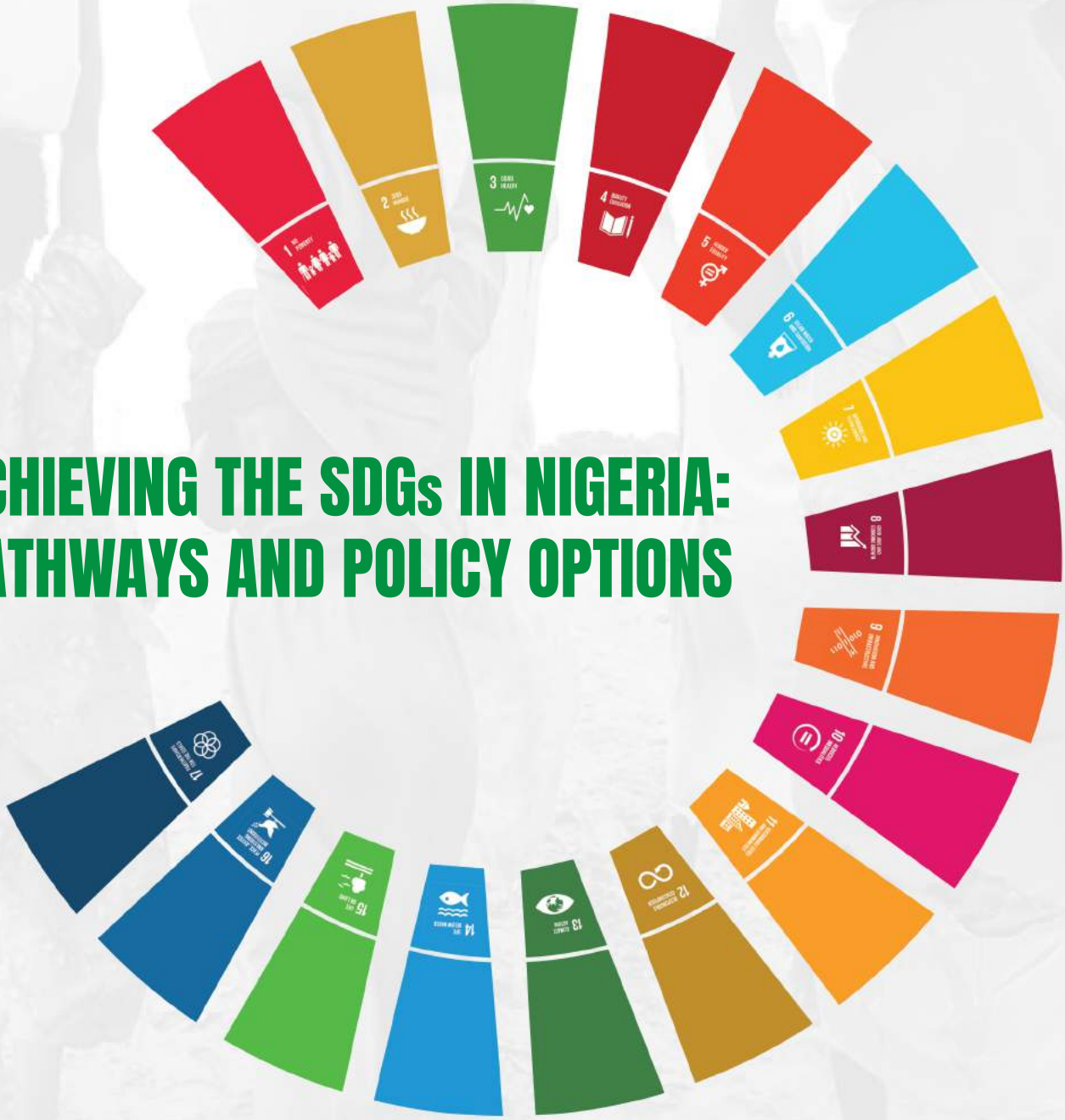
The Presidency



ACHIEVING THE SDGs IN NIGERIA: PATHWAYS AND POLICY OPTIONS

OFFICE OF THE SENIOR SPECIAL ASSISTANT TO THE PRESIDENT
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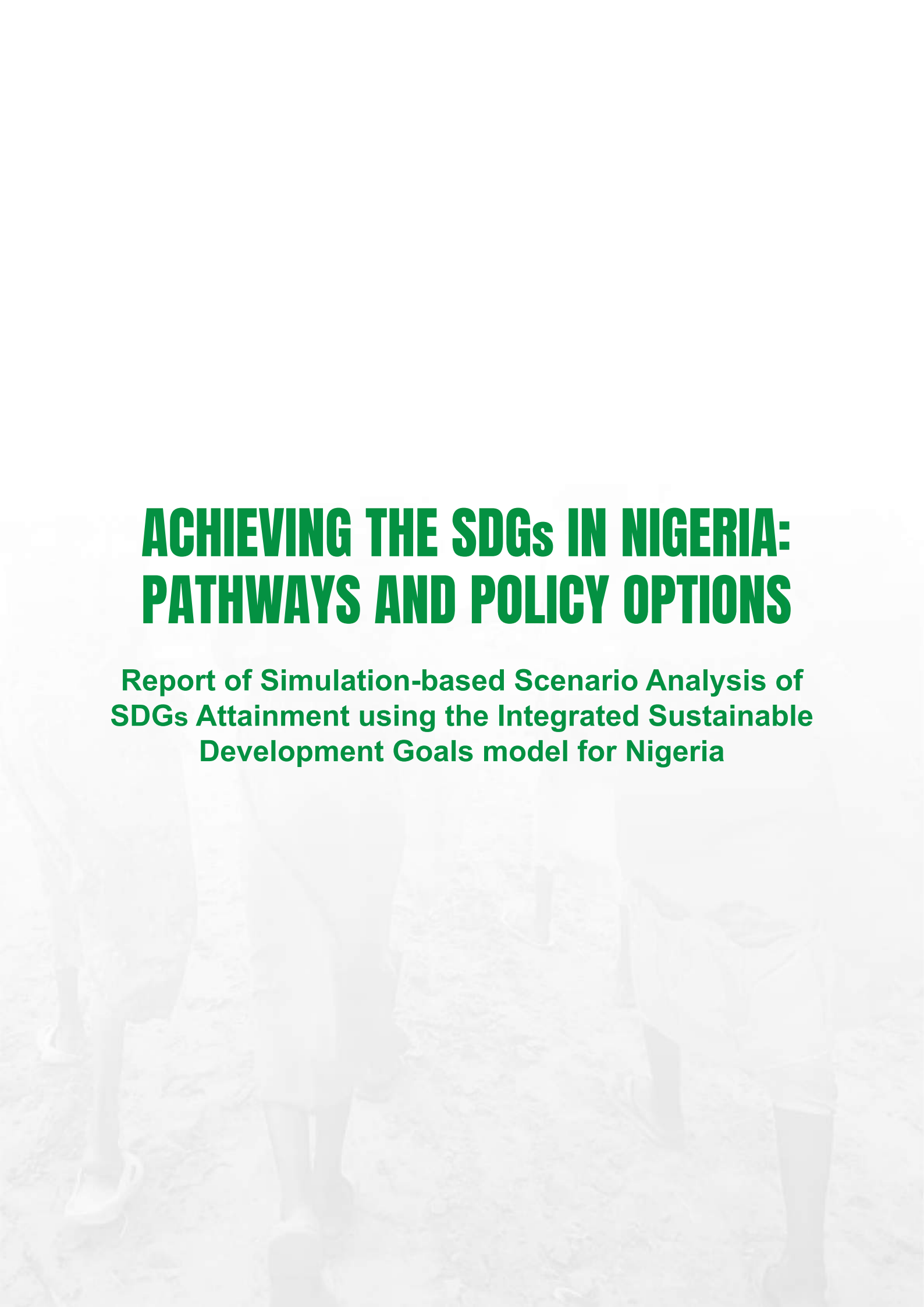
2019

ACHIEVING THE SDGs IN NIGERIA: PATHWAYS AND POLICY OPTIONS

Report of Simulation-based Scenario Analysis of SDGs Attainment using the Integrated Sustainable Development Goals model for Nigeria



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ACRONYMS AND ABBREVIATIONS

ASAI	Average Service Availability Index
BAU	Business as usual
CAIDI	Customer Average Interruption Duration Index
CAIFI	Customer Average Interruption Frequency Index
CBN	Central Bank of Nigeria
CPI	Composite Performance Index
CTAIDI	Customer Total Average Interruption Duration Index
EIA	US Energy Information Administration
ERGP	Economic Recovery and Growth Plan (2017-2020)
FAO	Food and Agricultural Organization
GDP	Gross Domestic Product
GHG	Greenhouse Gases
IEA	International Energy Agency
ILO	International Labour Organization
IMF	International Monetary Fund
iSDG	Integrated Sustainable Development Goal Simulation Model
iSDG-UI	User-Interface-Version of the iSDG-Model
iSDG-RV	Research-Version of the iSDG-Model
MBNP	Ministry of Budget and National Planning
MDAs	Ministries, Departments and Agencies
MDGs	Millennium Development Goals
MI	Millennium Institute
MIT	Massachusetts Institute of Technology
NBS	Nigerian National Bureau of Statistics
NDHS	National Demographic and Health Survey
NISER	Nigerian Institute for Social and Economic Research
NPoPC	Nigerian National Population Commission
OSSAP-SDGs	Office of the Senior Special Assistant to the President on the SDGs
PM2.5	Atmospheric Particulate Matter (from emissions) of size smaller than 2.5 micrometers; in iSDG "PM25" since dots are not used within variable names
SAIDI	System Average Interruption Duration Index

SAIFI	System Average Interruption Frequency Index
SD	Systems Dynamics
SDGs	Sustainable Development Goals
SOM	Soil Organic Matter
SSA	Sub-Saharan Africa
T21	Threshold 21 Model
UN	United Nations
UNDP	United Nations Development Programme
UNpop	United Nations Population Division
WDI	World Development Indicators (World Bank)
WHO	World Health Organization

FOREWORD

In the historic journey of the human race, whether at the individual, family or societal levels, the place of planning has always been evident. The journey from food gathering, to farming and the industrial and knowledge-based economies of today tells us that society is built on the substructure of the economy. This implies that the economy, which supports the superstructure of our existence, cannot be left to chance or to run itself. It has to be planned consciously to keep operating with minimal hitches.

Nigeria's experience with development planning pre-dates her independence in 1960 with successive National Development Plans (NDPs) being developed in the post-independence era. Instructively, in the mid-1970s, at the peak of its relevance as a national economic barometer, Nigeria's National Development Plan ran parallel to a similar exercise in China which at that time was also trying to lay a solid foundation for its economy in many respects. Unfortunately, while China persevered on an upward trajectory and ended up as the go-to economy of the world today, Nigeria has not been so fortunate having moved from one planning framework to another, with varying degrees of implementation until the frames could not really be said to be impactful. As a consequence, and together with the inevitable impact of global economic downturns, we, as a nation, have had our fair share of economic development blights since then.

The adoption of the Millennium Declaration and the Millennium Development Goals as a development paradigm in the year 2000 added further impetus to Nigeria's planning process. Invariably, Nigeria has had to domesticate both the MDGs and its successor global development Agenda, the Agenda 2030 and the Sustainable Development Goals (SDGs), for implementation within the context of its economic, social and ecological realities.

It must be emphasized that the fundamental issue affecting development in Nigeria relates to the proper management of the development processes, namely, policy formulation, planning, and implementation of programmes. Over the years, these challenges have resulted in poor delivery of public services, unacceptable levels of poverty and inequality, with a huge infrastructural deficit and poor human development indices, among other things.

Nigeria chose to use the integrated Sustainable Development Goals (iSDG) policy simulation model, as a planning tool, to complement the existing ones currently in use at national, sub-national and sectoral levels to address some of its most pressing development challenges. In adopting this model, the government aims to enhance the coherence in policy formulation and planning by minimizing trade-offs and maximizing synergies between various policy measures. The fact that this versatile planning tool will be housed in the Ministry of Finance, Budget and National Planning is an indication of my government's commitment to improved planning and budgeting coordination of all development efforts at all tiers of governance.
I wish, therefore, to congratulate the Office of the Senior Special Assistant to the President on SDGs, the Ministry of Finance, Budget and National Planning and the United Nations Development Programme (UNDP) on the successful development

and domestication of the iSDG-Nigeria model, as well as the production of this report. I also commend the various experts for their invaluable contributions in terms of professional knowledge and insights which helped to enrich the model and to make it reflect the Nigerian reality.

It is my sincere hope that planners and policymakers at all levels of governance will use the results of this analysis to achieve our goal of an economic turnaround and shared prosperity. In particular, I urge both the national and sub-national governments to use the model in three fundamental ways. One, as a framework for sound, evidence-based policy analysis, planning and implementation. Two, as a platform for institutionalizing needs assessment and costing as a key input into planning and budget making. And, three, as an advocacy tool for resource mobilization towards filling any identified funding gaps in the achievement of the Agenda 2030 and the SDGs, as well the Africa Union Commission Agenda 2063.

MUHAMMADU BUHARI, GCFR

President and Commander-in-Chief of the Armed Forces

Federal Republic of Nigeria

PREFACE

The publication of this report represents a watershed moment in the development path of our country. The report serves two important purposes. First, it heralds the official announcement of the successful domestication of the integrated Sustainable Development Goals (iSDGs) model specifically for Nigeria. The iSDG-Nigeria model is a policy simulation tool for use in aligning our national development strategies and programmes with the SDGs. The core objective of this is to enhance the achievement of the 17 SDGs, by 2030. Second, the publication marks the first practical step towards application of the model for evidence-based policy formulation and planning in Nigeria. By domesticating the model, we have developed a robust analytical tool that will lead to a shift from the hitherto pigeon-hole approaches to planning and replace them with one that has requisite technical soundness, analytical robustness and flexibility to different contexts for appraising the possible outcomes of various policy choices over time. Therefore, both the publication and the model itself are products of a strong commitment by the government to the ideals of sound planning to achieve the aspirations of Agenda 2030 and the lofty goals of the SDGs, as well as the Africa Union Commission Agenda 2063.

In the mid-2000s, the country launched the Nigeria MDGs Needs Assessment and Financing Strategy that was the fulcrum of its development strategy from 2006-2015. And to strengthen sub-national collaboration, the Needs Assessment and Costing exercise was stepped down to the States between 2009 and 2011. Another key collaborative initiative of the federal government with the states and local governments was the Conditional Grants Scheme (CGS). The defining feature of the CGS is that it allowed states and local governments access to counterpart funding of their MDG projects and programmes from the Paris Club Debt Relief (DRG) funds subject to the preparation of local development plans underpinned by rigorous needs assessment/costing in four relevant sectors: education, health, agriculture, water and sanitation. This collaborative approach led to better budget implementation and improved delivery of quality public services at the facility point. All these and many past initiatives provide us with a firm foundation on which the SDG-related initiatives, generally, and the application of the iSDG simulation model, are founded.

It is noteworthy, therefore, that implementing the iSDG policy simulation model in Nigeria, in conjunction with the other existing models currently in use, is a positive step towards resolving some of our most pressing development challenges. I have no doubt that this report will provide stakeholders, including policymakers, development practitioners, planners, budget experts, civil society organizations and citizens with the tools to not only effectively plan and execute development projects but also evaluate government policy performance and help in tracking progress towards achieving the Economic Recovery and Growth Plan (ERGP) and other development plans and strategies, as well as the SDGs.

