantial, and the figures for the old indicators are in line with the figures and definitions for access to improved water source and sanitation, from the Water and Environment Sector Report 2019.

Final energy consumption

The values for oil consumption in various areas (UNSD) for the period 1995-2002 were indicated as not reflective of reality during the workshop in November 2019. These are adjusted in accordance with the comments received while maintaining the overall oil consumption figures.

Biodiversity

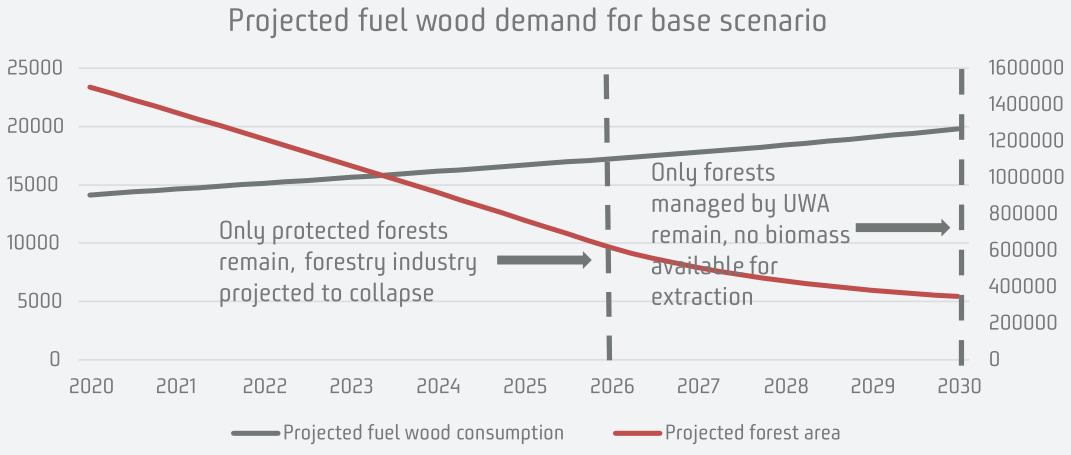
The Lake Victoria Fisheries Organization supplied data used in conjunction with the methodology described in Kleisner and Pauly (2015), to estimate the historical trends for the proportion of fish resources sustainably exploited and for the fish resources availability share.

Appendix 2: Limitations

Forested areas

The simulation runs indicate a continuing steep decline in forested areas under all scenarios. This is in line with what is reported in the "State of Uganda's Forestry." (Ministry of Water and Environment, 2016). However, what should be highlighted is the strong assumption that no biomass will be extracted from the forests under the management of Uganda Wildlife Authority (UWA). Furthermore, the coping mechanisms and social/economic consequences of the drastic losses of forested areas has not been scientifically discernible during the short period of the project. As of 2017, biomass comprised 88.9% of Uganda's energy balance, of which: firewood 78.6%, charcoal 5.6% and agricultural residues 4.7% (National Planning Authority, 2017). Currently, the model is unable to properly deal with the situation where the country loses the majority of its energy supply. The present model structure assumes that the gap between supply and demand closes through imports with no cost adjustment. While this assumption works fine for electricity, gas, coal or oil, the situation is different with biomass, since a fraction of the biomass is consumed at 'no cost' (uncontrolled cutting and consuming of trees), while importing the biomass always entails a certain cost. This is currently not accounted for in the model. Figure A.3 below shows the projected biomass consumption for the base scenario (Business as Usual, continuing current historical investment patterns). Even though forests are depleting, biomass consumption continues to grow. This is due to the assumption in the model that energy demand not met domestically will be met through imports.

Figure 18 - A3 - Projected fuelwood demand for Base scenario. Fuelwood on left axis in KTOE, forest area on right axis in hectares.



To understand the potential economic implications, the following could be taken into consideration: By 2030, there will be no forests available for biomass consumption. The demand for biomass, however (total from households and industry) will stand at over 21000 KTOE, of which 94% will be for fuelwood, which results in a value of 19805 KTOE (as shown in the graph). If one-third of the fuelwood demand is met through uncontrolled cutting (an assumption) along with a cost of UGX1000/kg of firewood, and energy content of 15 MJ/kg, the economic impact of the demand gap for biomass in 2030 could then be calculated as:

$$Economic\ impact = \frac{Demand\ for\ fuel\ wood * Fraction\ met\ through\ uncontrolled\ cutting}{Energy\ content} * Price\ of\ fuel\ wood$$

The resulting energy gap in 2030 in the Base scenario would be worth over UGX18 trillion in real terms (using the 2020 Shilling). The Base scenario also shows a real GDP of UGX118 trillion in the year 2030. That means that with the above assumptions, if historical trends continue, the energy gap would be worth 15% of the GDP of Uganda in the year 2030.

There are, of course, many factors that can affect this. Changes in nutritional habits, such as eating more raw food, increased efficiency in cooking, a shift of energy mix for industry and services production,[11] increased access to alternative energy sources for households, increased emigration, and increased urbanization rate are some of the factors that can affect this energy gap. It is also very likely that the biomass energy supply would act as a carrying capacity for various industry and services subsectors, which would then stagnate if biomass energy supply begins to be harder to access.

But while there are many possible balancing factors that can lead to a smaller energy gap that are not captured in the model, there are also many possible negative effects that are not captured. For instance, people can shift more to alternative biomass sources, such as manure or agricultural residue, which would lower the carbon and nutrient content of the soils, leading to diminishing agricultural yields. Together with intensifying rains due to climate change which lead to further nutrient runoffs, this can ultimately lead to desertification in many areas. Another example is that lack of fuelwood for cooking can lead to nutritional problems and can increase the chance of diseases spreading through untreated water. It can also lead to large-scale internal migrations, to cities, for example, and cause social tensions. Finally, if there was any impact on the forests managed by UWA, it could cause significant damage to both biodiversity and to the tourism sector.

Rebased GDP

In late 2019, the Ugandan Bureau of Statistics released the "Rebased Gross Domestic Product Estimates to 2016/2017 base year." The new GDP estimate, however, is not only rebased to 2016/2017, but also features computational, methodological and accounting revisions, along with more representative value and volume indicators, as well as expanded price deflators. This means that not only the real, but the nominal historical production values of Uganda have also been revised. This section deals with the impact this has on the analysis and its interpretation.
After a careful review, the conclusion is that the analysis results can be trusted (explanation below), while keeping in mind that the results for industry production are likely conservative while the results for the services production should be considered as optimistic.

As a result of the revision, the overall economy is estimated to have been 18.3% higher in 2016/2017 than the 2009/2010 SUT structure indicated. However, it is not the overall size of the economy, but the trends of the changes over time that impact results within the iSDG-Uganda model, as mentioned in the Methodology Section 2.2. Instead of comparing the overall levels of the items, the growth rates, which represent the trends of change over time, are compared. The graphs below show the comparisons of the growth rates of GDP (Figure A.4), agriculture production (Figure A.5), industry production (Figure A.6), services production (Figure A.7), total consumption (Figure A.8) and total investment (Figure A.9). Revised GDP figures are available going back to 1995, while for the rest the revised figures are available going back to 2008.

11. Although there are provisions in NDP III for the diversification of the energy mix, for example by increasing electricity production from hydro and solar, these provisions are not sufficient to decrease the dependency on biomass in absolute terms.