I wish to commend the tireless efforts of all the staff of my office, the Ministries, Departments and Agencies (MDAs), re

searchers from the Millennium Institute and UNDP who made useful inputs into the production of this report. In light of the findings in this report, especially in relation to what it would take to achieve the Sustainable Development Goals by 2030, I look forward to a seamless application of the model in support of policy formulation, planning and programme implementation by all tiers of government and other stakeholders. My office will continue to work closely with all collaborating partners, including the Ministry of Finance, Budget and National Planning and the UNDP, in institutionalizing and the domesticating the model at both federal and sub-national levels.

PRINCESS ADEJOKE ORELOPE-ADEFULIRE

Senior Special Advisor to the President on Sustainable Development Goals

ACKNOWLEDGEMENTS

This report was prepared by researchers from Millennium Institute (MI) in conjunction with the staff of the Office of the Senior Special Assistant to the President on the SDGs (OSSAP-SDGs), the Federal Ministry of Finance, Federal Ministry of Budget and National Planning (MBNP) and the United Nations Development Programme (UNDP), Nigeria Country Office. To that extent, the first credit for this landmark report goes to Mr Holger Maximilian Kleemann of the Millennium Institute, for guiding the development of the iSDG-Nigeria model and laying the groundwork for the production of this report.

The model customization process and the production of this report benefitted from the inputs of national experts concerned with sustainable development, namely, the Policy Team[1] and the Technical Team[2]. Membership of these teams was drawn from government ministries, departments and agencies (MDAs), research institutions, and the private sector. Their inputs were in the form of supply of data through documents and interviews, and expert views and insightful contributions during the series of workshops that were conducted in the course of the assignment.

We would like to especially thank Bartholomew T. Feese, immediate past Director (Budget Monitoring and Evaluation), in the Budget Office of the Federation. We thank him for his leadership in organizing the workshops and coordinating the team of experts, and also extend the same courtesies to Joseph D. Kuma, and Kalu Ogbonnaya Ukwa, the two private sector costing and IT experts, for their role in facilitating the workshops and acquiring data for the project. We would like to acknowledge the input and support of Dr Timothy Okon, Special Adviser to the Honourable Minister of State for Petroleum, and Mr Davies Pade, Director in the Ministry of Mines and Steel Development, who provided valuable insights into their respective work areas during the workshops in which the respective special sectors were conceptualized. Similarly, we would also like to thank Mr Oregbesan Olalekan from the National Power Training Institute of Nigeria for the rich information on the problems in Nigeria's power sector. Also acknowledged are the invaluable contributions of two consultants, Professor Mike I. Obadan and Professor D. Olu Ajakaiye, who undertook a technical review of the draft final report. Similarly, Patrick Edebor deserves appreciation for editing the report.

In a very special way, we would like to most sincerely thank the three collaborating partners, OSSAP-SDGs, MFBNP, and UNDP, for all the guidance and support they rendered. Specifically, we are most grateful to the Honourable Minister of Finance, Budget and National Planning, Mrs Zainab S. Ahmed, for her strong belief in the importance of the process and the final product. Moreover, we would like to thank Mohamed Yahya, UNDP Resident Representative for his support and Ojijo Odhiambo, UNDP Economic Advisor for Nigeria and ECOWAS for his invaluable insights, technical guidance and commitment in guiding the entire model domestication and report production process.

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1. See Annex 6.1 for a list of members of the Policy Team.

2. See Annex 6.2 for a list of members of the Technical Team.

KEY MESSAGES

- The iSDG model, which has been successfully domesticated in Nigeria, should be maintained and utilized in comple menting the existing models in the Ministry of Finance, Budget and National Planning. To this end, the government should consider domiciling both the iSDG Research and User Interface versions in the Ministry.

- The MBNP should also consider collaborating with NISER, and possibly one other academic institution, to train more experts in systems dynamics (SD) modelling to ensure the sustainability of the iSDG domestication in Nigeria.

- To truly sustain the domestication of the iSDG-Nigeria model, the capacity building component of Nigerian modelling experts and policymakers who are expected to make good use of the research and user interface versions of the iSDG model should be ongoing. In this regard, the plan to cascade the customization of the iSDG model to the states, together with a capacity building training and sensitization programme, is in order and needs to be fully implemented to complement efforts at the federal level.

- Data posed substantial challenges to the simulations in terms of availability and quality. Therefore, going forward, it will be most desirable to address the data issues, especially those aspects where there is leverage for improvement in future projects. Specifically, the National Bureau of Statistics (NBS) and their counterparts at the state level (the State Bureaux of Statistics) should be supported with necessary resources to produce reliable data following international standards to enable incorporation of many more indicators into the iSDG model. Management of cooperation across MDAs and other administrative levels, from federal through state to local, is just as necessary as physical infrastructure for data acquisition and management, and human resources. In particular, sub-national data should be enriched to represent the heterogeneity of the impacts of alternative policy scenarios at the national and sub-national levels.

- The ERGP neglects some SDGs, such as climate change adaptation, marine and terrestrial conservation, air and water pollution, resource use, and traffic fatalities. Specifically, the ERGP does not seem to contain sufficient policies to adapt to climate change; hence the population and their assets are left unprotected against the risks emanating from this global issue. Simulations featuring much higher expenditure on climate change adaptation show that a lot is at stake and there is so much to be gained here.

- The simulations suggest that the ERGP is insufficient to reach the SDGs even under optimistic assumptions. The ERGP+SDG-Scenario, containing more ambitious policies, suggests that an adapted policy mix could get much closer to the SDGs. However, even, the latter scenario also leaves notable achievement gaps in the SDGs. Therefore, to improve on the achievement of the 2030 targets in all the indicators for which iSDG simulation

results are available, there is a need to articulate and effectively implement significant additional SDG-related policies and programmes (to be implemented by both federal and sub-national governments) so as to increase the percentage of indicators for which the 2030 targets are achievable from the present.

- In combination, policy interventions often have different – expected and unexpected – effects from planning single interventions. Such effects include cross-sectoral impacts on other goals than the intended ones. Importantly, it can also mean unintended impacts of one policy on other policies. This means that policies engender desirable and un desirable synergies. The latter implies the existence of important policy trade-offs. The identification of such effects should lead to the implementation of policy combinations that increase positive and reduce negative synergies, that is, emphasizing combinations that improve policy coherence. Thus, planners and policymakers should make effective use of the capability and robustness of the iSDG model to identify the likely unintended desirable and undesirable impacts of policies on other indicators. This helps to provide a guide for the design and implementation of complementary and ameliorative policies, as may be necessary.

- To increase the prospects of achieving many more SDGs beyond Goal 2 under the ERGP +SDG Scenario, Nigeria will need much more than the estimated cost of N125 trillion in real terms. It will, therefore, be necessary for the domestic and international partners to provide financial support substantially in excess of this amount.

- Strong population growth aggravates many other issues. A sustained reduction in population growth could help a lot by increasing the resources available per capita. Investment in family planning is an important policy lever, although population growth reduction is a combined effect of interventions in several areas, e.g., improved education and better wages. Additional policies may be necessary.

- The simulations relating to the prospects of achieving the SDGs by 2030 are predicated on the federal government's ERGP. To the extent that the task of ensuring achievement of the SDGs is not that of the federal government alone using the instrument of ERGP, the active involvement of the sub-national governments, especially the state governments, is imperative. To this end, the states and local governments would need to mainstream SDG policies and programmes into their plans and budgets to complement the efforts of the federal government to achieve the SDGs by the target date or before. They would also need to provide data from the sub-national levels so that the strong heterogeneities in Nigeria can be properly represented in future versions of the iSDG.

- Meanwhile, government at all levels should intensify their domestic resource mobilization efforts and explore other innovative financing mechanisms, including channelling remittances to development projects through the issuance of diaspora bonds and securitization of future streams of revenue from government infrastructure assets, among other things. This should be complemented by other forms of external support, especially in the areas of capacity building, access to technology and complementary trade policies.

OVERVIEW

PREAMBLE

This report presents the results of the application of the iSDG model in analysing the prospects of achieving the 17 SDGs by 2030 under three different policy scenarios. The report has six chapters. Chapter 1 highlights the context, objectives, and analytical framework of the report. It also summarizes the preliminary activities such as capacity building and post-simulation activities such as validation workshop. In Chapter 2 is a detailed description of the analytical framework entailing the iSDG model and its structure. It also contains the SDG targets and policy intervention areas. The chapter provides information on the three policy scenarios, namely, the No-ERGP-Scenario, Optimistic-ERGP-Scenario, and the ERGP+SDG-Scenario. These scenarios can be defined briefly as follows: The No-ERGP-Scenario assumes no policy changes after 2015 and presumes the continuation of pre-ERGP policies only. The Optimistic-ERGP-Scenario assumes that the policies and programmes in the ERGP are effectively and efficiently implemented. The ERGP+SDG-Scenario, goes beyond Optimistic-ERGP by identifying integrated policy mixes that could improve SDG performance in those areas where the ERGP has been considered insufficient for full SDG attainment.

Chapter 3 contains the analysis of the simulation results regarding the prospects of achieving the SDGs by 2030. It analyses the prospects of achieving the targets for 64 indicators of the 17 SDGs which were incorporated into the iSDG model and for which simulation results were produced. The chapter also contains the results of the composite performance index for the 17 SDGs to gain insights into the prospects of achieving specific SDGs by 2030. The synergies and coherence among the policy interventions are discussed in Chapter 4 while the estimates of annual and aggregate costs of the scenarios aimed at achieving the SDGs detailed in Chapter 3, are found in Chapter 5. Also, the costs which are in nominal and real terms are disaggregated into its two components, namely, SDG expenditure on social and economic services as well as SDG expenditure on subsidies and transfers. In addition, the expected contributions from the private sector are provided. The implications of all these for government's fiscal balance are also contained in Chapter 5. Chapter 6 contains key findings, conclusions and recommendations.

MAIN FINDINGS & CONCLUSIONS

Foremost, the domestication, calibration and simulation of the iSDG model for Nigeria is an innovation that should be encouraged and maintained. The operationalization of the model in Nigeria is an important addition to the portfolio of models available to policymakers for policy analysis and planning. It is important to stress that the iSDG model is not a substitute for the existing econometric and computable general equilibrium models but a complementary one. Even prior to domesticating the model in Nigeria, only 64 out of the 169 possible SDG indicators were included in the generic model. Grounds for selecting indicators for the model were quantifiability and availability of supporting data. As the indicator definition and computational methods improve, and as the model is maintained, updated and recalibrated in future, it is anticipated that the data challenges will be addressed. By so doing, the very robust capabilities of the model, especially the long-term simulation of alternative scenarios, . In other words, it is anticipated that when data challenges are addressed in the near future, more indicators can be incorporated into the model. of alternative scenarios, the assessment of achievement of various target indicators, the composite

performance index, the synergy and sensitivity analysis will all enrich policy planning and provide benchmarks for monitoring, evaluation and impact assessment. In other words, it is anticipated that when data challenges are addressed in the near future, more indicators can be incorporated into the model.

The simulation results show that the ERGP is insufficient to reach the SDGs even under optimistic assumptions. Even, the ERGP+SDG policy scenario also leaves notable gaps in achievement of the SDGs. Analysis of the simulation results for the 64 indicators summarized in Table ES1 reveals that under the No-ERGP- Scenario, only 2 of the 64 target indicators are achieved before or by 2030. Under the Optimistic-ERGP-Scenario, the 2030 target for only 16 (or 25 per cent) of the 64 indicators are achieved. Another 5 indicators (7 per cent) are almost achieved. In the ERGP+SDG-Scenario, the corresponding figures of indicator achievements are as follows: achieved indicators 25 (39 per cent), almost achieved 6 (9 per cent). The results of the composite performance index presented in Figure ES1 below corroborate this finding. Even under the best scenario (ERGP+SDG-Scenario), only SDG 2 (End Hunger) is likely to be achieved. The 2030 targets for the remaining 16 SDGs are unlikely to be achieved even if the ERGP and the investigated supplementary SDG policies and programmes are well funded and efficiently and effectively implemented.

TABLE ES1: SDG INDICATOR OVERVIEW FOR THE THREE SCENARIOS

Goal	Indicator	Degree of target attainment			Direction of development			ERGP impact
		No ERGP-scenario	Optimistic ERGP-scenario	ERGP+SDG-scenario	No ERGP-scenario	Optimistic ERGP-scenario	ERGP+SDG-scenario	
1	% of population below international poverty line	●	●	●	→	↗	↗	↗
1	% of population below national poverty line	●	●	●	→	↗	↗	↗
1 3	Average access to basic health care	●	●	●	→	→	→	↗
1 3 11 13	Mortality from natural disasters	●	●	●	↘	↘	→	↘
1 11 13	% of population affected by natural disasters	●	●	●	↘	↘	→	↘
1 11 13	Economic damage from natural disasters as % of GDP	●	●	●	↘	↘	→	↘
2	Prevalence of undernourishment	●	●	●	→	↗	↗	↗
2	Prevalence of stunting	●	●	●	→	↗	↗	↗
2	Prevalence of malnutrition	●	●	●	→	→	→	↗
2 8	Agriculture production in tons per worker	●	●	●	→	→	→	↗
2	Sustainable agriculture: area %	●	●	●	↘	↘	→	↗
3	Maternal mortality ratio	●	●	●	→	→	→	↗
3	Under-five mortality rate	●	●	●	→	→	→	↗
3	Neonatal mortality rate	●	●	●	→	→	→	↗
3	Cardiovascular, neoplasm, diabetes & respiratory mortality	●	●	●	→	→	→	↗
3	Road traffic mortality	●	●	●	↘	↘	↘	↘
3	Contraceptive prevalence rate	●	●	●	↘	↘	↘	↗
3	Adolescent birth rate	●	●	●	→	→	→	↗
4	% of 20 - 24-aged: completed secondary school	●	●	●	→	→	→	↗
4	% of 20 - 24-aged: enrolled in tertiary education	●	●	●	→	→	→	↗
4	Adult literacy rate	●	●	●	→	→	→	↗
4 5	Gender gap in tertiary literacy	●	●	●	→	→	→	↘
5	% of female: exploitations, sexual offences & monogamy	●	●	●	→	→	→	↗
6	Access to improved water source	●	●	●	↘	↗	↗	↗
6	Access to improved sanitation facility	●	●	●	→	↗	↗	↗
6	Water withdrawal per unit of GDP	●	●	●	→	→	→	↗
6	Water resources vulnerable by index	●	●	●	→	→	→	↘
7	% of population with access to electricity	●	●	●	→	→	→	↗
7	Renewables in final energy consumption	●	●	●	↘	↘	↘	↘
7	Energy intensity level of primary energy	●	●	●	↘	↘	↗	↗
8	Real GDP growth rate per capita	●	●	●	↘	↘	↗	↗
8	Real GDP growth rate per employed person	●	●	●	→	→	→	↗
8	Material footprint	●	●	●	→	→	→	↘
8	Material footprint per capita	●	●	●	↘	↘	↘	↘
8	Material footprint per GDP	●	●	●	↘	→	→	↘
8	Domestic material consumption	●	●	●	→	→	→	↘
8	Per capita domestic material consumption	●	●	●	↘	↘	↗	↘
8	Domestic material consumption per GDP	●	●	●	→	→	→	↗
8	Unemployment rate	●	●	●	→	→	→	↗
8	% youth not in employment, education, training	●	●	●	→	→	→	↗
8	Rural access index	●	●	●	↘	↘	→	↘
9	Industry, production as % of GDP	●	●	●	→	→	→	↘
9	Per capita industry production	●	●	●	→	↗	↗	↗
9	% of total employment in industry	●	●	●	↘	↘	↘	↗
9	CO2 emissions per unit of value added	●	●	●	→	→	→	↗
10	Income growth rate gap of average pop vs. poorest 40%	●	●	●	→	→	→	↗
10	% population below half median income	●	●	●	→	→	→	↗
10	Average labour share	●	●	●	↘	↘	↘	↘
11	% of urban waste collected and disposed	●	●	●	→	↗	↗	↗
11	Exposure to PM 2.5	●	●	●	→	→	→	↘
11	% of link roads sustainably exploited	●	●	●	↘	↘	↘	↘
11	% of territories we are protected	●	●	●	↘	↘	→	↘
11	% of terrestrial area protected	●	●	●	→	→	→	↗
12	Forest cover %	●	●	●	↘	↘	→	↗
12	Red list index	●	●	●	→	→	→	↘
12	Violence related mortality	●	●	●	→	↗	↗	↗
12	Bribery incidence	●	●	●	↘	→	→	↗
12	Government effectiveness	●	●	●	↘	→	→	↗
12	Domestic revenue as % of GDP	●	●	●	↘	→	→	↗
12	Directorates as % of GDP	●	●	●	↘	→	→	↗
12	Staff turnover as % of GDP	●	●	●	→	→	→	↗
12	% revenue from domestic taxes	●	●	●	→	↗	↗	↗
12	Grants as % of domestic revenue	●	●	●	↘	→	↘	↘
12	Interest on public debt as % of export	●	●	●	↘	→	→	↗

Legend:		
Degree of Target attainment	2030-Target attained	○○●
	2030-Target almost attained (=barely missed)	○●○
	2030-Target not attained	●○○
Direction of development	Desirable: moving towards / deeper into target range	☺
	not (or hardly) approaching target range	☹
	Undesirable: varying direction: alternating between desirable and dundesirable or vise versa	😐
Policy impact	Desirable impact of *Optimistic-ERGP-scenario*	👍
	Undesirable impact of *Optimistic-ERGP-scenario*	👎
	None or hardly any change in *Optimistic-ERGP-scenario* compared to *No-ERGP-scenario*	👉

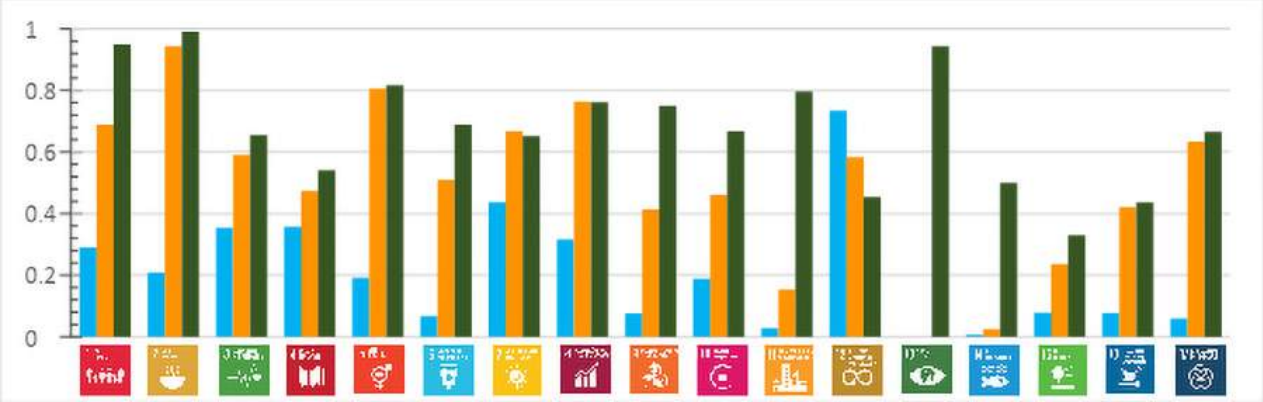


Figure ES1: Average SDG-Goal Performance for each SDG on a scale from 1 (target for all SDG indicators attained for this goal) to 0 (no closure of the initial gap of SDG indicators relative to their respective targets). **No-ERGP-Scenario** , **Optimistic-ERGP-Scenario**, **ERGP+SDG-Scenario**

Therefore, to ensure the achievement of the 2030 targets in virtually all the indicators for which iSDG simulation results are available, there is a need to articulate and effectively implement significant additional SDG-related policies and programmes at the federal and sub-national levels so as to increase the percentage of indicators for which the 2030 targets are achievable.

The results of the synergy and sensitivity analysis show that, indeed, several policies and programmes do have positive and negative spill-overs on other indicators. This is typical of all policy interventions which inevitably have three effects, namely, *the desired and intended effects, the desired and unintended effects, and the undesired and unintended effects.* The capability of iSDG model to identify these three effects, termed synergy, is particularly useful in policy planning. The results of the exercises presented in chapter 4 reveal those policies that are likely to have some or all of these effects. Thus, planners and policymakers should make effective use of the capability of the iSDG model to identify the likely unintended, desirable and undesirable impacts of policies on other indicators to provide a guide to the design and implementation of complementary or ameliorative policies, as may be necessary. Clearly, the iSDG model is a veritable tool for identifying such effects to provide an evidence base for undertaking policies that are likely to ameliorate the undesired effects as well as consolidate and enhance the desirable but unintended effects. The capability of iSDG in carrying out sensitivity analyses, as demonstrated in chapter 4, should also provide insights into the robustness of the likely effects. This feature of iSDG should, therefore, be regularly used for these purposes.

Analysis of the costing of SDG expenditures, presented in chapter 5, reveals that the annual SDG expenditure for the Optimistic-ERGP-Scenario, is likely to increase systematically until 2030. Essentially, the SDG expenditure under ERGP+SDG-Scenario is lower than under the Optimistic-ERGP-Scenario because of the significant efficiency gains realizable under the ERGP+SDG-Scenario. When SDG expenditure is decomposed into those related to social and economic services and those related to subsidies and transfers, the results are quite different. While the annual SDG expenditure on social and economic services is higher under the ERGP+SDG-Scenario compared to Optimistic-ERGP-Scenario, the reverse is the case for the subsidies and transfers because of improved efficiency and better targeting associated with the ERGP+SDG-Scenario. It was also revealed that the private sector is expected to make substantial contributions to SDG expenditure. Indeed, it is assumed that the private sector will contribute 50 per cent of SDG expenditure. Accordingly, the increase in annual private sector expenditure is highest under ERGP+SDG-Scenario. The cumulated SDG expenditure under ERGP+SDG-Scenario is estimated at N83 trillion in real terms by government and N42 trillion in real terms by the private sector, making a total of N125 trillion in real terms. It was pointed out that since it is unlikely that more than one SDG (Goal 2) is likely to be achieved under ERGP+SDG-Scenario, Nigeria will need to spend a lot more on SDG expenditure items in order to achieve many more goals.

CHAPTER ONE

INTRODUCTION

1.1 PREAMBLE

In September 2015, 190 UN Member countries adopted the Agenda 2030, including the Sustainable Development Goals (SDGs), as the successor to the Millennium Development Goals (MDGs). Agenda 2030 seeks to guide countries to end extreme poverty and hunger, fight inequality and injustice, and fix climate change, among other things. In most countries, including Nigeria, the MDGs were only partially achieved, thus shifting a greater development burden to the future. The innovative idea of goal-oriented planning, pioneered by the MDGs, gained acceptance in Nigeria when the country used MDG Needs Assessment and Costing as a basis for a ten-year development strategy (2006-2015).

The scope of the SDGs has been expanded significantly, compared to the MDGs. Rising from 8 Goals to 17, the SDGs increased not only in comprehensiveness but also in the complexity of challenges of development planning. Besides, much more than the MDGs, the integrated focus of the Agenda 2030 and the SDGs requires a unified approach incorporating the cross-sectoral linkages of policies, trade-offs and policy-synergies. In recognition of this, several Sub-Saharan African (SSA) countries, including Namibia, Malawi, Senegal and Cote d'Ivoire are currently undertaking integrated SDG policy design using the integrated Sustainable Development Goals Simulation Model (iSDG). To achieve the SDGs, Nigeria has likewise engaged the services of the Millennium Institute (MI) to help domesticate and customize the iSDG model for use in Nigeria's medium-to-long-term planning. This is to form a basis for estimating the consequences expected from current and alternative policy choices as well as for scaling up public investments in economic, social and physical infrastructure towards achieving the Agenda 2030.

This report describes the results and insights gained from the application of the iSDG model to Nigeria's Sustainable Development Goals Agenda.

1.2 OBJECTIVES OF THE STUDY

Generally, the iSDG simulation model is useful for integrated SDG policy design and for mainstreaming SDG policies into national policy and planning. Specifically, it can provide significant insights into the prospects of achieving the SDGs against the backdrop of implementing a package of domestic policies or interventions. In light of this, the broad objective of the study, whose findings are reported from Chapter 3 onwards, is to use the iSDG model to ascertain the prospects of achieving the SDGs with the implementation of alternative policy packages or interventions. The specific objectives are as follows:

- Track the progress recorded in achieving the Sustainable Development Goals;
- Provide insights into the adequacy or other wise of current policy initiatives or interventions aimed at achieving the SDGs and, hence, inform on additional policy initiatives that may be required; and
- Determine the additional cost of scaling up public investments in social, economics, and physical infrastructure with a view to achieving the SDGs.

BOX 1. 1: THE SDGS AT A GLANCE

- Goal 1. End poverty in all its forms everywhere
- Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture
- Goal 3. Ensure healthy lives and promote well-being for all at all ages
- Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
- Goal 5. Achieve gender equality and empower all women and girls
- Goal 6. Ensure availability and sustainable management of water and sanitation for all
- Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all
- Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
- Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
- Goal 10. Reduce inequality within and among countries
- Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable
- Goal 12. Ensure sustainable consumption and production patterns
- Goal 13. Take urgent action to combat climate change and its impacts*
- Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development
- Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
- Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
- Goal 17. Strengthen the means of implementation and revitalize the global partnership for sustainable development.

Source: United Nations. *Transforming our World: The 2030 Agenda for Sustainable Development, August 2015*

1.3 FACTS BEHIND THE SDGS

By 2015 when the SDGs were adopted, noticeable progress had been made in addressing global social and development issues following the implementation of actions relating to the MDGs. However, several challenges remained, which continued to affect the achievement of the goals in many countries/regions. These challenges are prominent in the areas of eliminating poverty and hunger, ensuring good health, quality education, gender equality, clean water and sanitation, good jobs and economic growth, reducing inequalities, and achieving relief from climate change, among other things. Also, under the MDGs, development planners did not focus much attention on several issues that now feature in the SDGs. The combination of this unfinished business of the MDGs and previously unaddressed issues provided the context for the SDGs. These underlying conditions and facts behind the SDGs are presented in ANNEXE 1:

1.4 ANALYTICAL FRAMEWORK

To achieve the above objectives, some analytical approaches can be used, for example, the econometric model and the computable general equilibrium model. However, the findings in this report are derived from an application of the integrated Sustainable Development Goals (iSDGs) model which uses the System Dynamics (SD) computer simulation methodology.

Agenda 2030 consists of long-term goals and the iSDG model is considered best suited for long-term planning and integrated scenario analysis at a high aggregation level. It aims at maximizing the coherence of policy packages by minimizing trade-offs and maximizing synergies between policy measures. Importantly, the iSDG model promotes coherent planning within the complex SDG system. Its adoption for this report is considered suitable as the integrated focus of the Agenda 2030 requires a unified approach incorporating the cross-sectoral linkages of policies, trade-offs and policy-synergies.

Computer simulation of the model provides the user with tools to test the impact of potential policies across all the SDGs. Such a policy impact assessment includes side effects on non-target areas of policies. Depending on whether these side effects are desirable or not, they constitute synergies or trade-offs.

Nigeria has adopted the iSDG policy simulation model as a planning tool to complement the existing excel-based sectoral costing models that were used in costing the MDGs from 2006 to 2015. The iSDG model is expected to help policymakers and planning officials at all levels of government to understand the interconnectedness of policies designed to achieve the SDGs as well as provide insights into their likely impacts.

From the iSDG Nigeria policy simulation model, this report provides insights into the following issues:

- Aggregate performance of each SDG, in terms of achievement by 2030 against the backdrop of the package of policies and interventions imple mented. In other words, the model provides useful insights into the ability of the policy packages to deliver on the SDGs.

- Effects of policies implemented individually or collectively on the SDGs attainment. These effects are useful for policy interactions or syn ergies: one policy may strengthen the effect of another policy or weaken it. In other words, the simulation results show that a policy that is suc cessful in solving one challenge may fail in an other indicator. Also, the model reveals the extent to which performance improvement in a goal requires the combination of policies; and

- Cost increase caused by various policy interven tions to achieve the SDGs by 2030. This means the model provides a guide on the cost implica tions of the policies and interventions.

1.5 CAPACITY BUILDING IN iSDG

The iSDG-Nigeria model is intended to contribute to sustained policy analysis and design at least over the whole period until 2030. To this end, an iSDG Policy Team was constituted and trained to use the iSDG model effectively. The team members have variegated academic and professional backgrounds and were selected from across different departments and levels of government to reflect the integrated nature of the model. Additional team members were also recruited from academic institutions as well as from the private sector based on their subject-matter expertise.

The iSDG Policy Team (initially planned for 25 participants, later grew to 56), thus received training on iSDG User Interface (iSDG-UI) to define, run and analyse policy scenarios. A sub-group, the iSDG Technical Team (initially planned for 10 experts, but later grew to 23), also received training on the iSDG Research Version (iSDG-R), to better understand the internal structure of the model and most of its equations.

Members of these teams received training in System Dynamics and iSDG modelling via the online learning system run by the Millennium Institute as well as a series of training workshops. The training programme had the following structure:

INTRODUCTORY ONLINE-COURSE (CA. 40H)
- Whole iSDG Policy Team
- iSDG Technical Team worked on additional exercises

iSDG-R TRAINING (2 WEEKS)
- iSDG Technical Team

iSDG-UI-TRAINING (1 WEEK)
- iSDG Policy Team

Advanced iSDG-R training (2 weeks)
- iSDG Technical Team

ADVANCED iSDG-UI TRAINING (1 WEEK)
- iSDG Policy Team

The various workshops equipped the teams substantially to domesticate the iSDG. The capacity-building efforts are explained in greater details in a separate report.

The training modules on iSDG-UI succeeded in preparing participants to train other interested parties. Members of the Technical Team gained the most from this train-the-trainer aspect due to the enhanced knowledge they obtained during the additional iSDG-R training.

1.6 STAKEHOLDER ENGAGEMENT/WORKSHOP

As earlier mentioned, selection of the iSDG Policy and the Technical Teams was done to reflect a large diversity of participants from different Ministries, Departments and Agencies (MDAs). Introducing such a wide network of government officials to iSDG and its possibilities also means using their diverse expertise to validate and improve the model.