Figure 19 - A4 - GDP comparison

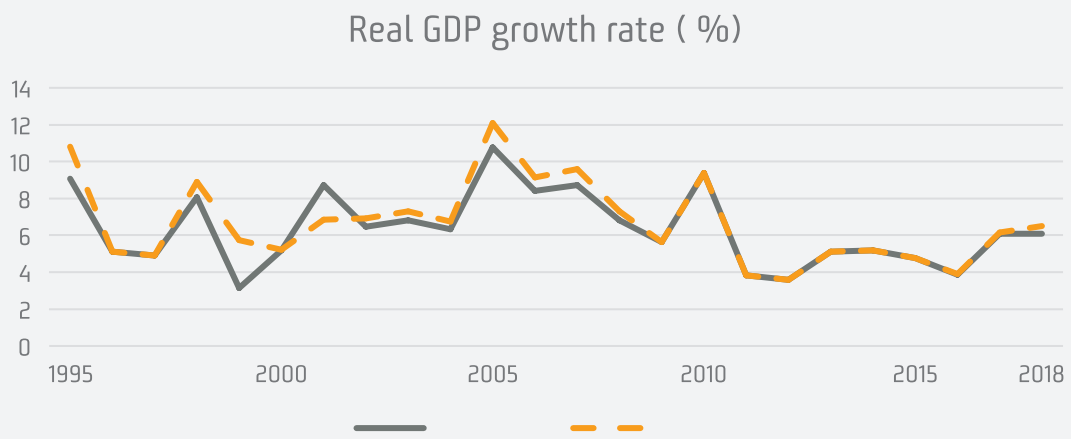


Figure 20 - A5 - Agriculture production comparison

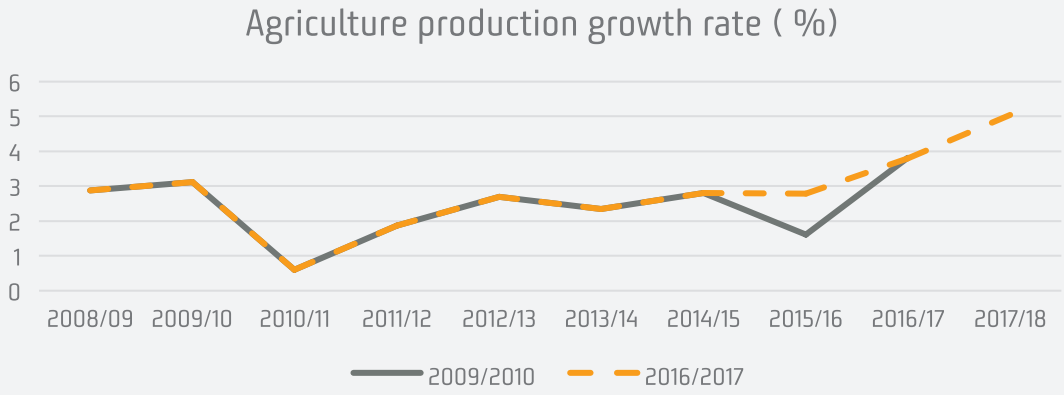


Figure 21 - A6 - Industry production comparison

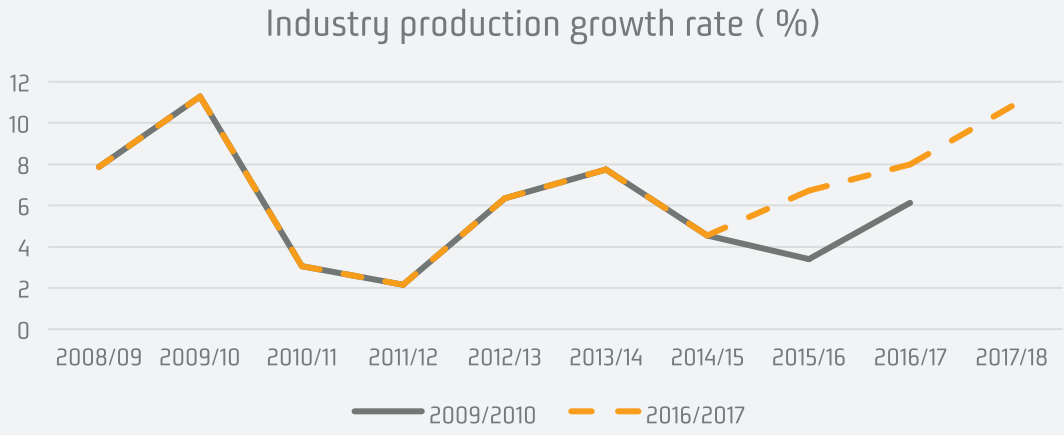


Figure 22 - A7 - Services production comparison

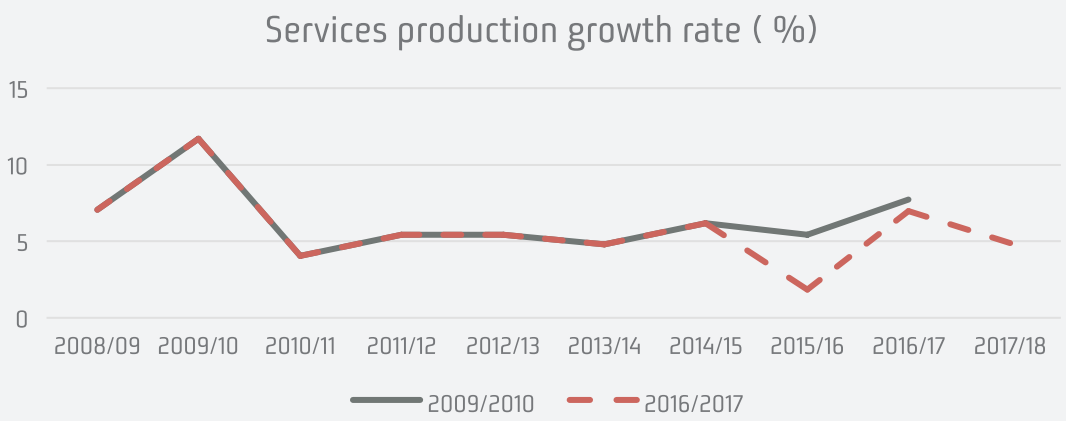


Figure A.4 shows that the overall economic growth patterns match very well. For the period 2008-2015, they match perfectly, with a small deviation in the last two years. Figures A.5-A.7 shows the deviation. The patterns of change in production across the three aggregate areas of agriculture, industry and services, all deviate after 2015. Most notably, the 2016/17 revision of GDP indicates an accelerating growth of industry production and a decelerating growth of services production. The calibration of the production areas is according to the growth patterns. An important factor in the calibration, however, is the level of investment, and hence capital-output ratio. Figures A.8 and A.9 below show the comparisons across consumption and investment, respectively.

As shown in Figure A.9, the patterns of growth in investment match perfectly until 2015, after which there is a deviation, while maintaining the dip and surge pattern. Meanwhile, the patterns of growth in investment do not match perfectly, but do match very closely, while maintaining the oscillations in the patterns. The degree to which the patterns match across the items mentioned above, particularly Figures A.5-A.7 on

Figure 23 - A8 - Consumption comparison

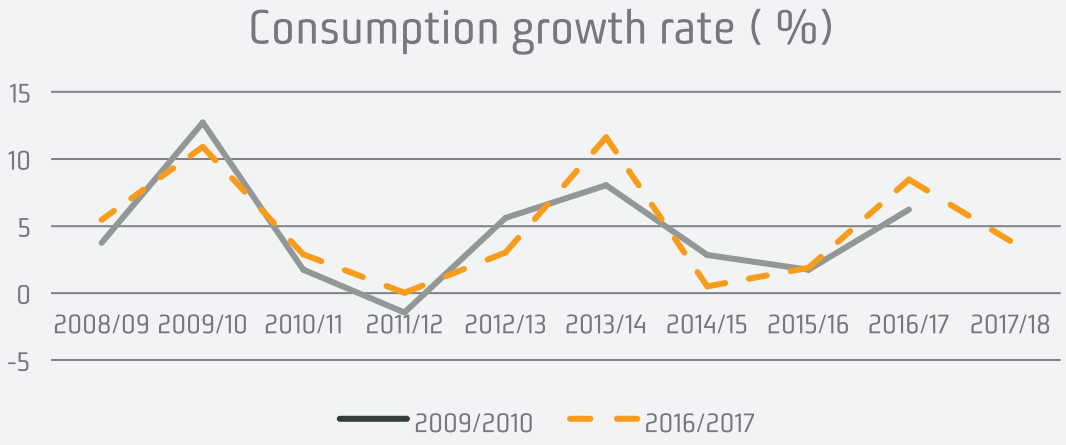
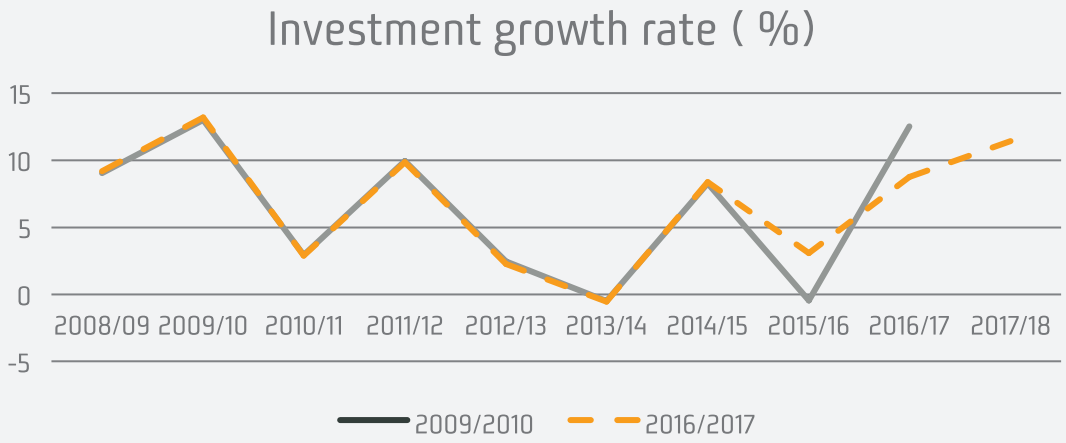


Figure 24 - A9 - Investment comparison



production areas, and Figure A.9 on investment, gives confidence that the model reflects the economy of Uganda sufficiently well for the analysis to be able to inform policymaking.

As previously mentioned, however, some differences must be kept in mind when interpreting the results. Namely, results for industry production are conservative, while results for services production are optimistic. This is because, for recent years, the iSDG model assumes a slower growth rate for industry than is indicated by the revised production data; it also assumes a faster growth rate for services than is indicated by the revised production data. Additionally, while the overall size of the economy was reassessed, the overall shares of production areas have shifted as well, as can be seen when comparing the shares from Figures A.10 and A.11 below.

The decision to use the 2009/10 based figures, rather than the 2016/17 based figures is for the following reasons: Firstly, the full data set necessary as an input to the iSDG-Uganda model is not available in the rebased 2016/2017 figures at present moment. This includes disaggregated government consumption, along with government revenue figures as well as

Figure 25 - A10 - Production shares, GDP based 2009/10

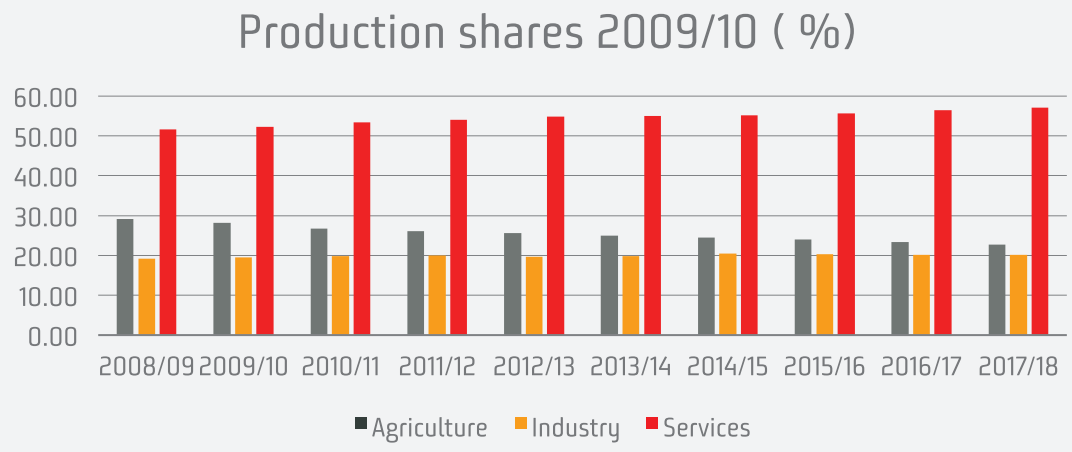
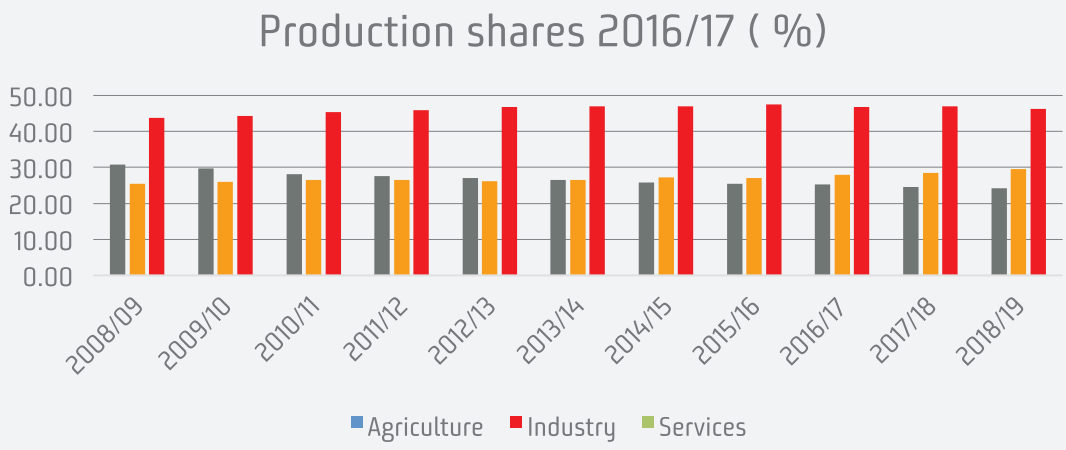


Figure 26 - A11 - Production shares, GDP based 2016/17



functional government expenditure figures (e.g. health, education, transportation infrastructure). Secondly, the current data set is only available from 2008, while the model relies on data starting from 1995. Although there are rebased GDP figures available from UBOS for the 1995-2007 period, the disaggregated rebased figures are not available at currently, and therefore would have required estimations and assumptions to be made, which would have been more unreliable than the dataset used. Further, lowering the time horizon reproduced by the model would also reduce the level of confidence in the results of the model. Relying on an internally consistent dataset that spans over a longer time horizon is preferred over having a dataset over a short time horizon, where the gaps are filled with assumptions, and the 2009/2010 dataset currently used is internally consistent.

There is the question whether making use of the rebased figures is possible while starting the model in 1995, by adjusting the 2009/10 based figures to the 2016/17 based figures and maintaining internal consistency at the same time. While possible, it would mean having to make a large number of assumptions, and each added assumption would broaden the confidence interval of the results. For this analysis, therefore, the 2009/10 based figures are used. Once the 2016/17 based figures become available for the full dataset needed to run iSDG-Uganda, it is recommended to implement a full update.

Aggregation level of industry and services production

In the iSDG-Uganda model, only agriculture production is disaggregated by crops, livestock, fisheries, aquaculture and forestry production. Industry and services production are represented only at the aggregate level. This is mainly due to time and data constraints within the current project. The analysis of the SDG accelerators going into 2030 are not affected by the level of aggregation. However, for analysing the achievement of Vision 2040 targets, the planned oil and mining areas would have to be disaggregated from the rest of industry, while tourism, and possibly other areas, such as ICT, would have to be disaggregated from the rest of services, in order to capture the particular dynamics of those areas, which could differ from the rest. They can include a change in the revenue structure of the government, a shift in the balance of payments, and drastic changes in material flows.

Employment

While the employment figures from ILOSTAT have been adjusted as a consequence of using UBOS figures for total population rather than UNPOP figures, the figures themselves require further investigation and adjustment. This is due to the definition of employment used by ILOSTAT, whereby

"Employment comprises all persons of working age who during a specified brief period, such as one week or one day, were in the following categories: a) paid employment (whether at work or with a job but not at work); or b) self-employment (whether at work or with an enterprise but not at work)..." (19th International Conference of Labour Statisticians, 2013.)

These figures contain informal employment, which is good for capturing the actual labour/output ratio of Uganda (formal employment stood at only 1 million in 2015, according to figures from UBOS). However, defining informal work too broadly means that people who are able to do very little informal work are also categorized as 'employed' (it was discussed during the November workshop that the survey questions had a very low threshold for the number of hours worked in the period preceding the survey in order for the person to qualify as employed). This has been adjusted for this in the model calibration phase in several ways, such as assuming a very low minimum to average salary ratio. However, the potential productivity of Uganda's labour force is most likely underestimated, as long as relatively few working hours per week are required in order for someone to be considered as 'employed'. This highlights the necessity for more detailed data collection in the labour market, to understand in which areas most of the potential productivity could be unlocked.

Water and sanitation

As mentioned in the report, figures for the percentage of population with access to improved water source and improved sanitation facilities are used, rather than figures for the newer indicators of the percentage of population with access to safely managed water source and safely managed sanitation facilities. The old improved indicators are used in lieu of sufficient data points, and in light of the fact that they match more closely the indicators and figures relied upon by the Government of Uganda (Ministry of Water and Environment, 2018). However, the new SDG indicators are more stringent than the old ones (WHO/UNICEF, 2018), and this is reflected in the fact that the few data points available for the new indicators show much lower figures than the old ones.

It is difficult to ascertain how this impacts the results: on the one hand, it means that the current level of achievement of SDG 6 is likely to be lower than the model indicates. On the other hand, it might also mean that the percentage change in the positive direction is greater than indicated by the model. This highlights the importance of data collection on the indicators for SDG 6, in order to properly assess the attainment level of SDG 6.

Regional development

One of the 18 programmes from NDP III is Regional Development. This programme refers to the geographical targeting of investments. The iSDG-Uganda model functions at the aggregate national level and does not feature disaggregation by region. While the model can provide information on the categories of intervention where investments can accelerate the achievement of the SDGs, the more specific details of the investments, such as region, must be determined through other means in order to bridge the analysis gap. For example, the forthcoming Poverty Status Report 2019 and its background papers, such as UNDP-Uganda's Vulnerability to Poverty study, use household survey data that enables sub-regional and spatial targeting. iSDG-Uganda can inform the categories of interventions that should be prioritized, while the household survey analyses can be used to identify spatial targeting.