The Policy Team invited other government experts who could not participate in the full training to hold presentations and for questions and answers sessions in subject matter areas that were underrepresented. In addition to this, a one-day stakeholder validation workshop held on 20-21 August 2019, in Abuja.

1.7 CHALLENGES TO THE STUDY

The greatest challenge to the study relates to data for the simulations. Although there is substantial improvement concerning the data used in the core-iSDG model, some data gaps still remain, especially in the areas of government accounts, education, poverty, employment, energy and transport.

Additionally, data challenges showed up prominently in the special sectors, particularly in oil and gas, solid minerals and mining, power, and sub-national disaggregation. No doubt, there were several reasons for

the data challenges. However, going forward, it will be most desirable to address them, especially those aspects where there is leverage for improvement in future projects. The most immediate lever seems to be the allocation of sufficient human and material resources to gather data from different sources, checking it for consistency and converting it to forms that can be used by iSDG-Nigeria.

1.8 STRUCTURE OF THE REPORT

This report has six chapters. Chapter 1 highlights the context, objectives and the analytical framework of the report. It also provides insights into the preliminary activities such as capacity building and post-simulation activities, such as validation workshop. Chapter 2 contains a detailed description of the analytical framework entailed in the iSDG model and its structure. Also included here are SDG targets and policy intervention areas. Importantly, the chapter provides information on the policy scenarios, namely, the No-ERGP-scenario, Optimistic-ERGP-scenario, and the ERGP+SDG-scenario.

Chapter 3 contains the analysis of the simulation results regarding the prospects of achieving the SDGs by 2030. It analyses the prospects of achieving the targets for 64 indicators of the 17 SDGs which were incorporated into the iSDG model and for which simulation results were produced. The chapter also contains results of the composite performance index for the 17 SDGs to gain insights into the prospects of achieving specific SDGs by 2030. The synergies and coherence among the policy interventions are in chapter 4, while the estimates of the annual and aggregate costs of achieving the SDGs detailed in chapter 3 are in chapter 5. Also, the costs which are in nominal and real terms are disaggregated into its two components, namely, SDG expenditure on social and economic services as well as SDG expenditure on subsidies and transfers. In addition, the expected contributions from the private sector are provided. The implications of this for government's fiscal balance are also contained in chapter 5. Chapter 6 concludes the report with a summary, key conclusions and recommendations.

Empowered lives.
Resilient nations.

CHAPTER TWO

THE INTEGRATED SUSTAINABLE DEVELOPMENT GOALS MODEL

2.1 SIGNIFICANCE AND SCOPE OF THE iSDG MODEL

The 17 Sustainable Development Goals are interconnected and constitute a complex system characterized by interwoven feedback loops,[1] lengthy time lags between cause and effect, and non-linearities[2] that are often unrecognized. Actions to achieve progress in one SDG sector may cause underachievement or failure in another. Likewise, a successful SDG initiative in one sector might create synergies for improvements in another. Therefore, the interconnectedness of the SDGs partly makes policy design and planning for the SDGs a considerable challenge.

The iSDG model was developed by the Millennium Institute to promote coherent planning within the complex SDG system. The iSDG articulates cross-sectoral linkages between the SDGs that constitute a meshwork of interconnected feedback loops. Simulating the model on the computer provides the user with tools to test the impact of potential policies across all the SDGs. Such a policy impact assessment includes the side effects on non-target areas of policies. Depending on whether these side effects are desirable or not, they constitute synergies or trade-offs. The model is useful for integrated SDG policy design and for mainstreaming SDG policies into national planning. The model features a user-friendly interface to make policy experiments and comparisons of a simulation run smoothly.

Box 2.1: Key Features of the iSDG Model

1. Integrates economic, social, and environmental factors;
2. Represents the important elements of complexity – feedback relationships, non linearity and time delays – that are fundamental for proper understanding of development issues;
3. Is transparent in its structure, assumptions, equations, and data requirements, and thus serves as a participatory tool in consensus building and policy discussions;
4. Is flexible enough to be customized for specific countries by trained users based on country-specific conditions;
5. Simulates the medium- and long-term consequences of alternative policies; and
6. Allows for easy comparison to reference scenarios and supports advanced analytical techniques, such as sensitivity analysis and optimization.

[1]A feedback loop means that after some time the outcome of a change may again influence the very same change that originally caused it. For example, health expenditure improves health, which increases productivity and thus production, which then implies higher public revenues, which in turn increases health expenditure.

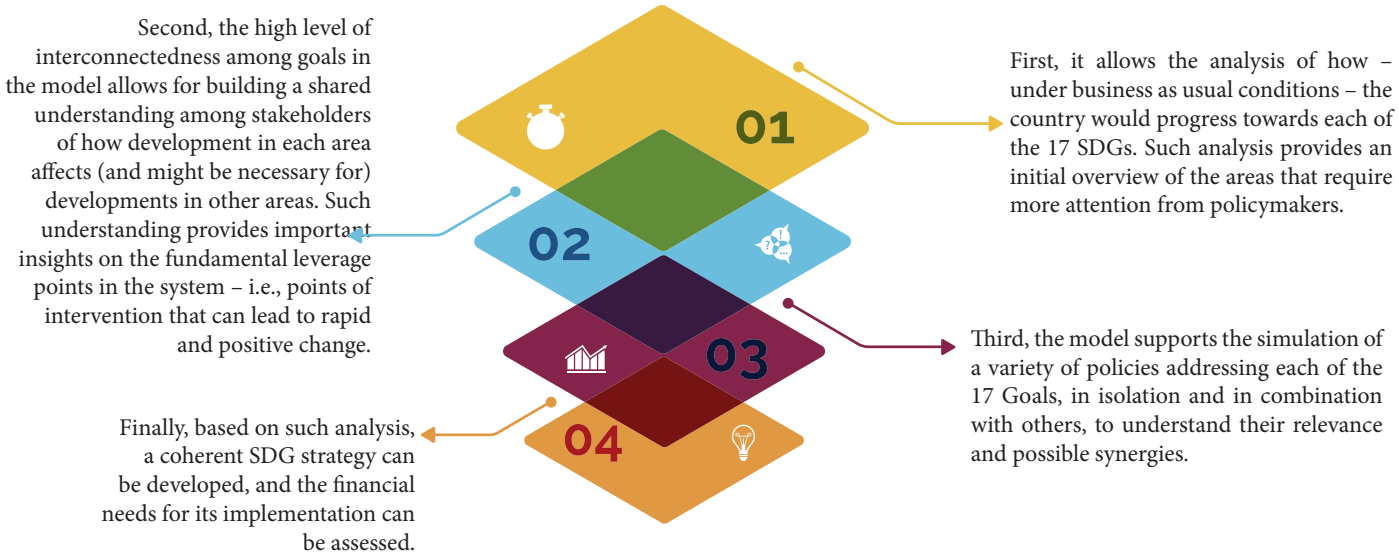
[2]Non-linearity is a causal connection, where the reaction to a change is not simply a linear function. Examples include tipping points or saturation such as diminishing returns of investment

The iSDG model simulates the medium- and long-term consequences of alternative policies. Hence, it allows for easy comparison to reference scenarios, thus serving as a tool in consensus building and policy debate. It simulates from the year 1990 to the present time and from there to the end of 2030, the final year of implementing the SDGs. However, the model can be set to simulate over longer horizons, if desired.

The model applies to the SDGs primarily at the national level; it is not meant to replace more detailed models focused on specific sectors or geographical locations. Instead, the iSDG model is designed as part of a mix of approaches that contribute to SDG planning on different scales. Specifically, the iSDG as well as the spreadsheet-based, sector-specific models used for MDG costing in Nigeria may mutually augment each other. In this way, the iSDG model is capable of providing bird's-eye view insights on cross-sectoral impacts that the intervention-focused spreadsheet models cannot provide. The latter, on the other hand, may be able to provide the level of detail that is necessary for implementation planning.

Even before the national domestication of the iSDG model in the country, many of its parts had already been disaggregated. Some of these disaggregations are geographical (urban vs rural), while others are more subject-specific, including the 101 age cohorts of the population and its two genders, the differentiation of vehicle-, road- or fuel types, the different causes of mortality, and so on. In the process of domesticating the iSDG nationally, the model is often further disaggregated to better represent aspects that exhibit strong heterogeneity in the country (a point that is contingent upon data availability).

Box 2.2 : The iSDG Model: Four Levels of Its Usefulness for SDG Planning



2.2 FOUNDATION OF THE ISDG MODEL

The iSDG model uses the System Dynamics (SD) approach: a computer simulation methodology and mathematical modelling technique to frame, understand and discuss complex issues and problems. System Dynamics was first developed at the Massachusetts Institute of Technology (MIT) in the late 1950s. It has been applied to a wide range of issues, including environmental sustainability, water quality and quantity management, climate change, sustainable agriculture and food security, income distribution, economic policy and many others, making it an ideal methodology for the SDGs. This wide applicability is possible because SD is well suited both for interdisciplinary issues (e.g. cross-sectoral, inter-ministerial) and trans-disciplinary issues (involving the participation and commitment

of stakeholders outside of government). SD is a holistic modelling approach that explains systemic behaviour in terms of positive and negative feedback loops, delays in information transmission, time lags associated with stocks and flows, and non-linear relationships (Sterman, 2000). The SD method does not embrace standard neo-classical economic assumptions of perfect information and optimal decision-making. Instead, it takes a "bounded rationality" approach to human perceptions and decision-making (Sterman, 2000).

The iSDG model, on the other hand, builds on the foundation of the Threshold-21 (T21) model, a system dynamics model for integrated national planning that has evolved from over 30 years of research and development by the Millennium Institute. It has been successfully applied to MDG planning and other areas in many countries. T21 has been used to address planning and policy design for agriculture and food security, green economy, regional planning, and many aspects of sustainability in over 40 countries. As such, it represents the accumulated knowledge of many governments regarding integrated development planning.

2.3 THE iSDG MODEL STRUCTURE AND INTERCONNECTIONS OF THE SECTORS

The iSDG model is a System Dynamics-based model for comprehensive and participatory development planning for the SDGs. The model integrates economic, social, and environmental factors, and represents the critical elements of complexity – feedback relationships, non-linearity and delays – that are fundamental for effectively addressing development issues. The model is customized to country-specific conditions (model domestication), both through country-specific parameterization using corresponding data and through the addition of special sectors that represent development issues endemic to the country.

The iSDG model is composed of 30 sectors. A sector is a small piece of structure with internal mechanisms that can be understood in isolation from the rest of the model. The size of a sector is chosen in consideration of the amount of information that the user can take in at once and fit into the size of standard computer monitors. The 30 sectors of the iSDG model include 10 social sectors, 10 economic sectors, and 10 environmental sectors (Table 2.1). The sectors interact with one another dynamically through a complex network of feedback loops. The selection of the sectors is based on the desired ability of the model to properly track the SDGs and simulate relevant policies. The role or purpose of each sector is summarized in Tables 2.2 – 2.4.

Table 2.1: Sectors of iSDG Model

Social	Economy	Environment
1. Population	11. Agriculture	21. Land
2. Fertility	12. Industry	22. Soil
3. Mortality	13. Services	23. Water Demand
4. Education	14. Aggregate Production	24. Water Supply
5. Health	15.Investment	25. Energy Consumption
6. Infrastructure	16. Households	26. Electricity Generation
7. Vehicles	17. Government	27. Energy Supply
8. Employment	18. Governance	28. Material Consumption
9. Income Distribution	19. Finance	29. Emissions and Waste
10. Poverty	20. Balance of Payments	30. Biodiversity

Figure 2.1 provides a conceptual overview of the iSDG core model structure, which includes 30 interacting sectors embedded within the economic, social, and environmental dimensions of sustainability.

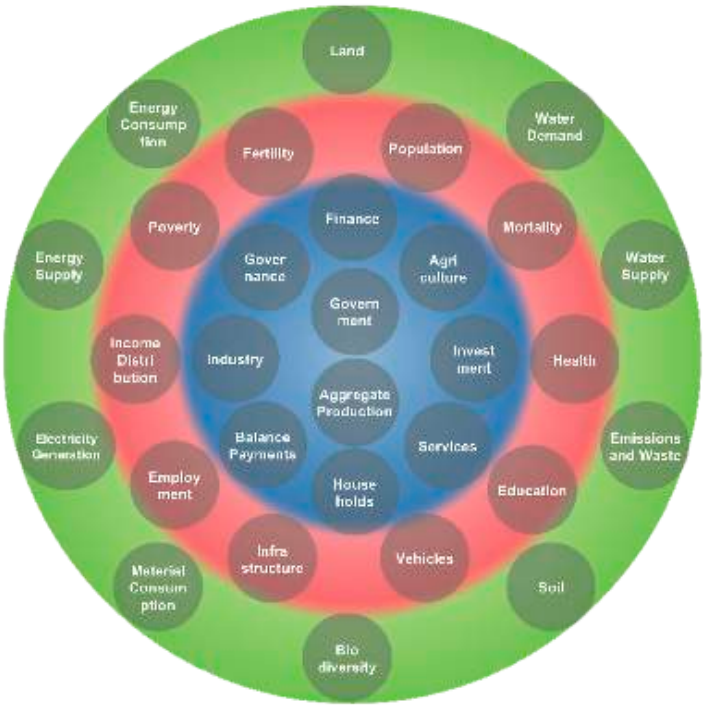


Figure 2.1: Conceptual Structure of iSDG Model

Note: The Figure 2.1 shows model sectors within economic, social, and environmental dimensions. Environmental sectors are shown in the green circle, social sectors in the red, and economic sectors in the blue.

Economic activities (blue circle) take place within society (red circle), from which social resources are drawn to generate economic value, and within the broader natural environment (green circle), which contributes sources and sinks of natural resources, emissions, and waste. All sectors interact dynamically; a change in one sector leads to impacts, over time, on all other sectors. This rich feedback structure determines endogenously[3] the behaviour of the model, as economic, social, and environmental indicators respond to the accumulation or decay of resources over time.

From Table 2.1 it can be seen that the economic sectors include the production sectors (agriculture, industry and services), which are characterized by expanded Cobb-Douglas production function with inputs of resources, labour, capital, and endogenous total factor productivity. The government sector 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 key macro balances are incorporated into the model. The governance sector comprises the six indicators of a composite index of governance that affects productivity and effectiveness of public expenditure. The household sector traces household revenue and disposable income (based on economic activity, government's subsidies and transfers, remittances, and so on), which is then used to support private saving and consumption. In the investment sector, private and public investments are allocated to different production sectors. The balance of payments sector traces trade, the current, capital and financial account transactions, and the finance sector comprises capital flows (including public debt management).

[3]The more endogenous a model is, the less it relies on external (exogenous) drivers and the more it relies on model-internal drivers that are themselves determined by the model.