Return on investment (ROI)

Return on investment calculations are completed at a certain level of investment. It is indicative of the marginal return on investment of model indicators at a given point of time. If further investment is completed, or assumptions changed, this may increase or decrease the marginal returns on investment. A sensitivity analysis, not a part of this study, could be conducted to find where the model estimates greatest returns in order to optimize investment levels. Although these results can be subject to changes in assumptions, it gives a better view of how to optimize investment levels.

Appendix 3: Intervention costing

In this section, a justification of the process is presented, then the projects from MTEF are shown by category, including the intervention in the model they are related to, and any other assumptions that are made in terms of the costing.

Justification of the process

The costs were derived primarily from MTEF documents and other sources as described below. Although costs for the NDP III programmes are available, many of these programmes are cross-sectoral and many interventions span multiple programmes. For example, the Agro-industrialization programme includes not only investment into agriculture and industry, but also paved road infrastructure. This is in addition to the Mineral Development, Sustainable Development of Petroleum Resources, Private Sector Development, Manufacturing, Sustainable Urbanization and Housing and of course Integrated Transport Infrastructure and Services programmes that also mention increasing paved road investment. Although these are most often linked to specific projects, the spillovers onto other areas outside of the programmes' intended change should also be measured. Therefore, this analysis recategorizes the projects within these programmes by intervention. Because the costs for the individual projects within these programmes are not available, it was not possible to map these costs onto the programmes directly. Therefore, results are shown by the category of intervention, with additional interpretation to the programmes in the results section.

Agriculture (Agr)

Public investment into agriculture (crops)

Promote agriculture production by increasing the proportion of public investment for private investment that increases agricultural capital. These can take the form of public-private partnerships or subsidies for capital investments (e.g. tractors for farmers). These investments may result in reduced private investment. Note that although these are indexed to the GDP, these are not counted as a part of the cost but as a reallocation of government investment. This is divided into four categories: crops, livestock, fisheries and aquaculture.

Crops

Crops-related projects found from the tables include general programmes that promote productivity and specific crops (e.g. coffee or cotton). A portion of Crop Resources is earmarked for additional spending on Fertilizer Subsidies and Sustainable Agriculture Training, and thus deducted from the total. See those sections for details on how these amounts were estimated.

Table 16 - A2 - Public investment into agriculture (crops) cost assumptions

Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
Total	581.66	505.24	635.83	481.90	568.34	715.64	1214.21	484.84
010 Ministry of Agriculture, Animal & Fisheries								
01 Crop Resources	66.987	89.667	270.184	102.263	110.671	77.253	49.408	48.403
03 Directorate of Agricultural Extension and Skills Management	54.396	3.547	3.864	2.976	4.976	4.976	5.063	13.463
05 Agriculture Infrastructure, Mechanization and Water for Agricultural Production	16.774	27.846	48.436	60.436	60.776	60.776	76.401	69.341
49 Policy, Planning and Support Services*	26.355	27.240	50.788	73.110	72.386	63.631	42.223	37.408
121 Dairy Development Authority								
55 Dairy Development and Regulation	5.693	5.412	10.132	10.132	11.116	12.296	13.713	15.413
122 Kampala Capital City Authority								
05 Urban Commercial and Production Services	6.325	4.834	7.188	7.188	7.318	7.475	7.663	7.888
51 Agricultural Research	82.445	59.463	79.662	79.662	83.605	88.337	94.015	100.83
152 NAADS Secretariat								
54 Agriculture Advisory Services	279.162	219.742	145.894	145.894	146.466	147.152	147.975	148.963
155 Uganda Cotton Development Organisation								
52 Cotton Development	4.744	4.38	8.642	8.642	9.126	9.706	10.403	11.238
160 Uganda Coffee Development Authority								
53 Coffee Development	52.422	73.529	96.702	96.702	114.573	136.018	161.752	192.633
500 501-850 Local Governments								
82 District Production Services*	43.523	106.817	91.493	109.524	115.583	120.375	129.976	135.377
Less for Fertilizer Subsidies	0	38.549	42.685	47.632	53.505	60.200	67.765	75.935
Less for Sustainable Agriculture Training	0	19.275	21.343	23.816	26.753	30.100	33.882	37.967

* Assume these are divided amongst all crops, livestock, conventional fisheries and aquaculture based on their latest production rates (values allocated to this intervention shown).
Source: Adapted from MTEF, NDP III and author estimates for this analysis.

Livestock

General programmes that promote productivity in livestock.

Table 17 - A3 - Public investment into agriculture (livestock) cost assumptions

Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
Total	86.75	77.43	214.24	207.87	208.89	207.15	198.48	210.07
010 Ministry of Agriculture, Animal & Fisheries								
02 Directorate of Animal Resources	65.981	47.963	107.918	80.408	80.408	75.863	70.627	77.627
49 Policy, Planning and Support Services*	3.931	3.873	15.376	25.706	24.671	22.638	14.795	13.617
125 National Animal Genetic Res. Centre and Data Bank								
56 Breeding and Genetic Development	10.347	10.403	63.242	63.242	64.416	65.825	67.516	69.545
500 501-850 Local Governments								
82 District Production Services*	6.491	15.187	27.699	38.510	39.393	42.825	45.544	49.279
* Assume these are divided amongst all crops, livestock, conventional fisheries and aquaculture based on their latest production rates (values allocated to this intervention shown).								
Source: Adapted from MTEF and author estimates for this analysis.								

Conventional fisheries

Based on the description of the Fisheries Resources Programme, it was not possible to differentiate between conventional fisheries and aquaculture, so this is distributed between the two based on the current production. Additionally, policy, planning and support services is also distributed between the two.

Table 18 - A4 - Public investment into agriculture (conventional fisheries) cost assumptions

Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
Total	7.29	8.20	20.20	35.46	34.07	30.63	18.92	26.79
010 Ministry of Agriculture, Animal & Fisheries								
04 Fisheries Resources*	6.410	6.183	16.142	24.507	23.620	20.952	13.169	18.770
49 Policy, Planning and Support Services**	0.330	0.410	1.450	4.386	4.024	3.348	1.410	1.737
500 501-850 Local Governments								
82 District Production Services**	0.545	1.609	2.612	6.570	6.425	6.333	4.342	6.285

** Assume these are divided among conventional fisheries and aquaculture based on their latest production rates.*
*** Assume these are divided amongst all crops, livestock, conventional fisheries and aquaculture based on their latest production rates (values allocated to this intervention shown).*
Source: Adapted from MTEF and author estimates for this analysis.

Aquaculture

As mentioned previously under "Conventional fisheries," the "fisheries resources" and "policy, planning and support services" amounts from MTEF are distributed between conventional fisheries and aquaculture based on current production.

Table 19 - A5 - Public investment into agriculture (aquaculture) cost assumptions

Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
Total	2.209	2.488	6.128	10.755	10.333	9.290	5.738	8.126
010 Ministry of Agriculture, Animal & Fisheries								
04 Fisheries Resources*	1.944	1.875	4.896	7.433	7.164	6.355	3.994	5.693
49 Policy, Planning and Support Services**	0.100	0.124	0.440	1.330	1.220	1.015	0.428	0.527
500 501-850 Local Governments								
82 District Production Services**	0.165	0.488	0.792	1.993	1.949	1.921	1.317	1.906

** Assume these are divided among conventional fisheries and aquaculture based on their latest production rates.*
*** Assume these are divided amongst all crops, livestock, conventional fisheries and aquaculture based on their latest production rates (values allocated to this intervention shown).*
Source: Adapted from MTEF and author estimates for this analysis.

Fertilizer subsidies

In agriculture, a portion of GDP can subsidize (to varying degrees) additional fertilizers that would increase agricultural yields. Fertilizer usage assumed to go up about 10% after 2017/18. These values are not from the National Budget Framework as it does not provide this level of aggregation but are estimated then deducted from the cost of crops intervention.

Table 20 - A6 - Fertilizer subsidies cost assumptions

Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
Total	0.000	38.550	42.685	47.633	53.505	60.200	67.765	75.935

Source: Author estimates.

Sustainable agriculture training

A portion of the GDP dedicated to the training of farmers in sustainable agriculture with the possible effects of (1) increasing the retention of nitrogen in the soil to improve agricultural yields, and (2) increasing the proportion of harvested area sustainably managed that negatively affects the rate of land abandonment and employment. It is assumed that 0.3% of farmers are to be trained yearly.

Table 21 - A7 - Sustainable agriculture training cost assumptions

Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
Total	0.000	19.275	21.343	23.816	26.753	30.100	33.882	37.968

Source: Author estimates.

Irrigation

A portion of GDP to develop irrigation capacity on arable land. This increases the availability of water for agriculture, changes the nutrient values of the land and increases the attainable yield of crops. Increased irrigation can also put pressure on water demand.

Table 22 - A8 - Irrigation cost assumptions

Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
Total	0.000	0.000	102.066	548.783	1152.165	1259.961	1402.757	839.974

Source: Adapted from MTEF for this analysis.