Table 2.2: Role/Purpose of Each Sector in the iSDG Model: Economic Sector

Economic Sector	Purpose
Agriculture	This captures agricultural output/value added. The sector focuses mainly on crops, livestock, and fishery production, for whichde-detailed data is generally available. Attainable yield depends on potential yield and availabilityof water and macro-nutrients.
Industry	This sector captures industrial production. Apart from capital and labour, factor productivity depends on several other drivers, including education, health, infrastructure, access to electricity, level of governance, macroeconomic stability, openness to trade, and public agriculture expenditure.
Services	Represent the provision of services in the private sector. Apart from capital and labour, factor productivity depends on several other drivers, which also drive industrial production.
Aggregate Production	The aggregate production sector represents a set of accounting relationships used to calculate national production and national income figures. The sector is built on standard economic identities and produces critical macroeconomic indicators used in several other sectors.
Investment	The investment sector represents the mechanism of allocation of private i n v e s t m e n t within the production sectors. Investment allocation is based on changes in the rate of return on investment from each sector.
Households	The households accounts sector represents how various economic flows are combined to determine household income, and how this income is split into consumption and savings, part of which eventually becomes investment.
Government	The government sector represents sources of government revenue and how total government expenditure is allocated among various possible uses, based on standard accounting identities.
Governance	Calculates, based on the World Governance Indicators database, a composite index of governance. The composite indicator, as well as individual governance indicators, is used in several sectors to determine productivity and effectiveness of public expenditure.
Finance	The sector describes how savings are allocated to investment and how the financing needs of the government are met through domestic and foreign financing.
Balance of Payments	The balance of payments sector represents a set of accounting relationships tracking the significant cross-border financial flows between the country and the rest of the world. The sector is primarily based on the IMF's Balance of Payments Manual.

The social sectors include detailed population dynamics by sex and age cohorts (age 0 to age 99 and age >100); health and education challenges and programmes; basic infrastructure (roads and rails) and vehicles; employment; poverty levels and income distribution. Such sectors consider, for example, the interactions of income, healthcare, nutrition, and adult literacy rates on fertility and life expectancy, which, in turn, determine population growth. Population determines the labour force over time, which shapes – besides education and capital levels – employment. 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 a positive impact on productivity. At the same time, they cause fossil fuel demand and emissions which are toxic to human health and the environment.

Table 2.3: Role/Purpose Of Each Sector In The iSDG Model: Social Sector

Social Sector	Purpose
Population	The population sector simulates total population and population age distribution based on endogenous fertility and mortality. In the iSDGpopulation sector, the population stock is an accumulation of three flows: births, deaths and net migration.
Fertility	This captures the effect of profound changes in the socio-economic development on demographics.Since various factors can influence reproductive behaviour at different ages, this sector calculates age-specific fertility.
Mortality	To capture the demographic impact of changes in the socioeconomic context, the iSDG provides an endogenous representation of mortality. Since the various factors that influence mortality have age-specific impacts, the model also includes age-specific death rates.
Education	The education sector tracks the level and distribution of education among the adult population disaggregated across age groups and gender. Educational levels and distribution are driven by government expenditures in the education sector, per capita income, health, infrastructure, access to electricity, and governance.
Health	The health sector drives vital indicators that are directly relevant to SDG targets and feedback to other sectors and processes in the model. These include access to primary healthcare, prevalence of undernourishment, and proportion of population exposed to pm 25 levels exceeding WHO guidelines.
Infrastructure	Transportation infrastructure plays a critical role in the iSDG model and influences many sectors, including education, health, agriculture, industry and services
Vehicles	The vehicles sector tracks the populations of passenger and commercial road vehicles and the emissions they produce. Vehicle emissions contribute to the aggregate volume in the emissions and waste sector which ultimately harms human health.
Employment	The sector represents how economic activities create job opportunities. Growth in agricultural land for farming, and capital accumulation for industry and services production are considered the major forces driving the growth of labour demand. Technology advancement, on the contrary, tends to decrease labour demand
Income Distribution	Income distribution is important because of its link to poverty. As a model supporting development policies, there is a need to include the implications of specific policies on income for the poorest in society, and on the overall income distribution forthe country.
Poverty	The sector structure provides the opportunity to assessthe influence of tax progression, subsidy and transfer policieson poverty rates. The poverty and income distribution sectors have an active and direct link.

The environmental sectors 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 sectors. 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 sectors, such as agricultural productivity, nutrition and biodiversity. Additional issues addressed are the demand and supply of fossil fuel, electricity and water with their impact on several factors, such as productivity, access to electricity (and its effect on education), access to water and sanitation facilities (and their effects on human health), 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, efficiency levels and capacities for renewable energy use.

Table 2.4: Role/Purpose of Each Sector in the iSDG Model: Environment Sector

Environment Sector	Purpose
Land	Tracks land use for different purposes. The sector includes four classifications of land including agricultural land, settlement land, forest land, and other lands. Agriculture land is further divided into arable land and pasture land.
Soil	To determine soil nutrient balances and their long-term impact on soil organic matter. Considered are flows of the three major soil macro-nutrients (Nitrogen,Phosphorous,and Potassium)as they relate to agricultural activities.
Water Demand	To capture medium and long-term trends in water withdrawal by major category. Total water withdrawal is the sum of water with-drawal from the industry, agriculture, and domestic/municipal sectors.
Water Supply	The water supply sector calculates the average yearly supply of water from renewables ources. The sector does not consider seasonal variations of water supply and only represents dam capacity as a year-to-year smoothing factor in water supply.
Energy Consumption	To represent the major drivers of national final energy consumption in the long term. The sector includes consumption from production activities; consumption from the residential sector; consumption from transportation; and residual demand for other uses.
Electricity Generation	To calculate total electricity production from fossil fuels, nuclear, hydropower and other renewable sources. In this sector, electricity capacity is expanded as expected future demand for electricity grows.
Energy Supply	To represent the primary energy supplyof gas, oil, coal, biomass, and electricity, based on the International Energy Agency's Energy Balances.
Material Consumption	To calculate materials extraction, domestic material consumption (DMC), and material footprint(MF). Materials extraction is calculated based on the levels of production in the different sectors
Emissions and Waste	This sector calculates fossil fuel emissions for CO_2, N_2O, SO_x and CH_4, as well as the greenhouse gas emissions caused by fossil fuel in CO_2 equivalent. The calculation of emissions is based on fossil fuel consumption and physical conversion factors. It also calculates non-energy emissions from agricultural activities, from the production of cement, and land use changes.

Biodiversity	This sector represents the significant factors affecting biodiversity change and determines benefits index for biodiversity. Factors affecting biodiversity include changes in precipitation and temperature, deforestation, and nitrogen emissions.

2.4 SDGS AND TARGETS IN THE iSDG MODEL

The model tracks the attainment status of all 17 SDGs. A total of 64 SDG targets (78 targets when double-counting those targets that appear under several SDGs) are included in the model (see Annex 3). The targets were selected from the 169 SDG targets (including doubles) of the 2030 Agenda (https://sustainabledevelopment.un.org/SDGs). Grounds for selection were quantifiability and availability of supporting data.

It is essential to note the gaps in the target values for some of the SDG sub-indicators. For some indicators, Agenda 2030 already assigned values or at least calculation algorithms based on initial indicator values (e.g. halving based on 2015 values). For indicator targets that do not have UN-assigned values, it is up to the nation to use its discretion to decide on their own targets. At the time of embarking on this study, there were no set of target values that had been officially agreed upon by the Nigerian government. Hence, targets needed to be parameterized based on the best knowledge and judgement of the Technical Team, the Policy Team and the modelling experts. For a detailed list of the targets in the model that fall under each SDG, the values assigned to the targets, and the source of the assigned values see Annex 4.

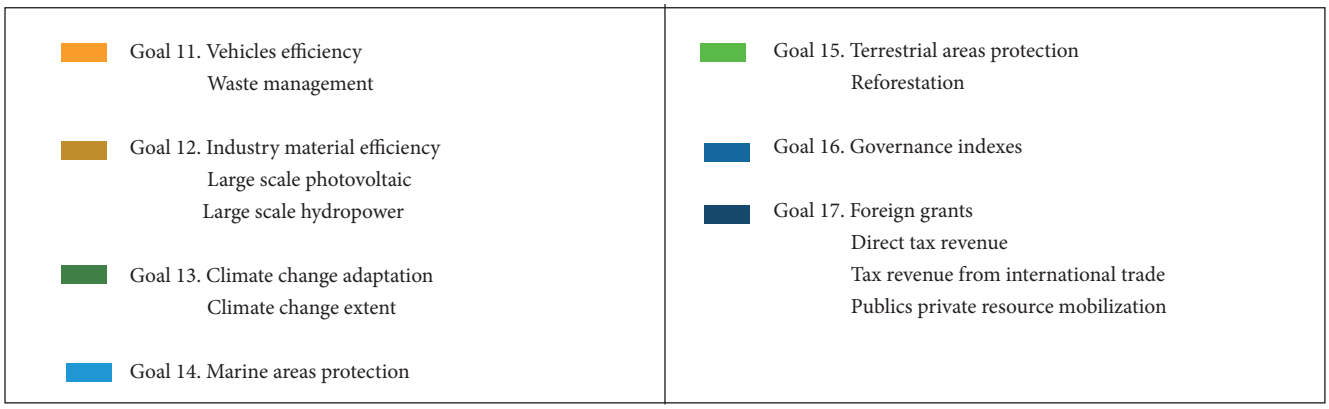
Attainment of each SDG is calculated as the average of the attainments for the corresponding targets. This "SDG-performance" for the targets is the extent to which the gap between the target values at year 2015 and SDG target for 2030 is closed by the end of 2030, measured as a percentage.

2.5 POLICY INTERVENTION AREAS IN THE iSDG MODEL

Table 2.5 contains the various areas of policy intervention in the iSDG model aimed at achieving the SDGs. These areas include policies and assumptions that directly impact on a goal's relevant indicators. There is flexibility in the application of the policy areas to countries. For example, in a given country, poverty eradication could be more effectively achieved through a comprehensive education and agriculture programme than through direct subsidies to the poorest households. In addition to those indicated in the table, the iSDG model can be customized to stimulate further policies directed to achieve the SDGs.

Table 2.5: SDG-Related Areas of Intervention in the iSDG Core Model

Goal 1. Subsidies and transfers Subsidies and transfers distribution by percentile	Goal 6. Improved water sources Improved sanitation facilities
Goal 2. Agriculture training Efficient irrigation systems	Goal 7. Small scale photovoltaic Small scale hydropower
Goal 3. Public healthcare Reproductive health	Goal 8. Industry energy efficiency Households energy efficiency
Goal 4. Public education	Goal 9. Paved roads Railways
Goal 5. Education gender bias Productivity gender bias Employment gender bias	Goal 10. Tax progression Net migration Foreign debt service



2.6 iSDG VERSIONS

The iSDG Nigeria model exists in two versions, the Research version (iSDG-R) and the User Interface version (iSDG-UI). The latter involves an easy-to-use interface showing policy levers that can be set to run scenarios by the user. iSDG-UI features graphical output of the outcome of the scenarios in terms of SDG development indicators as well as a plethora of built-in tools to facilitate analysis and interpretation of these results in order to inform policymaking. iSDG-R, on the other hand, allows access to the model's underlying causal structure including its equations.

iSDG-UI is comparable to a dashboard in a car, including the steering, pedals and other controls (policy levers) as well as a plethora of instruments that give read-outs of the status of the car's entire system. On the other hand, iSDG-R is comparable to the car's engine running under the hood of iSDG-UI. When the car is first built (domestication of iSDG-R for Nigeria) or at a later period when the engine needs servicing (e.g. updates based on newly available data), the hood needs to be opened, i.e. iSDG-R comes to use, but under normal driving conditions (training, presentations of policy analysis) only the dashboard and controls (iSDG-UI) are used, the hood remaining closed. Therefore, the findings contained in this report relate mainly to the iSDG-UI version.

2.7 iSDG MODEL DOMESTICATION

Here, domestication is taken to mean the adaptation of the iSDG model for use in national development planning in Nigeria. The domestication process includes populating iSDG model with Nigerian data and customizing it concerning country-specific development issues by developing additional model components in the form of specialized sectors that are added to the core model.

2.7.1 DATA

It is instructive to note that iSDG is not driven by historical data. Instead, most variables are endogenously generated out of the model structure. However, historical data is still indispensable, both for validation purposes and for model calibration. In the iSDG model, data was used for setting parameters and initial values, as well as for calibration. Calibration means that some parameter values that cannot be or have not been directly measured are determined by adjusting them, so that simulation output and historical data can match well. The hope is that these parameter values are then close to the actual reality. The method of "partial model calibration"' (Homer 1983) is extensively used to prevent the arbitrariness of the calibration.

There are a large number of parameters that needed to be adjusted to appropriate values for Nigeria (e.g. unit costs of paved roads construction). Since the simulation starts from 1990, the initial conditions of important system variables (e.g. population, the health status of population, etc.) of that year also need to be entered into the model. The values of subsequent years are then calculated via the

simulation. Some model variables are driven by external data, e.g., variables that represent external influences such as international oil prices.

Generally, data was, wherever possible, sourced from national sources, but due to certain challenges and problems of data quality and consistency, data from international sources was also used to a substantial degree. The principal sources of data are shown in Box 2.3.

Box 2.3: Key Sources of Data for the iSDG Model

Important National data sources:
Ministry of Budget and National Planning (MBNP which obtained the data from several different parts of government)
Nigerian National Bureau of Statistics (NBS)
Nigerian National Population Commission (NPopC)
Central Bank of Nigeria (CBN)
National Demographics and Health Survey

Important international data sources:
International Monetary Fund (IMF)
US Energy Information Administration (EIA)
United Nations Population Division (UNPop)
World Development Indicators by the World Bank (WDI)
World Health Organization (WHO)
International Energy Agency IEA
International Labor Organization (ILO)
Food and Agricultural Organization (FAO)
Worldwide Governance Indicators

2.7.2 QUANTIFICATION OF THE POLICY SCENARIOS

The first step in scenario quantification was matching the interventions described in the ERGP with iSDG policy variables and gathering information on the need for model adaptation to better represent Nigerian policies as well as a feasibility assessment of model adaptations and its prioritization.

The central aspect of the definition of the policy scenarios is setting future values for the policy variables such as development expenditure (e.g. for clean water and sanitation, education, road construction, road maintenance, sustainable agriculture training, fertilizer subsidies, etc.). These values may differ between scenarios depending on the policy interventions envisioned in the respective scenarios.

In addition to the policy variables, there are also some influences from the rest of the world, (e.g. the world market prices of fossil fuels or fertilizers, the severity of climate change, remittances from the diaspora, etc.). For such exogenous data variables, assumptions on future development needed to be made.

Furthermore, some variables describe national developments that are not calculated by the model and for which reasonable assumptions have to be made that may differ between scenarios (e.g. inflation rate, exchange rate, urbanization development, shares of different crops in the harvested area, etc.). While the government may have some influence on these, that influence is either indirect or some other actors may have a stronger influence.

Part of these values could be determined from official policy targets that the government has agreed upon, while for others reasonable assumptions had to be made by the Policy Team reasoning on the basis of available data, historical developments and their subject-matter expert knowledge. Other experts were also consulted who were not part of the Policy Team. The Policy Team, however, took charge of the entire exercise, including data collection and validation.

2.8 VALIDATION

Validation is a process of improving the credibility and usefulness of a simulation model. It is carried out in part by the modellers, through a plethora of analyses and tests aimed at securing:

- Internal consistency of the data used for parame terization
- Internal consistency of the model
- Proper representation of relevant aspects of Nigeri an reality in the model

Moreover, the validation process exposes both the structure of the model and its parameterization to the scrutiny of subject matter experts to ensure that they properly represent Nigerian conditions and causal relationships. To this end, the Technical Team carried out a sector-by-sector review of the iSDG model. This structural validation involved comparison of the understanding of the model structure that the sector experts had gained in addition to their own understanding of Nigerian reality. The discussions that attended this further led to the adaptation of the model to Nigerian reality. For instance, the existing maximum import age policy for vehicles in Nigeria needed to be represented in the model. Other examples include policies that fostered the domestic production of fertilizer or the rehabilitation of roads that were poorly maintained in the past.

Another important step in the validation process was the expert review of the fit between actual data and model simulation for historical time series (1990 – 2016). In cases where there was a substantial deviation between simulation and data, the discussion with the experts from the Policy Team often revealed the drivers behind the development of the data. With this understanding, the modelling experts improved the fit by better representing these factors. In some cases, however, the discussions revealed limited data quality or limited data availability as the likely cause of the insufficient fit.

Yet, another critical step in the validation process was the review of preliminary baseline-scenario for the future (2018 – 2030) by the Policy Team during a workshop. The experts assessed the practicality of the simulation output by applying their professional judgement. Importantly, the training the Teams received was a prerequisite for validating the model structure and its equations as this was only possible based on sufficient depth of understanding of the model. The expert-validation led not only to improvements of the model but, in many cases, also to valuable insights that they can use in the real world.

The last step of the validation exercise was a workshop with broad stakeholder participation beyond the Teams that took in August 2019.

2.9 STRUCTURAL ADAPTATIONS OF THE iSDG MODEL TO NIGERIAN DEVELOPMENT ISSUES

To better represent endemic issues in Nigeria, five special sectors were integrated into the iSDG-Nigeria model. These are:

- Conflict
- Oil & gas
- Solid minerals mining,
- Power sector problems
- Sub-national disaggregation

Several workshop days were allocated to brainstorm together with the subject-matter experts. The workshop resulted in qualitative model sketches that combine knowledge coherently. These model sketches were not yet quantified simulation models, but they provided a logical birds-eye view of the various issues and, importantly, how they are causally connected.

Unfortunately, these initial model sketches had to be cut down substantially because relevant data that would have allowed for their parameterization and calibration were not available on time. Even the structures that have been implemented stand on somewhat shaky ground for the same reason.

The rest of the section highlights issues and assumptions relating to the special sectors. The schematic illustrations are in Annex 2.

2.9.1 SPECIAL SECTOR: CONFLICT

When working on calibrating agricultural production, it became apparent that the unaltered core iSDG model could not fit the data. This is because, in reality, there is a conflict in the Northern part of the country which has led to the displacement of people, agricultural land not being cultivated and school enrollment falling drastically in the affected areas. These developments were, therefore, represented in a special sector so that after the inclusion of these structures, the model would closely represent reality.

The special sector – conflict – represents a process whereby an increasing proportion of the agricultural area of the country is affected by conflicts. It assumes 2009 as the starting year and 2019 as conflict peak year. In between these two periods, the conflict area is assumed to extend by 50 per cent every year up to a maximum of 25 per cent of the total agricultural area of the country unless the peak year predates 2019. It is assumed that the enrolment in schools in conflict areas reduced by 90 per cent for primary and 25 per cent for secondary and tertiary schools. Calibration suggests a reduction of agricultural productivity in conflict areas by 35 per cent for cereals and 75 per cent for non-cereals. It is assumed, furthermore, that 90 per cent of the people employed in growing such crops is displaced from conflict areas. The investigated scenarios make different assumptions regarding the continued development after the peak year, from assuming a continuation at the same conflict level (No-ERGP-scenario) to a recovery of 10 per cent of the area every year (Optimistic-ERGP-scenario & ERGP+SDG-scenario).

2.9.2 SPECIAL SECTOR: OIL AND GAS

Although the contribution of oil to the GDP has reduced significantly to less than 10.0 per cent, the oil and gas sector is still of particular importance to the country because of its enormous contribution to foreign currency inflow and government revenue generation, and also because of the dependency that this has created. Furthermore, it is necessary to clarify the contribution of the flaring of natural gas associated with oil extraction to Nigeria's CO_2 emissions.

Annex 2, Figure A2.1 shows the contribution of the oil and gas sector to GDP, its contribution to government revenue and the CO_2 emissions resulting from flared natural gas (Annex 2, Figure A2.4). To this end, it improves the representation of the extraction of natural gas and crude oil (Annex 2, Figures A2.5 and A2.6) that was simplified in the core model before and adds a structure for the value added created by the domestic refining of crude oil (Annex 2, Figures A2.7, A2.8 & A2.9).

Calculating value added, the sector assumes increasing costs for intermediate inputs for increasing degrees of resource exhaustion. Symptoms of this may already be seen in the increased reinjection fraction in order to get more oil out of wells that need additional pressure.

Moreover, the special sector allows for exploring the consequences of different assumptions concerning the development of sabotage/conflict on issues such as oil and refinery products lost through tapped/broken pipelines or increased idle time of production facilities.

To explore the effect of building domestic value chains, therefore, the refinery subsector was included. It also allows for exploring the consequences of inadequate maintenance, as well as the impact of private refineries that are supposed to come online in the coming years. This aspect is quite important as Nigeria currently imports most of its finished fuel and exports crude oil and because government-owned refineries are not producing as

expected. Based on the insights gained from experts in the Policy Team, it was assumed that private refineries, unlike government refineries, will carry out adequate maintenance. Similarly, it was also assumed that if at some point in the future domestic oil extraction should fall short of the combined demand of public and private refineries, the former ones would be preferred and private refineries would have to source oil on the world market.

2.9.3 SPECIAL SECTOR: SOLID MINERALS MINING

The solid minerals mining sector used to make substantial contributions to Nigeria's economy some decades ago. The consequences of the drop in oil price have shown that diversification is essential; hence, one of the avenues pursued to grow the economy is a revival of the solid minerals mining sector.

The schematic presentations of the contribution of the sector to GDP and to government revenue (Annex 2, Figures A2.10 – A2.12) show that extraction is driven by investment into mining capital, labour and the development of total factor productivity (TFP). Total factor productivity for mining derives from the general industry TFP, but an additional elasticity allows for the TFP of mining to react stronger or weaker than the general industry TFP.

2.9.4 SPECIAL SECTOR: POWER SECTOR PROBLEMS

The challenges faced in the power sector constitute a major impediment to Nigeria's development. So compelling are these challenges faced locally that many companies have relocated to neighbouring countries. The power sector has been described as highly inefficient and generating many unnecessary social costs (e.g., damage to appliances from black-outs or from unstable electricity, investment in back-up-generators and the diesel cost for running them, etc.). Besides, there was an interest in better understanding the implications of the power sector for inequality and the potential of electricity tariff segregation schemes aimed at fighting poverty and improving the efficacy of the power sector.

The problem with the pre-existing sector on final energy consumption was that it assumed that energy consumption was demand driven for all energy forms including electricity. While this might be the case in some countries, especially the industrialized ones, it is not so in Nigeria, where the limiting factor for electricity consumption is on the supply side.

The sector first calculates a long-term potential grid electricity consumption, which is the grid electricity consumption we would see in the long term if there was electricity of good quality and quantity for everyone at all times. The calculation of this variable is based on the drivers of such demand in sectors such as agriculture, industry, services, residential, and transport.

However, if the situation suddenly improves, this will not immediately materialize as consumption because some consumers (especially companies) have opted for permanent self-generation due to low quality of grid electricity services (especially continuity, reliability). It is expected that such companies will only switch back to grid electricity after a considerable delay if quality remains continuously good. That is, they would wait to see if the improvement is permanent.

There are some other effects that also contribute to the suppression of short-term potential grid electricity consumption below what it would be on the long run. For example, consumers might have fewer electrical appliances than they would if power supply were stable. Also, people consume less electricity during load-shedding when they are using their small generator set because that source of electricity is costlier. Therefore, this short-

term potential grid electricity consumption is the realized demand that the grid is exposed to.

However, only part of that demand can be met by grid electricity supply, the rest is either intentionally blacked out (load-shedding) or lost unintentionally. Hence, grid electricity consumption is always the minimum of potential grid electricity supply and short-term potential grid electricity consumption.

The unsatisfied part of the short-term potential grid electricity consumption leads to load shedding contingent self-generation, which is the kind of self-generation that happens only when there is no grid electricity. Together with permanent self-generation, it forms total self-generation.

The model furthermore assumes that the lower the electricity service quality approximated by the variable (perceived) proportion of short-term potential consumption met by supply, the higher the permanent self-generation proportion. "Perceived" here indicates that consumers' reaction to their perception is not immediate: they will watch service quality for a while; it is only if they "perceive" an improvement to persist over a long time that this can influence them to switch back from permanent self-generation to grid-electricity. The time to perceive and react to changes in electricity service quality is estimated to be about three years. Also underlyng this is that permanent self-generation implies substantial sunk investments which have to be put into consideration in switching over to power supply from the grid.

It should be emphasized that grid electricity consumption is not simply equal to electricity generation capacity. In Nigeria, part of this capacity is idle because transmission/ distribution capacity cannot handle the full generation capacity. The information sources considered tended to dispute on which of the two is the tighter bottleneck, though. The iSDG model assumes that distribution capacity tends to be slightly larger initially, but that increasing transmission capacity (based on expert information) tends to surpass distribution capacity, thus stabilizing it at a level slightly above distribution capacity, which is not increasing due to lack of investments. The effects of increasing these transmission and distribution capacities can be explored in the iSDG through the scenario variables of distribution capacity future and transmission capacity future. They were not policy variables, because there was no data on the unit cost of expending transmission capacity and because the expansion of distribution capacity is outside of direct government control because this part of the sector has been privatized. As a result, these variables were not included in the scenarios that were to be used for costing.

Furthermore, distribution companies may sometimes even reject part of the load (and prefer to load-shed instead) even if that load could be transmitted and distributed, and consumers could take that load. This may seem bizarre at first sight, but unfortunately, it makes sense from the special economic perspective that distribution companies are in. A load may be rejected if a significant number of users on the distribution grid are unwilling or unable to pay for electricity supply. Hence, it is not sensible for discos to buy electricity much in excess of the amount consumers actually pay for. The effects of this load-rejection could be explored by using a scenario variable, namely, the proportion of load rejected by discos.

The electricity that can be supplied to the customers depends not only on generation capacity, but also on the technical losses. The effects of different developments of these losses can be explored using the scenario variables technical electricity loss factor future and proportion of technical electricity losses in distribution future (the re

sidual loss being in transmission).

Following the terms and conditions of international contracts, part of the generation capacity is prioritized for export. The effects of different future developments in this regard could be explored using the scenario variable generation capacity prioritized for export future.

In addition, even if there were sufficient transmission and distribution capacity available, some of the generation capacity might still not be utilized, as did happen in the past due to non-functioning power lines or lack of gas supply. The effects of this problem can be explored using the scenario variable potential electricity generation capacity utilization factor future. Since this scenario variable lacked information on attached costs, they were not used for the costed scenarios.

Some changes were also necessary in the electricity generation sector (Annex 2, Figure A2.14) where it is now assumed that the new electricity generation capacity depends not only on the expected electricity demand but also on capacity utilization. Following this logic, therefore, it means that even if there is potentially a huge unsatisfied demand, there is no incentive to invest in new generation capacity, if the utilization of existing capacity is already low because of the bottlenecks in transmission, distribution or lack of fuel supply, etc. In addition, there is a problem in revenue collection in Nigeria: part of the customers are illegally connected to the grid and, therefore, do not pay any bills or they could be registered but pay their bills late. The iSDG model, therefore, assumed the non-existence of an incentive to expand electricity generation capacity beyond what customers are paying for.

2.9.5 SUB-NATIONAL DISAGGREGATION

Nigeria is not only a large country, it is also a very diverse one geographically (natural resources) and socio-economically (e.g. North-South or rural-urban). In addition, Nigeria is a country divided into several administrative levels from the federal through state down to the local government levels. All these tiers of government are responsible for different developmental aspects and, therefore, the implementation of policies aimed at SDG attainment. This picture of heterogeneity implies that a model that only looks at national averages may not represent some aspects well enough to be useful for policymaking. Consequently, iSDG-Nigeria was designed originally to be disaggregated into three areas, namely:

- Agriculture
- Education
- Access to basic healthcare

Agriculture has a heterogeneous base due to the different climatic conditions in the country. The agricultural pattern forms a gradient from the southern tropical regions to quite arid regions in the North. But there are also important implications of social issues affecting agriculture such as the pastoralists-farmers conflict in the North and the South.

Similarly, the Policy Team described education as being very heterogeneous across the country, featuring a kind of see-saw in school enrolments: very low enrolment rates of girls in the North and reduced enrolment rates of boys in parts of the South.

Access to basic health care can be heterogeneous too along geographical gradients, but often the rural/urban divide is also very important. Some aspects in iSDG are already disaggregated along the rural-urban divide. Hence, the disaggregation of the three aspects mentioned above was to focus on the differences between the six geopolitical zones of the country.

Unfortunately, due to extreme data limitations at the sub-national level, the sub-national disaggregation had to be abandoned for the most part in this project. However, sub-national disaggregation could be implemented to some degree for health indicators such as infant mortality rate, under-five mortality rate, and the prevalence of malnutrition and stunting.

Adaptation of the Transport Infrastructure sector

The transport sector was adapted based on historical data and the judgment of the modelling experts during the calibration phase. The adaptation was based mainly on information gathered from the costing tools on infrastructure and information gathered from experts in the Policy Team.

Besides a few strange exceptions, data on railways shows something in the range of 3,500 kms for all time. Also, available information suggests that railway lines have deteriorated over the past decades. However, on the effects of infrastructure, it is important to consider only the functional parts of the infrastructure. The data on the rail sector and information on its deterioration suggest that the data is not referring to functional railway lines alone, but to all railway lines, including the dysfunctional ones. Since the data was needed for calibration but could not be used previously because the iSDG featured only functional railway lines, the structure of iSDG-Nigeria had to be adapted to consider the dysfunctional railways as well. The same argument holds for unpaved roads: it appeared unrealistic, given the increasing figures and the assumed lack of data on quality status of unpaved roads, that the data would exclude dysfunctional unpaved roads. The situation is different for paved roads because historical data also shows decreases. It was, therefore, assumed that data on paved roads refers to functional roads only.

Furthermore, before this project, the iSDG assumed that maintenance was prioritized over the construction of new transportation infrastructure, as this tended to be more cost-efficient, so that construction only had to take place out of the residual funds after maintenance had been paid for. However, information from experts on the Policy Team suggested that this is, unfortunately, not always the case in Nigeria. Hence, the policy variable infrastructure maintenance priority allocation future was added to iSDG-Nigeria (Annex 2, Figures A2.16-A2.18). This allows for setting this from 0 (all money to construction) to 1 (all money to maintenance). For the past, this was determined via calibration, which suggests that, for paved roads, there has been substantial maintenance (75 per cent of the paved roads funds), whereas for the unpaved it was assumed to have decreased from 40 per cent to 20 per cent between 1990 and 2016. For rail, it was assumed that no money has been spent on maintenance at all during that time, based on the deterioration described by the experts. Note that maintenance, as used above, means routine and periodic maintenance.