Industry (Ind)

Public investment into industry

Funds to promote the industrial by increasing the proportion of public investment to encourage private investment that increases industrial capital.

Table 23 - A9 - Industry capital investment cost assumptions

Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
Total	103.589	136.831	216.195	185.436	192.241	212.727	237.313	266.816
015 Ministry of Trade, Industry and Cooperatives								
01 Industrial and Technological Development	50.046	65.961	64.532	40.532	40.862	41.257	41.732	42.302
02 Cooperative Development	5.617	14.927	27.254	27.254	32.629	39.078	46.818	56.106
04 Trade Development	2.259	7.212	19.283	12.486	2.609	3.033	3.541	4.151
07 MSME Development	1.226	0.898	1.168	1.118	1.305	1.469	1.667	1.903
49 General Administration, Policy and Planning	7.704	12.753	14.305	14.393	16.316	18.729	21.624	25.099
154 Uganda National Bureau of Standards								
06 Standards Development, Promotion and Enforcement	20.082	18.767	68.936	68.936	75.301	82.94	92.106	103.106
306 Uganda Export Promotion Board								
05 Export Market Development, Export Promotion and Customized Advisory Services	2.799	2.961	5.043	5.043	5.788	6.682	7.755	9.043
500 501-850 Local Governments								
83 District Commercial Services	0	0	2.232	2.232	2.679	3.214	3.857	4.629
110 Uganda Industrial Research Institute								
04 Industrial Research	13.856	13.352	13.442	13.442	14.752	16.325	18.213	20.477

Source: Adapted from MTEF for this analysis.

Services (Ser)

Public investment into services

Funds to promote services production by increasing the proportion of public investment to encourage private investment that increases industrial capital.

Table 26 - A12 - Paved road infrastructure cost assumption

Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
Total	164.910	193.651	512.500	479.830	640.244	803.791	800.295	644.449
022 Ministry of Tourism, Wildlife and Antiquities								
03 Tourism , Wildlife conservation and Museums	7.973							
49 General Administration, Policy and Planning	7.054							
117 Uganda Tourism Board								
53 Tourism Development	8.577							
023 Ministry of Science, Technology and Innovation								
01 Regulation	1.244	1.787	4.617	4.519	4.617	4.906	5.869	5.869
02 Research and Innovation	1.416	15.569	121.673	98.857	101.638	56.558	45.164	45.164
03 Science Entrepreneurship	1.21	1.721	4.977	4.442	4.804	12.63	4.804	4.804
49 General Administration and Planning	53.509	28.437	41.278	42.055	48.302	48.302	58.04	69.726
022 Ministry of Tourism, Wildlife and Antiquities								
01 Tourism, Wildlife Conservation and Museums	0	9.189	160.957	160.957	189.101	225.022	267.328	318.494
49 General Administration, Policy and Planning	0	5.035	7.607	7.607	10.231	11.231	13.231	15.231
117 Uganda Tourism Board								
02 Tourism Development	0	17.107	25.167	25.167	29.798	35.356	42.025	50.028
Source: Adapted from MTEF for this analysis.								

Energy (Enr)

The National Budget Framework has one large hydroelectric generation project. There are other smaller projects included, but the costs were not explicit. This is treated as business as usual spending within the model. Although solar sources are identified as sources for investment, there is no additional expenditure for these as compared to the base year. When interventions begin in 2020, the model takes into account relative costs, and there is growth in each of these power sources, however, does not indicate additional investment. There are many references to electricity distribution within the budget document, however, these are not captured explicitly in the model.

Table 25 - A11 - Energy investment cost assumptions

Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
Total	774.139	676.075	754.611	752.244	47.741	47.741	47.741	47.741
017 Ministry of Energy and Mineral Development								
02 Large Hydro power infrastructure	774.139	676.075	754.611	752.244	47.741	47.741	47.741	47.741
Source: Adapted from MTEF for this analysis.								

Infrastructure (Inf)

Paved road infrastructure

A portion of GDP spent on road construction. This intervention will improve factor productivity, access to education and health services and the number of vehicles in the country. However, vehicle emissions and mortality due to road accidents and air pollution will increase.

Table 26 - A12 - Paved road infrastructure cost assumptions

Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
Total	2964.619	3997.646	6404.567	5952.452	6169.452	6156.321	6093.428	8787.039
016 Ministry of Works and Transport								
01 Transport Regulation	7.737	7.94	56.512	62.203	49.051	47.4	50.5	55.5
02 Transport Services and Infrastructure	196.764	778.575	1,253.19	817.872	623.847	1,272.28	1,948.34	5,380.04
03 Construction Standards and Quality Assurance	19.089	23.764	27.755	27.755	29.755	32.6	36.6	41.6
04 District, Urban and Community Access Roads	27.462	113.447	175.64	117.87	117.87	117.87	117.87	117.87
05 Mechanical Engineering Services	52.767	57.955	117.207	58.307	60.3	63	67	72
49 Policy, Planning and Support Services	16.366	26.572	25.558	21.296	24.739	28.507	33.196	38.142
113 Uganda National Roads Authority								
51 National Roads Maintenance & Construction	2,083.89	2,279.93	3,999.07	4,216.78	4,528.88	3,734.09	2,828.66	1,889.80
118 Road Fund								
52 National and District Road Maintenance	417.363	540.946	448.833	542.267	646.909	772.479	923.164	1,103.99
122 Kampala Capital City Authority								
06 Urban Road Network Development	120.339	145.077	277.897	65.2	65.2	65.2	65.2	65.2
Total for the Vote	120.339	145.077	277.897	65.2	65.2	65.2	65.2	65.2
500 501-850 Local Governments								
81 District, Urban and Community Access Roads	22.84	23.44	22.903	22.903	22.903	22.903	22.903	22.903

Source: Adapted from MTEF for this analysis.

Railways

Additional expenditure towards the development of the rail network that can increase factor productivity and aggregate output and improve access to education and health services. A railways project is from NDP III Draft 3 Table 3.4.

Table 27 - A13 - Railway infrastructure cost assumptions

Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
Total	0.000	0.000	0.000	0.000	604.268	1208.537	1430.040	1390.004

Source: Adapted from MTEF for this analysis.

Water and sanitation (Was)

Safely managed water

Additional expenditure towards expanding the water network to increase population access to safely managed water sources in both rural and urban areas.

There is an Integrated Water Management Project identified within MTEF without indication of whether it is for water sources or sanitation infrastructure, thus, this expenditure is divided between safely managed water and sanitation expenditure by the expenditure in 2018.

Table 28 - A14 - Safely managed water cost assumptions

Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
Total	338.684	720.579	580.791	785.950	1205.236	1058.035	1058.651	639.846
019 Ministry of Water and Environment								
01 Rural Water Supply and Sanitation*	67.714	70.803	94.468	117.242	94.468	94.468	95.249	95.249
02 Urban Water Supply and Sanitation*	192.402	540.496	368.292	548.923	986.219	837.468	833.944	394.504
04 Water Resources Management*	12.927	40.313	36.134	36.134	36.134	36.134	36.915	36.915
49 Policy, Planning and Support Services**	16.508	22.537	23.469	25.465	28.479	27.805	27.551	44.357
122 Kampala Capital City Authority								
08 Sanitation and Environmental Services*	0.004	0.088	12.691	12.449	13.601	14.982	16.641	18.630
500 501-850 Local Governments								
81 Rural Water Supply and Sanitation*	48.152	45.366	43.784	43.784	44.384	44.837	45.619	47.300
82 Urban Water Supply and Sanitation*	0.977	0.977	1.953	1.953	1.953	2.344	2.735	2.891

** Split between Water Supply and Sanitation*
*** Split between Water Supply, Sanitation, Climate Adaptation, Reforestation and Land Protection*
Source: Adapted from MTEF and author estimates for this analysis.

Sanitation

Additional expenditure towards expanding population access to proper sanitation (e.g. latrines) in rural and urban areas. There is "Integrated water management project" identified within MTEF without indication of whether it is for water sources or sanitation infrastructure. Thus, this expenditure is divided between safely managed water and sanitation expenditure by the expenditure in 2018.

Table 29 - A15 - Sanitation infrastructure cost assumptions

Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
Total	338.684	720.579	580.791	785.950	1205.236	1058.035	1058.651	639.846
019 Ministry of Water and Environment								
01 Rural Water Supply and Sanitation*	18.955	19.819	26.443	32.818	26.443	26.443	26.662	26.662
02 Urban Water Supply and Sanitation*	53.857	151.294	103.091	153.654	276.061	234.422	233.436	110.429
04 Water Resources Management*	3.619	11.284	10.114	10.114	10.114	10.114	10.333	10.333
49 Policy, Planning and Support Services**	4.621	6.309	6.569	7.128	7.972	7.783	7.712	12.416
122 Kampala Capital City Authority								
08 Sanitation and Environmental Services*	0.001	0.025	3.553	3.485	3.807	4.194	4.658	5.215
500 501-850 Local Governments								
81 Rural Water Supply and Sanitation*	13.478	12.699	12.256	12.256	12.424	12.551	12.769	13.240
82 Urban Water Supply and Sanitation*	0.273	0.273	0.547	0.547	0.547	0.656	0.765	0.809

** Split between Water Supply and Sanitation*
*** Split between Water Supply, Sanitation, Climate Adaptation, Reforestation and Land Protection*
Source: Adapted from MTEF author estimates for this analysis.