On the other hand, rehabilitation, which is actually the result of insufficient routine and periodic maintenance is almost like a new construction in terms of cost, so that it is considered part of non-maintenance expenditure (taken out of the budget for new infrastructure). Based on the costing tools, the construction of new paved roads and upgrades from unpaved to paved roads were also differentiated by additional model structure. The reason is that while both lead to more paved roads, upgrades also reduce the length of unpaved roads because they are being replaced by paved ones. Also note that rehabilitation converts dysfunctional infrastructure back to functional ones and that the cost for this tends to be a bit lower than for new constructions. Policy variables that allow for allocating desired proportions of the budget for new infrastructure to either new (green-field) construction, rehabilitation or upgrades to

paved roads were also included. A structure was also added so that the unit cost of maintenance could be entered independently of the cost of new construction. Furthermore, policy variables were added that allow for changing the quantitative allocation of the total infrastructure budget vs. paved or unpaved roads vs. rail (Annex 2, Figures A2.16-A2.18), indicates the proportion of transport infrastructure expenditure by type). In addition, because of the importance of rural access, policy variables were added that allow for increasing the expenditure on unpaved roads (Annex 2, Figures A2.16-A2.18).

2.9.6 HARMONIZATION OF iSDG WITH SECTORAL COSTING TOOLS

A number of costing tools were created or updated by the Technical Team. The purpose of these tools is to determine the cost of detailed policy interventions aimed at SDG attainment:

- Agriculture
- Education
- Energy
- Environment
- Roads
- Rail

The sectoral costing tools and iSDG-Nigeria model have differing purposes and aggregation levels; iSDG-Nigeria works at a high aggregation level and its primary purpose is integrated SDG policy analysis, where overall costing is only one use. It aims at maximizing the coherence of policy packages by minimizing trade-offs between measures and maximizing synergies between measures. While the costing tools are not able to do the latter due to their sectoral nature, they can work at an aggregation level that is as fine-grained as necessary for actual planning and budgeting.

To maximize the benefit of using both types of tools, an attempt was made to harmonize the costing tools with iSDG model in the following two steps:

- Extract and aggregate unit costs from costing tools for use in iSDG; and
- Extract from iSDG simulation run information on scenario-dependent development of data to be used as input in the costing tools

Unfortunately, for the most part, this harmonization would have required improvements in the costing tools that could not be carried out as part of the present exercise.

The first step of the harmonization process could be carried out only for the roads and rail costing tools to some degree and for the environment costing tool for reforestation unit cost. Concerning the second step, only population growth rates and inflation could be implemented.

2.10 SCENARIO DEFINITION

The main aspect of the definition of the policy scenarios is setting of future values for the policy variables, such as development expenditure (e.g. for clean water & sanitation, education, road construction, road maintenance, sustainable agriculture training, fertilizer subsidies etc.). These values may differ between scenarios depending on the policy interventions envisioned in the respective scenarios. Given this, the typical first step for all policy scenarios was to define their start time, that is, the point in time when the scenarios diverge based on the differing scenario definition. Owing to the limited availability of data for the past few years, this is usually defined one or two years back in time. However, in Nigeria, the special situation was a major change in government and, therefore, also in policies after 2015: The Economic Recovery and Growth Plan (ERGP (2017-2020)). Hence it was decided that the scenarios are to diverge from 2016 into the future.

Three main scenarios are simulated and compared for target attainment at the end of year 2030 comprehensively for all 17 SDGs. These scenarios are referred to as the No-ERGP-scenario, the Optimistic-ERGP scenario, and the ERGP+SDG-scenario. The definitions of the No-ERGP and Optimistic-ERGP scenarios allow for assessing the maximum potential impact of the ERGP, especially in terms of SDG attainment.

2.10.1 MAIN SCENARIOS

THE NO-ERGP-SCENARIO

This scenario assumes no policy changes after 2015 and continuation of pre-ERGP policies only. It paints the picture of a Nigeria as if there never had been an ERGP and previously existing policies were continued in a "business-as-usual" (BAU) fashion. This scenario provides a foundation for comparison for the other two scenarios. For the years 2016 up to the present, this scenario is somewhat counterfactual as the ERGP exists and is being (at least partially) implemented in reality.

THE OPTIMISTIC-ERGP-SCENARIO

The purpose of this scenario is to estimate the potential of the ERGP for SDG attainment, its cost as well as analysis of synergies and trade-offs.

The scenario provides an assessment of how the ERGP policy measures, as currently conceived, might perform with respect to the 17 SDGs if all of the policy measures were implemented very well and fully, without significant unplanned delays. To this end, this scenario assumes a substantial improvement of governance. The scenario is based on the Policy Team's and the modellers' best understanding of the currently planned ERGP and on the present capabilities of iSDG-Nigeria to represent it.

The above definitions of these two scenarios allow for assessing the maximum potential impact of the ERGP, especially in terms of SDG attainment. Comparing the Optimistic-ERGP-scenario with the No-ERGP-scenario has the advantage, in terms of interpretation, that if the former does not attain the targets for some SDGs or its subordinate indicators, it is highly likely that policies beyond the ERGP would be needed to attain the SDGs.

Considered in the iSDG-Nigeria model is a mixture of policy interventions such as changed expenditure and taxation levels, and assumptions on future developments (e.g. exchange rate, interest rate, etc.). There are also some variables which are somewhere in between as they are not under direct government control but can indirectly be influenced by government action or they are partially influenced by government action and partially by other factors and actors.

It is important to note that neither the No-ERGP-scenario nor the Optimistic-ERGP-scenario is meant to represent the reality from 2016 up to today. Such a "realistic ERGP-scenario" would need to take into consideration the present implementation gap (sometimes also called "implementation rate") and make assumptions about its future development. However, data on this gap was not available to the Technical Team to a sufficient degree. Conceptually, such a scenario would be in between the No-ERGP-BAU-scenario and the Optimistic-ERGP scenario for the policy variables.

Should it become necessary to replace the No-ERGP-scenario with a "realistic ERGP-scenario" as baseline scenario in future projects, its comparison with the Optimistic-ERGP scenario would yield insights into what could be gained by better implementation of the ERGP. The comparison of a "realistic ERGP-scenario", with the No-ERGP-scenario would yield insights into what the ERGP implementation,

continued at current implementation rates, could yield in terms of SDG attainment.

However, comparing a "realistic ERGP-scenario" with the No-ERGP-scenario would not allow for assessing whether the ERGP is sufficient to attain the SDGs because one would tend to attribute the lack of SDG attainment to insufficient implementation of policies that are still hoped to be fundamentally sufficient if they were only implemented correctly. That is the advantage of the approach taken here in using an Optimistic-ERGP scenario.

THE ERGP+SDG-SCENARIO

The third scenario, the ERGP+SDG-scenario, goes beyond Optimistic-ERGP by identifying integrated policy mixes that could improve SDG performance in those areas where the ERGP has been found insufficient for SDG attainment. It also attempts to quantify the cost for achieving the SDGs, if they can be achieved by proper funding alone within the time frame until 2030.

To these ends, the scenario attempts to optimize policies (expenditure and taxation and additional policies) beyond the ERGP for reaching SDGs. In terms of assumptions for variables not under direct government control, it makes the same assumptions as the Optimistic-ERGP-scenario.

The ERGP+SDG-scenario is a one without a budget ceiling aimed at estimating the cost of reaching the SDGs (or getting as close to reaching them as possible). This scenario could inform a future revision of the ERGP. While such revisions are typically carried out only towards the end of the implementation period in many countries, simulation-based policy impact analysis allows for proactive rather than merely reactive policy adjustments.

This scenario uses iSDG backwards: the No-ERGP-scenario and the Optimistic-ERGP-scenario use quantifications for the policy variables as inputs and yield the degree of target attainment as output. In contrast, the ERGP+SDG-scenario is supposed to yield the quantifications for the policy variables as outputs as they are the answers to the question as to what it would take to get as close as possible to the SDGs. Aggregating and converting these expenditures then yields the costing of the scenario. If the SDGs cannot be reached by even absurdly high levels of expenditure, the maximum goal attainment until 2030 is an additional output of the analysis. To use iSDG backwards in this manner means testing different combinations of policy variable quantifications to maximize the outcome in terms of SDG attainment. Owing to the specifics of the model, automatic optimization algorithms could not be used for this task so that the modelling experts carried out this optimization themselves.

Unlike for the Optimistic-ERGP-scenario, only a subset of the ERGP+SDG-scenario variables was used: excluded were variables not under direct or were only partially under government control, such as exchange rate or urbanization rates. Moreover, some policy variables in iSDG have no costs attached yet and they can be used only for exploratory analyses, not for costed scenarios: For the Optimistic-ERGP-scenario, for example, substantial improvements of the governance indicators were assumed, and the consequences of such improvements compared to the No-ERGP-scenario are to be explored. However, the model does not as yet contain information on what it would take from a financial perspective to achieve such improvements. Therefore, any policy variables that do not have budget implications attached were excluded from manipulation in the **ERGP+SDG-scenario**. In addition to expenditure policy variables, taxation policy variables were also included as they are an important lever for the government.

Essentially, three types of policy variables were included for forging the ERGP+SDG-scenario: taxation, expenditure and distribution of these, e.g., to income levels or education levels. For the other policy variables and scenario variables that were used in the Optimistic-ERGP-scenario but that were not changed in the ERGP+SDG-scenario, it was assumed that their values were the same as in the Optimistic-ERGP-scenario. This means that the ERGP+SDG-scenario is based on the Optimistic-ERGP-scenario. Annex 4 contains the quantification of the scenario, including which variables were used.

It is important to note that both the Optimistic-ERGP-scenario and the ERGP+SDG-scenario assume that in the future (unlike before), private actors can be engaged substantially to invest into programmes aimed at reaching the SDGs. Examples for such measures are private-public-partnerships (PPPs) to build infrastructure like roads, hospitals and schools. This increases the leverage of the government as it allows for increasing total SDG expenditure beyond governmental SDG expenditure. The scenarios assume a substantial increase of such private engagement as Figure 2.2 shows: the share of the SDG expenditure borne by the government decreases from 100 per cent to 50 per cent by 2020 and then stays at that level until 2030. It means that from 2020 private sector investment towards achieving the SDGs is 50 per cent of the aggregate investment.

However, it further means that the SDG attainment resulting from the scenario is dependent on this private sector engagement and that without it, either the SDG attainment would be lower or the government would have to make up for the lack of private sector engagement by higher spending.

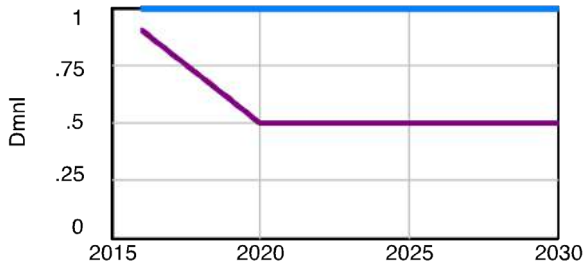


Figure 2.2: Public Share of SDG Expenditure: No-ERGP-scenario, Optimistic-ERGP-scenario and ERGP+SDG-scenario

2.10.2 SENSITIVITY SCENARIOS - MORE PESSIMISTIC ASSUMPTIONS OF THE FUTURE

As described above, the Optimistic-ERGP-scenario is a mixture of policy interventions such as changed expenditure and taxation levels, and assumptions on future developments (e.g. exchange rate, interest rate, and so on). There are also some variables which are somewhere in between as they are not under direct government control but can indirectly be influenced by government action or they are partially influenced by government action and partially by other factors/ actors. An example is how the different dimensions of governance could develop in the future.

To assess how successful the policy changes could be under pessimistic assumptions, it is helpful to run a scenario that, similar to the ERGP+SDG-scenario, uses only expenditure and taxation changes, but excludes the optimistic assumptions for all other scenario variables and instead assumes they stay the same as the No-ERGP-scenario. This is called the ERGP-costed-policies-only-scenario.

Similarly, it can be helpful to simulate an SDG-costed-policies-only-scenario which uses the policy variable settings of the ERGP+SDG-scenario for the expenditure and taxation policies but for the rest it uses the settings of the No-ERGP-scenario. It is a pessimistic version of the ERGP+SDG-scenario in the sense that it

assumes that the optimistic assumptions that are not under direct government control do not materialize.

Similarly, it can be helpful to simulate an SDG-costed-policies-only-scenario which uses the policy variable settings of the **ERGP+SDG-scenario** for the expenditure and taxation policies but for the rest it uses the settings of the No-ERGP-scenario. It is a pessimistic version of the **ERGP+SDG-scenario** in the sense that it assumes that the optimistic assumptions that are not under direct government control do not materialize.

CHAPTER THREE

ANALYSIS OF POLICY SIMULATION RESULTS

The simulation results for the three scenarios described in Chapter 2 are presented and analysed in this chapter. This model, like all others, is an approximation of reality and not the reality itself. It is significant to note that based on inputs from the Technical and Policy Teams, as well as data availability and the informed judgment of the iSDG Modelling Team, the model has been successfully domesticated and calibrated. Moreover, the results of the base run of the model reasonably replicated the actual data from 1990 to 2015. Therefore, it can be concluded that the model is a reasonable approximation of the Nigerian reality.

The simulation results show the prospects of reaching the targets for the SDG indicators should the policies and parameters associated with each of the scenarios be implemented effectively. In this regard, there are three possibilities. First, if the simulation results show that the target for an indicator is not achievable by 2030 under a given scenario, the implication is that, in reality, that target is not likely to be realizable under the policies and parameters associated with that scenario. Second, if the simulation results show that the target for an indicator is barely achievable by 2030 under the scenario, the implication is that, in reality, that target is only likely to be realizable under the policies and parameters associated with that scenario. Third, if the simulation results show that the target for an indicator is fully achieved or surpassed, the implication is that, in reality, the target is very likely to be achieved under the policies and parameters associated with that scenario.

In Section 3.1, the simulation results of each SDG indicator under the three scenarios are presented and analysed. In the graph for each indicator, the purple line represents the SDG target-level for the indicator, which each of scenarios should aim at achieving[3]. The blue and orange lines represent the No-ERGP-scenario and Optimistic-ERGP-scenario, respectively, while the thin brown line represents the ERGP+SDG-scenario. On the right of every graph is the last year of the historical development in magenta.

HOW TO INTERPRET THE SIMULATION RESULTS

In interpreting the graphs of the various scenarios, there are several possibilities. First, a scenario can be considered to go in a desirable direction if its graph approaches the target by 2030. Second, if the graph of the scenario reaches or exceeds the target by 2030, the scenario can be considered to have moved in the desired direction and achieved the target. Third, if the graph of the scenario diverges from the target, the scenario can be considered to be moving in an undesirable direction. The simulation results show the prospects of reaching the targets for the SDG indicators if the policies and parameters associated with each of the scenarios were to be effectively implemented.

Importantly, for some of the graphs this purple line resides on the top or bottom edge of the graph: For many indicators where an increase is desirable the target is 100% (or 1) whereas for many indicators where a decrease is desirable 0% (or 0) is the target. In order to make sense of each graph it is important to first spot this purple line.