Health (Hlt)

Additional expenditure on health spending increases the supply of health services. These, when adjusted with the demand for services (affected by education, infrastructure, income, etc.) improve the health status of the population whose externalities reach factor productivity (output and GDP), educational attainment, contraceptive prevalence and mortality to name a few. Health is thus a key element in the demographic transition as well as one of the indices of population well-being.

Table 30 - A16 - Health cost assumptions

Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
Total	1154.443	1716.825	2589.487	1550.412	1664.015	1721.098	1892.204	2097.691
014 Ministry of Health								
01 Health Governance and Regulation	0.57	0.65	0.691	0.422	0.5	0.5	8	2
02 Health infrastructure and equipment	42.029	70.834	273.73	126.779	54.326	19.531	31.5	27
03 Health Research	1.061	1.04	0.788	0.788	0.7	0.75	9	5
04 Clinical and public health	44.329							
05 Pharmaceutical and other Supplies	192.726	432.149	830.376	21.079	99.708	44.708	30.787	30.708
06 Public Health Services	0	14.824	33.655	5.211	25	35	40	50
08 Clinical Health Services	0	43.456	47.79	47.415	20	25	20	30
49 Policy, Planning and Support Services	17.901	19.953	22.431	28.415	42.14	42.235	43.859	57.107
107 Uganda AIDS Commission								
51 HIV/AIDS Services Coordination	7.085	6.806	8.722	8.722	10.201	11.975	14.105	16.661
114 Uganda Cancer Institute								
57 Cancer Services	22.489	47.356	91.258	33.97	36.955	40.537	44.835	49.993
115 Uganda Heart Institute								
58 Heart Services	11.085	12.68	24.707	24.707	27.799	31.509	35.961	41.303
116 National Medical Stores								
59 Pharmaceutical and Medical Supplies	283.964	296.702	396.172	396.172	473.009	565.214	675.859	808.633
122 Kampala Capital City Authority								
07 Community Health Management	16.567	18.808	13.786	13.786	14.67	15.729	17.001	18.527
134 Health Service Commission								
52 Human Resource Management for Health	5.159	6.261	6.867	6.867	7.76	8.831	10.116	11.658

Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
Total	1154.443	1716.825	2589.487	1550.412	1664.015	1721.098	1892.204	2097.691
151 Uganda Blood Transfusion Service (UBTS)								
53 Safe Blood Provision	12.723	19.135	17.942	17.942	20.389	23.325	26.849	31.077
161 Mulago Hospital Complex								
54 National Referral Hospital Services	63.608	58.599	69.156	69.156	74.942	81.885	90.217	100.215
162 Butabika Hospital								
55 Provision of Specialised Mental Health Services	10.94	12.697	21.58	21.58	23.095	24.912	27.093	29.71
163 Arua Referral Hospital								
56 Regional Referral Hospital Services	5.857	8.729	9.22	9.22	9.22	9.22	9.22	9.22
164 Fort Portal Referral Hospital								
56 Regional Referral Hospital Services	5.492	7.547	9.935	9.935	9.935	9.935	9.935	9.935
165 Gulu Referral Hospital								
56 Regional Referral Hospital Services	6.14	8.33	9.431	9.431	9.431	9.431	9.431	9.431
166 Hoima Referral Hospital								
56 Regional Referral Hospital Services	5.282	7.753	9.185	9.185	9.185	9.185	9.185	9.185
167 Jinja Referral Hospital								
56 Regional Referral Hospital Services	7.326	9.575	12.117	12.117	12.117	12.117	12.117	12.117
168 Kabale Referral Hospital								
56 Regional Referral Hospital Services	5.255	7.138	8.479	8.479	8.479	8.479	8.479	8.479
169 Masaka Referral Hospital								
56 Regional Referral Hospital Services	6.065	7.98	9.184	9.184	9.184	9.184	9.184	9.184
170 Mbale Referral Hospital								
56 Regional Referral Hospital Services	9.742	10.532	14.007	14.007	14.007	14.007	14.007	14.007
171 Soroti Referral Hospital								

Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
Total	1154.443	1716.825	2589.487	1550.412	1664.015	1721.098	1892.204	2097.691
56 Regional Referral Hospital Services	5.322	8.051	8.435	8.435	8.435	8.435	8.435	8.435
177 Kiruddu Referral Hospital								
56 Regional Referral Hospital Services		0	12.015	12.015	12.015	9.015	9.015	9.015
178 Kawempe Referral Hospital								
56 Regional Referral Hospital Services		0	8.898	8.898	8.898	8.898	8.898	8.898
179 Entebbe Regional Referral Hospital								
56 Regional Referral Hospitals Services		0	3.309	3.76	3.76	3.76	3.76	3.76
180 Mulago Specialized Women and Neonatal Hospital								
60 Mulago Specialized Women and Neonatal Hospital Services		0	9.396	9.396	2.618	7.618	7.618	7.618
304 Uganda Virus Research Institute (UVRI)								
03 Virus Research	2.97	6.238	9.069	9.069	10.119	11.378	12.89	14.703
Total for the Vote	2.97	6.238	9.069	9.069	10.119	11.378	12.89	14.703
500 501-850 Local Governments								
81 Primary Healthcare	336.299	535.424	552.21	549.324	560.472	573.849	589.902	609.166

Source: Adapted from MTEF for this analysis.

Family Planning

Additional spending on family planning increases the effectiveness of contraception and brings the actual fertility rate closer to the desired number of children per woman. In addition to playing an important role in the demographic transition, family planning is also an indirect tool that strengthens the position of women. This is the budget allocated to Uganda Reproductive, Maternal, and Child Health Improvement from the annex of the National Yearly Budget Framework (19/20), and this amount is deducted from health.

Table 31 - A17 - Family planning cost assumptions

Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
Total	83.030	118.400	91.110	85.380	0.000	0.000	0.000	0.000

Source: Adapted from MTEF for this analysis.

Education (Edu)

This can be an increase in the volume of expenditure on public education or a change in its distribution between the different levels (primary, secondary, tertiary). Since education has important effects on several areas (health, fertility, productivity and GDP among others), it often deploys its effects only with a delay of several years. Despite its indisputably positive results, education is a good that is strongly complementary with other elements such as capital, infrastructure, health etc., the minimum threshold of which is necessary for the greatest return on investment for education. Treatment of Education in the model is as a whole, and relative reallocations between different expenditure categories (i.e. primary, secondary and tertiary) are calculated based on the categorization of each budget line item.

Table 32 - A18 - Education cost assumptions

	Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
	Total	2304.98	2723.97	3388.22	3277.05	3479.35	3760.74	3953.89	4103.23
013 Ministry of Education and Sports									
Primary	01 Pre-Primary and Primary Education	101.494	112.421	84.219	27.706	39.819	44.182	49.417	55.7
Secondary	02 Secondary Education	11.501	4.339	11.568	57.704	129.853	241.134	197.993	16.049
Tertiary	04 Higher Education	126.421	175.59	81.405	70.848	86.052	86.125	101.453	119.845
Tertiary	05 Skills Development	103.861	125.994	330.283	246.279	195.515	164.247	143.914	166.176
Edu-All	06 Quality and Standards	18.679	24.126	41.34	34.435	27.754	31.005	34.906	39.587
Edu-All	07 Physical Education and Sports	26.113	31.292	33.201	33.201	38.62	45.122	52.925	62.289
Edu-All	10 Special Needs Education	3.184	3.011	2.632	2.632	2.794	2.987	3.22	3.499
Edu-All	11 Guidance and Counselling	0.73	0.886	1.075	1.075	1.265	1.492	1.765	2.093
Edu-All	49 Policy, Planning and Support Services	39.184	41.854	62.74	62.74	73.237	85.833	100.949	119.087
111 Busitema University									
Tertiary	13 Support Services Programme		0	14.917	15.209	14.75	16.097	17.444	20.153
Tertiary	14 Delivery of Tertiary Education Programme		0	22.052	21.76	24.726	27.735	31.346	35.678
Tertiary	51 Delivery of Tertiary Education and Research	29.875	31.416	0	0	0	0	0	0
122 Kampala Capital City Authority									
Edu-PriSec	08 Education and Social Services	34.875	40.934	44.974	44.974	46.753	48.888	51.45	54.524
127 Muni University									
Tertiary	13 Support Services Programme		0	12.102	11.113	11.302	11.703	11.93	13.002
Tertiary	14 Delivery of Tertiary Education Programme		0	5.188	6.177	6.764	7.295	8.187	8.457
Tertiary	51 Delivery of Tertiary Education and Research	12.161	15.737	0	0	0	0	0	0

	Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
	Total	2304.98	2723.97	3388.22	3277.05	3479.35	3760.74	3953.89	4103.23
128 Uganda National Examinations Board									
Edu-PriSec	09 National Examinations Assessment and Certification	31.775	54.73	123.279	123.279	142.463	165.484	193.109	226.258
132 Education Service Commission									
	52 Education Personnel Policy and Management	6.415	8.377	9.419	9.419	10.702	12.24	14.087	16.303
136 Makerere University									
Tertiary	13 Support Services Programme		0	286.61	284.656	284.75	286.61	349.078	459.778
Tertiary	14 Delivery of Tertiary Education Programme		0	29.503	31.458	58.127	88.382	64.453	0
Tertiary	51 Delivery of Tertiary Education	164.27	196.552	0	0	0	0	0	0
137 Mbarara University									
Tertiary	13 Support Services Programme		0	16.606	16.546	17.784	19.27	21.053	23.192
Tertiary	14 Delivery of Tertiary Education Programme		0	30.522	30.582	31.687	33.012	34.602	36.511
Tertiary	51 Delivery of Tertiary Education	31.712	37.018	0	0	0	0	0	0
138 Makerere University Business School									
Tertiary	13 Support Services Programme		0	75.148	74.843	78.511	84.303	89.36	91.75
Tertiary	14 Delivery of Tertiary Education Programme		0	1.543	1.848	3.007	3.007	4.901	10.851
Tertiary	51 Delivery of Tertiary Education	28.291	34.84	0	0	0	0	0	0
139 Kyambogo University									
Tertiary	13 Support Services Programme		0	79.615	80.492	84.61	95.801	109.23	125.344
Tertiary	14 Delivery of Tertiary Education Programme		0	52.693	51.815	62.739	69.598	77.829	87.705
Tertiary	51 Delivery of Tertiary Education	46.766	55.838	0	0	0	0	0	0
140 Uganda Management Institute									
Tertiary	13 Support Services Programme		0	29.095	28.321	30.245	31.678	33.242	34.948
Tertiary	14 Delivery of Tertiary Education Programme		0	4.2	4.974	6.643	9.524	13.135	17.639
Tertiary	51 Delivery of Tertiary Education	6.381	7.277	0	0	0	0	0	0
149 Gulu University									
Tertiary	13 Support Services Programme		0	24.784	21.044	24.784	24.784	24.784	24.784

	Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
	Total	2304.98	2723.97	3388.22	3277.05	3479.35	3760.74	3953.89	4103.23
Tertiary	14 Delivery of Tertiary Education Programme		0	23.667	27.408	26.385	29.647	33.56	38.257
Tertiary	51 Delivery of Tertiary Education and Research	28.415	36.944	0	0	0	0	0	0
301 Lira University									
Tertiary	13 Support Services Programme		0	12.601	12.601	12.901	13.5	14.035	14.488
Tertiary	14 Delivery of Tertiary Education Programme		0	6.298	6.298	7.079	7.777	8.8	10.214
Tertiary	51 Delivery of Tertiary Education	9.579	14.107	0	0	0	0	0	0
303 National Curriculum Development Centre									
Edu-All	12 Curriculum and Instructional Materials Development, Orientation and Research	7.333	6.658	14.267	14.267	15.62	17.242	19.19	21.527
307 Kabale University									
Tertiary	13 Support Services Programme		0	31.533	31.533	32.543	32.843	33.973	35.243
Tertiary	14 Delivery of Tertiary Education Programme		0	0.818	0.818	1.37	2.944	4.062	5.49
Tertiary	51 Delivery of Tertiary Education	14.416	19.893	0	0	0	0	0	0
308 Soroti University									
Tertiary	13 Support Services Programme		0	13.322	13.322	13.985	14.781	15.736	16.881
Tertiary	14 Delivery of Tertiary Education Programme		0	4.46	4.46	4.668	4.919	5.219	5.579
Tertiary	51 Delivery of Tertiary Education	10.372	15.262	0	0	0	0	0	0
500 501-850 Local Governments									
Primary	81 Pre-Primary and Primary Education	1,299.39	1,134.03	1,100.86	1,100.86	1,100.86	1,100.86	1,100.86	1,100.86
Secondary	82 Secondary Education	98.952	415.005	571.299	571.968	631.585	703.124	788.972	891.989
Tertiary	83 Skills Development	19.25	88.212	100.042	100.042	100.042	100.042	100.042	100.042
Edu-All	84 Education Inspection and Monitoring		0	7.763	7.763	7.763	7.763	7.763	7.763

Source: Adapted from MTEF and author estimates for this analysis.

Environment (Env)

Reforestation

Additional spending on reforesting land, increasing forest areas. This is one of the elements determining biodiversity indices.

Table 33 - A19 - Reforestation cost assumptions

Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
Total	74.319	116.112	133.754	133.254	133.754	133.754	133.754	133.754
019 Ministry of Water and Environment								
05 Natural Resources Management	74.319	116.112	133.754	133.254	133.754	133.754	133.754	133.754

Source: Adapted from MTEF for this analysis.

Terrestrial protection

Additional expenditure on land protection, mainly wooded land but also wetlands. Among other things, this protection limits the development of agricultural land at the expense of forests and wetlands.

Table 34 - A20 - Terrestrial protection cost assumptions

Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
Total	22.287	30.588	61.840	61.328	69.471	79.958	92.082	111.024
019 Ministry of Water and Environment								
49 Policy, Planning and Support Services	1.086	0.957	2.499	1.987	1.642	2.101	2.396	7.697
150 National Environment Management Authority								
51 Environmental Management	10.982	14.151	26.052	26.052	29.72	34.121	39.403	45.741
157 National Forestry Authority								
52 Forestry Management	9.824	15.085	32.499	32.499	36.529	41.366	47.169	54.133

Source: Adapted from MTEF for this analysis.

Marine protection

Additional expenditure on protecting waters, to increase sustainable fisheries. No expenditure categories found in the National Budget Framework.

Climate adaptation

Additional expenditure towards mitigating the negative economic effects of climate change (e.g. funds for farmers, preventative measures).

Table 35 - A21 - Climate Adaptation cost assumptions

Projects	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25
Total	85.864	111.288	153.844	150.503	152.255	157.416	160.157	169.521
019 Ministry of Water and Environment								
03 Water for Production	57.481	86.443	120.204	118.204	120.204	120.204	121.432	121.432
06 Weather, Climate and Climate Change	1.81	0.639	0.66	0.66	0.66	4.046	4.046	4.046
49 Policy, Planning and Support Services	4.185	3.481	6.217	4.876	3.598	4.137	4.168	11.752
302 Uganda National Meteorological Authority								
53 National Meteorological Services	22.388	20.725	26.763	26.763	27.793	29.029	30.511	32.291

Source: Adapted from MTEF for this analysis.

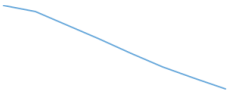
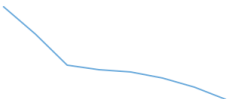
Appendix 4: Results of simulation on NDP III Targets

There are two scenarios simulated to analyse the effectiveness of NDP III on achieving NDP III targets. The indicators for which there was a comparison within the model are in the tables below.

The 2020 values represent the predicted starting value (pre-NDP III), while the 2025 values represent the predicted value at the end of 2025 with NDP III compared with base (without NDP III). Note that the value for 2020 is the same in both the base and NDP III, as this is before NDP III begins. Additionally, the percentage progress towards the goal using NDP III for those that have a target available is shown Note that some targets are reached better than others, and a brief interpretation of each result and trend is offered to share insight into how these came into being with the model in mind. Because of the way in which the model is developed, some indicator results may differ than with using another set of assumptions. This is noted where relevant, with more detailed explanation in limitations section (Appendix 2).

The results are presented in six tables below, one for the goal identified in NDP III and five for each of the objectives. Some indicators are not available in the model as either data was unavailable, or it is not within the scope of the current model. Others, such as paved road density, and income per capita is measured in different ways in the model and the results presented are anchored to the most recent available data and the results presented are percentage growth. Paved road density in the model captures all roads, not just national roads, while income per capita reflects pre-rebased GDP numbers (see Appendix 2 for a description of both).

Table 36 - A22 - NDP III target achievement and trend, indicators related to NDP III goal

No.	Target	2020 Base	2025 Base	2025 NDP III	% to Target	2025 Target
Goal: Increased household incomes and improved Quality of Life						
1	GDP Income per Capita (nominal USD)	933.33	1323.40	1372.99	120%	1301
		This indicator represents the average income per capita. It changes mainly according to production, taxes and population growth. Given the overall positive trend of GDP growth, income per capita exceeds the target in both base and NDP III scenarios. Note that the income per capita reported here is using the rebased GDP.				
2	Poverty Rates (%)	24.5%	21.4%	20.7%	42%	15.5%
		In the model, this rate is the proportion of the population above the national poverty line. The national poverty line has been calibrated to data on employment and Gini coefficients, with assumptions made on income distribution and workload. Many factors can influence the incidence rate, including household incomes, taxes, income distribution and overall production. In both the base and NDP III scenarios, this shows a declining trend as economic factors improve.				
3	Gini Coefficient	0.4511	0.4517	0.4525	-2%	0.39
		The Gini coefficient is a measure used to indicate relative income distribution within a society. From a scale of 0 to 1, 1 indicates the case where higher values indicate more unequal income distribution. Note that, in line with the definition, this only takes into account overall distribution but not the actual income.				
5	Population Growth Rate (% per year)	3.0%	2.9%	2.9%	20%	2.5%
		This rate represents the percentage increase in the total population over one year. The annual population growth rate decreases from 2.34% (2018) to 1.83% in 2035. It is influenced by fertility and mortality rates. Though significant progress is made towards the target, the overall growth is not targeted enough to bring 15.5% out of poverty.				

Source: iSDG-Uganda analysis results.

Table 37 - A23 - NDP III target achievement and trend, indicators related to NDP III Objective 1

No.	Target	2020 Base	2025 Base	2025 NDP III	% to Target	2025 Target
Objective 1: Enhance value addition in Key Growth Opportunities						
6	Real GDP Growth rate (% per year)	5.7%	5.2%	5.0%	-54%	7.0%
		This indicator represents the annual change in gross domestic product (market prices). It takes into account the output of three production areas (primary, secondary and tertiary). Due to the predicted collapse around 2025 of forestry, the final value here is lower than what the trends would indicate. A further explanation of this is contained below in the agricultural growth rate section.				
7	Industrial Growth Rate (% per year)	5.7%	7.1%	7.7%	83%	8.1%
		The growth of the industrial production is driven by investment into industry, total factor productivity and the availability of a qualified labour force. The combination of industrial investment augmented by existing and improved socioeconomic conditions in NDP III helps significantly to reach this goal, and the goal is 83% reached as compared with 2020.				
8	Industrial Proportion of GDP (%)	16.2%	17.4%	17.8%	18%	25%
		This indicator represents the proportion of industry in overall production. Though it shows a growing trend, it is not enough to meet the target. Considering that this is a dynamic model, relative to other production areas, it is still growing more quickly.				
12	Agricultural Growth Rate (% per year)	1.2%	-5.8%	-12.1%	-229%	7%
		The agricultural growth rate is anticipated to collapse around 2025 due to the predicted decline of the forestry around this time. By analysing the trend, and the simulation to 2030, the agricultural growth rate will rebound and continue to be positive after this decline. See the forest cover target for more details.				

Source: iSDG-Uganda analysis results.

Table 38 - A24 - NDP III target achievement and trend, indicators related to NDP III Objective 2

No.	Target	2020 Base	2025 Base	2025 NDP III	% to Target	2025 Target
Objective 2: Strengthen private sector capacity to drive growth and create jobs						
15	Savings as a proportion of GDP (%)	20.8%	22.6%	23.3%	18%	35%
		Savings is calculated as a sum of investments and the current account balance. The initial dip is caused by a surge in domestic financing that shocks the system and leads to lower private investment. Later, however, the private investments are actually stimulated thanks to NDP III, due to a later reduction of domestic financing, and increased capital and financial account. Finally, the overall increase in public investment also increases as a direct result of NDP III. Even with the initial dip, the overall performance is an improvement, and will lead to exponential benefits beyond 2025.				

No.	Target	2020 Base	2025 Base	2025 NDP III	% to Target	2025 Target
16	Exports as a proportion of GDP (%)	18.7%	19.7%	20.0%	100%	20%
		The change in export share reaches the target set thanks to a small increase. Export is affected by taxes on international trade and total factor productivity. Taxes on international trade remain unchanged. The increase is the effect of increased factor productivity, which increases due to the growth in capital.				

Source: iSDG-Uganda analysis results.

Table 39 - A25 - NDP III target achievement and trend, indicators related to NDP III Objective 3

No.	Target	2020 Base	2025 Base	2025 NDP III	% to Target	2025 Target
Objective 3: Consolidate and increase stock and quality of productive infrastructure						
18	Electricity generation (BW)	2.994	3.062	3.062	13%	3.500
		Power generation capacity is measured per billion kilowatt-hours of electricity produced each year. It combines the capacity of all fossil fuel sources (oil, gas, coal), biomass, and renewable sources including centralized and decentralized generation and. The total capacity depends on the expected demand for electricity.				
19	Access to Electricity (% of households)	23.5%	26.2%	26.2%	7%	60%
		The rate of access to electrical energy represents the proportion of the population with access to electricity. In the model, this indicator is determined by the coverage of electricity from decentralized and centralized sources, household income, education and urbanization. Note that the model does not directly capture distribution infrastructure, but given these other factors, the model does not anticipate it will meet this target.				
20	Paved Road Density (%)	21.0%	21.8%	28.9%		
		The proportion of paved road network is defined by the ratio of kilometres of paved road to the total network (paved and unpaved). This is trending upwards given that the relative proportion of paved roads being built is predicted to be higher than unpaved roads.				

Source: iSDG-Uganda analysis results.

Table 40 - A26 - NDP III target achievement and trend, indicators related to NDP III Objective 4

No.	Target	2020 Base	2025 Base	2025 NDP III	% to Target	2025 Target
Objective 4: Increase productivity and wellbeing of population						
22	Proportion of Households Dependent on Subsistence Agriculture (%)	63.7%	44.9%	45.7%	207%	55%
		Note firstly that this factor is not calibrated in the model due to the lack of historical data but is used however to estimate prevalence of undernourishment. It is dependent on shifts in migration to urban areas and the accessibility to forests. These factors show a downward trend in the future				
23	Life Expectancy (years)	61.02	62.97	63.21		
		This indicator quantifies mortality conditions by showing the estimated life span of a newborn. Health expenditure, food, average years of schooling, household income, pollution, fertility, access to electricity, access to water, climate and the number of vehicles can affect life expectancy.				
27	Forest Cover (% of total land)	7.5%	3.1%	3.3%	-40%	18%
		Forest cover continues a decline despite investment into reforestation and land protection. Given historical data, land protection efforts, though they may increase, are not fully effective. Additionally, reforestation spending, as indicated by budget documents and estimates of costs of reforestation, are not enough to reverse the trend of declining forest cover given forestry activities and the informal use of forests as biofuel.				
28	Average Years of Schooling (year)	6.08	6.66	6.69	12%	11
		Average years of schooling increase, though results are typically hard to see over relatively short time horizons as average years of schooling take into account the entire adult population. Therefore, even if educational attainment is higher for youth, adults, who may not be as well educated, are still counted in this measure.				
29	Infant Mortality Rate (per 1000 births)	70.36	63.46	62.03		
		The infant mortality rate expressed per 1,000 births is defined by the death of children under the age of 1. Like other mortality rates, it is an indicator of the effectiveness of health programmes.				
30	Maternal Mortality Rate (per 100,000)	361.85	330.56	326.15	57%	299
		Death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes. Like other mortality rates, it is an indicator of the effectiveness of health programmes.				

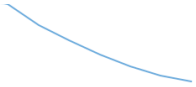
No.	Target	2020 Base	2025 Base	2025 NDP III	% to Target	2025 Target
31	Under Five Mortality Rate (per 1000)	89.24	79.83	77.84	31%	52
		This is the probability of dying between birth and 5 years of age, expressed per 1,000 live births. Like other mortality rates, it is an indicator of the effectiveness of health programmes.				
32	Total Fertility Rate	5.16	4.86	4.78	50%	4.4
		The total fertility rate combines health and economic factors that affect average fertility rates and the effectiveness of contraception. Given this, a future decline is expected.				
36	Prevalence of Stunting	34.2%	33.6%	33.1%	8%	20%
		Proportion of children under five years of age whose height for age is at least two standard deviations below WHO growth standards. This is affected by food production per capita, for those reliant on subsistence agriculture, and incomes.				
Source: iSDG-Uganda analysis results.						

Table 41 - A27 - NDP III target achievement and trend, indicators related to NDP III Objective 5

No.	Target	2020 Base	2025 Base	2025 NDP III	% to Target	2025 Target
Objective 5: Strengthen the role of the state in development						
38	Domestic revenue as a share of GDP	14.6%	14.7%	15.4%	195%	15.01%
		The various tax components that go into domestic revenue are calculated as a share of GDP. Additional changes in revenue result from the assumed changes in tax revenue from NDP III. The initial dip is caused by the fact that the growth of GDP outpaces the growth of taxes on income and profits during that period.				
Source: iSDG-Uganda analysis results.						

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