Legend:		
Degree of Target attainment	2030-Target attained	○○●
	2030-Target almost attained (=barely missed)	○●○
	2030-Target not attained	●○○
Direction of development	Desirable: moving towards / deeper into target range	☺
	not (or hardly) approaching target range	☹
	Undesirable: varying direction: alternating between desirable and dundesirable or vise versa	😐
Policy impact	Desirable impact of *Optimistic-ERGP-scenario*	👍
	Undesirable impact of *Optimistic-ERGP-scenario*	👎
	None or hardly any change in *Optimistic-ERGP-scenario* compared to *No-ERGP-scenario*	👉

Note for example, the difference beetween the smily and thumbs up: if the Optimistic-ERGP-scenario compared to No-ERGP-scenario are both moving towards the target but they are exactly one an the same for the indicator, they would have a smily face but a no-thumb. In the sections that follow, these symbols are used with respect to the Optimistic-ERGP-scenario only.

3.1. ANALYSIS OF SIMULATION RESULTS OF SDG INDICATORS UNDER THE THREE SCENARIOS

3.1.1. Simulation Results of Indicators of Goal 1: End Poverty in All its Forms Everywhere

The indicators incorporated into the iSDG model and for which there are simulation results under this goal are:

a) Share of Population Below the International Poverty Line

b)Share of Population Below the National Poverty Line

c)Share of Population with Access to Basic Health Care

d)Mortality Due to Disaster

e)Proportion of Population Affected by Disaster

f)Economic Damage Due to Natural Disaster

The simulation results for these indicators under each of the three scenarios are presented in Figures 3.1 to 3.6. With respect to the share of population below the international poverty line, the target is that by 2030, no one should be living below the international poverty line. So, the target for the indicator is zero. As depicted by the purple line in Figure 3.1. Evidently under the No ERGP or Business-as-Usual Scenario, depicted by the blue line, this target is unlikely to be achieved as at least 25 per cent of the population will still be living below the international poverty line by 2030 as opposed to the target of zero. Under the Optimistic-ERGP-scenario, and ERGP+SDG-scenario, the goal is likely to be achieved before 2025.

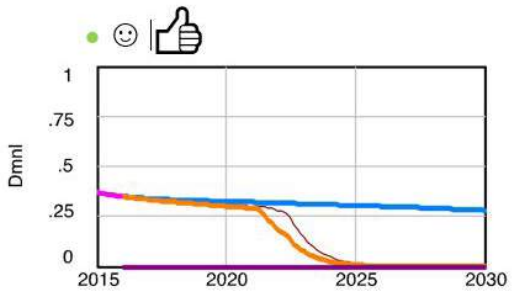


Figure 3.1: Share of the population below the international poverty line

Turning to the share of population below the national poverty line, the target is that at the most, no more than 20 per cent of the population should be living below the national poverty line. As shown in Figure 3.2, under the No-ERGP-scenario, this target is unlikely to be achieved by 2030 whereas under the Optimistic-ERGP-scenario and ERGP+SDG-scenario, not only is the target met, it is also surpassed such that before 2025, no one will be living below the national poverty line.

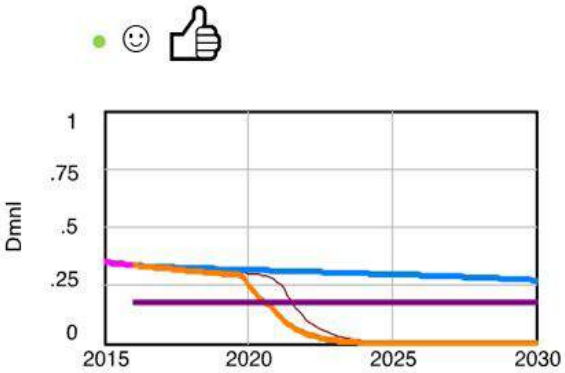


Figure 3.2: Proportion of the population below the national poverty line

Regarding the population with access to basic health care, the target is that by 2030, everyone will have access to basic health care. Figure 3.3, showing the simulation results, reveals that this target is unlikely to be met under any of the three scenarios. It is observable, however, that the graphs of each scenario are moving in the right direction. It is also evident that although the proportion of the population that has access to basic health care is highest under the ERGP+SDG-scenario, many people are still likely to be left behind in this regard. Accordingly, efforts should be intensified to increase the proportion of government expenditure on basic health care. Recalling that data challenges prevent adequate incorporation of the efforts by sub-national governments, it is possible that the ERGP+SDG-scenario may achieve this target. Moreover, with improved efficiency and governance in the health system at national and sub-national levels, the prospects of leaving no one behind in the area of basic health care is brighter.

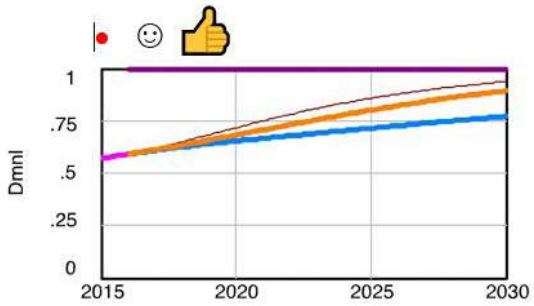


Figure 3.3: Average Access to Basic Health Care

For the proportion of the population affected by disaster and those affected by economic decline owing to disasters as a share of GDP the targets are zero as indicated by the purple lines in Figures 3.4, 3.5 and 3.6. The graphs of No-ERGP-scenario and Optimistic-ERGP-scenario diverge from the target primarily because disaster mitigation efforts are insignificant under these scenarios. Expectedly, under the ERGP+SDG-scenario when considerable efforts and expenditure on disaster mitigation are incorporated, the graph of this scenario moves in the right direction. It is evident that additional efforts and expenditure on disaster mitigation and adaptation will be required to achieve the targets of zero death due to disaster, zero population affected by disasters and zero loss of GDP due to disasters by 2030. To this end, the government should seek financial, technological and capacity-building support from the international partners, especially in the context of the Paris Accord on Climate Change and similar international processes. The Federal Government should also intensify its climate change mitigation and adaptation initiatives such as the issuance of Green Bonds the proceeds of which should be judiciously and efficiently utilized. State Governments should also be encouraged to do the same to fully achieve these disaster-related targets.

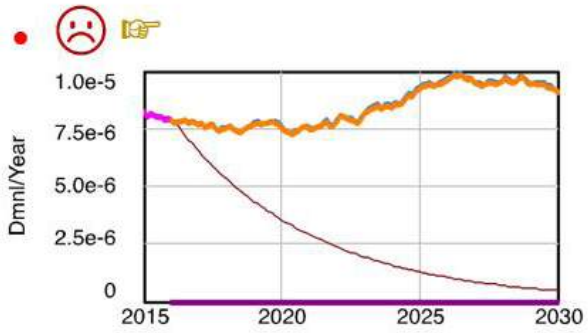


Figure 3.4: Mortality due to disasters

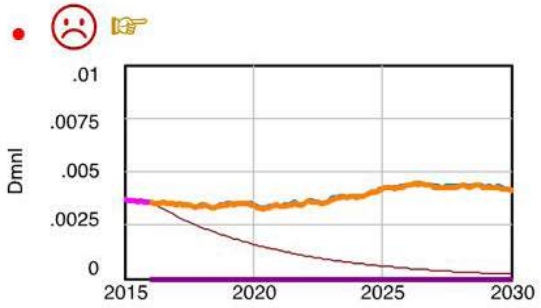


Figure 3.5: Proportion of population affected by disasters

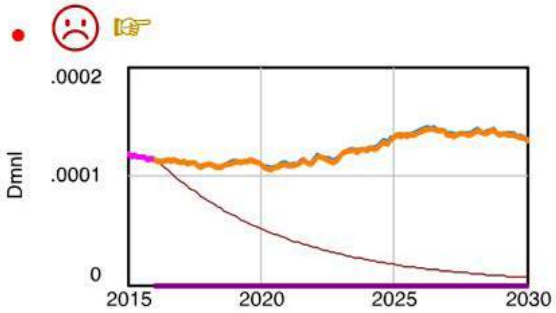


Figure 3.6: Economic damage due to natural disasters as share of GDP

3.1.2. SIMULATION RESULTS OF INDICATORS OF GOAL 2: END HUNGER, ACHIEVE FOOD SECURITY AND IMPROVED NUTRITION AND PROMOTE SUSTAINABLE AGRICULTURE

The indicators incorporated into the iSDG model and for which there are simulation results under this goal are:

a. Prevalence of Undernourishment

b. Prevalence of Stunting

c. Prevalence of Malnutrition

d. Total Agricultural Production

e. Proportion of Harvested Area Sustainably Managed

Figure 3.7 presents the simulation results for the prevalence of undernourishment. The target is to eliminate undernourishment by 2030. Clearly, under the No-ERGP-scenario this target is unlikely to be achieved by 2030. However, under both the Optimistic-ERGP-scenario and the ERGP+SDG-scenario, the targets are likely to be achieved around 2030. Given the uncertainty inherent in these scenarios, efforts should be made to effectively and efficiently implement the ERGP and associated SDG policies and programmes to ensure the achievement of this target.

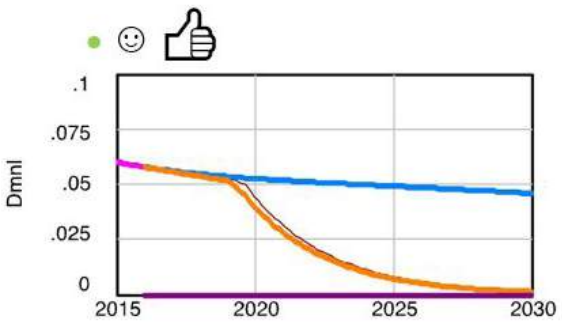


Figure 3.7: Prevalence of Undernourishment

Figures 3.8 and 3.9 present the simulation results for prevalence of stunting and malnutrition, respectively. Again, the targets are to end stunting and malnutrition by 2030. No-ERGP-scenario is unlikely to achieve these targets while under both the Optimistic-ERGP-scenario and the ERGP+SDG-scenario, the targets are likely to be achieved as early as 2020. However, it should be recalled that the two scenarios assume effective and efficient implementation of all policies and programmes related to stunting and malnutrition.

Therefore, in reality, it is unlikely that stunting and malnutrition would actually be eliminated in Nigeria by 2020. The indication, however, is that the prospects of achieving these targets before 2030 are there provided the ERGP and SDG policies and programmes are effectively and efficiently implemented.

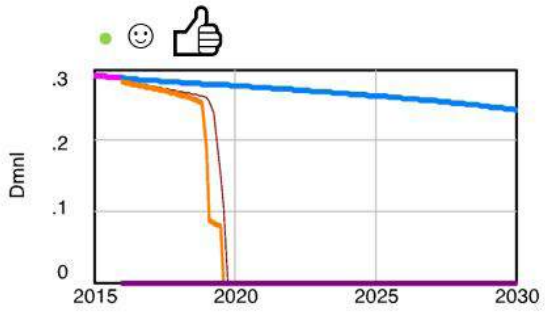


Figure 3.8: Prevalence of stunting

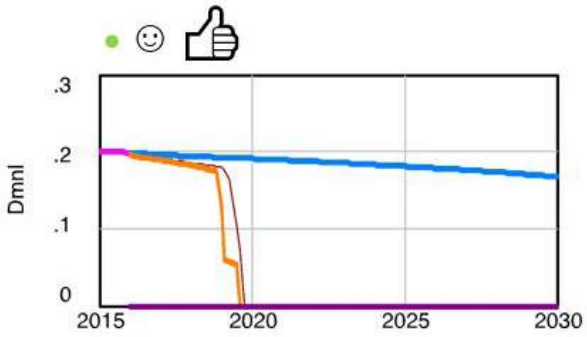


Figure 3.9: Prevalence of malnutrition

The simulation results for agricultural production per labour unit are presented in Figure 3.10. The target is to achieve about 29 tons per person in order to support the eradication of undernourishment, stunting and malnutrition by 2030. Agricultural output per labour unit is an indicator of labour productivity. It rises much faster in the Optimistic-ERGP-scenario compared to the No-ERGP-scenario but not quite attaining the target. In the ERGP+SDG-scenario, the goal is barely reached by 2030. Again, given the underlying assumption of effective and efficient implementation of the ERGP and SDG policies and programmes, there is considerable uncertainty about the achievement of this target in reality.

Meanwhile, given the large area of uncultivated arable land in Nigeria, there are no risks of rising agricultural productivity causing the undesirable effect of rising unemployment.

Indeed, the challenge is to make agriculture attractive to the youthful population. To this end, government at all levels and the development partners should provide financial, inputs (seeds, fertilizers, agricultural machinery, irrigation schemes, etc) and efficient extension services as well as appropriate marketing linkages and a price support system to farmers. Perhaps, more importantly, is the need to make the rural areas livable and attractive to the youth by providing necessary economic (transport, power, etc) and social (education, health, water and sanitation) infrastructure in them.

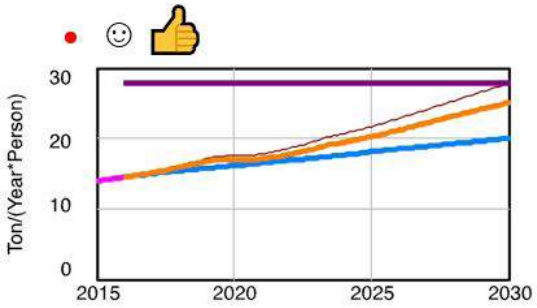


Figure 3.10: Total agriculture production in tons per labor unit

Figure 3.11 presents the simulation results for the proportion of harvested area that is sustainably managed. The target is that by 2030, the totality of area harvested will be sustainably managed by which time it is envisaged that there would have been an organic farming revolution in the country. Clearly, under the No-ERGP-scenario the proportion of harvested area sustainably managed simply stays essentially at zero, implying that farmers will still depend heavily on inorganic fertilizers and similar inputs. Under the Optimistic-ERGP-scenario, the result suggests that an organic farming revolution in Nigeria would have taken place by the mid-2020s such that the whole agricultural area would be sustainably managed. Note that this favourable development hinges on the assumption that 0.02 per cent of GDP is spent on training farmers in sustainable agriculture practices. Instead, if an industrial-style agricultural revolution was carried out, the development could be much less favourable. The scenario envisioned here indicates the great potential for sustainable agricultural training.

There is no difference between the *ERGP+SDG-scenario,* and the *Optimistic-ERGP-scenario* for this indicator.

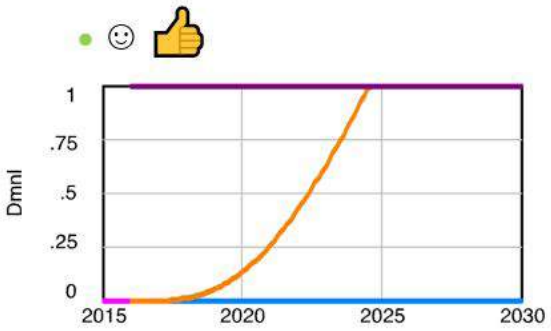


Figure 3.11: Proportion of harvested area sustainably managed

3.1.3. SIMULATION RESULTS OF INDICATORS OF GOAL 3: ENSURE HEALTHY LIVES AND PROMOTE WELL-BEING FOR ALL

The indicators incorporated into the iSDG model and for which there are simulation results under this Goal are:

a. Maternal Mortality Ratio

b. Under-five Mortality Ratio

c. Neonatal Mortality Ratio

d. Mortality due to Neoplasmic Diabetes and Respiratory Diseases

e. Mortality related to Road Traffic

f. Contraceptive Prevalence Rate

g.Adolescent Birth Rate

The simulation results for maternal mortality ratio (MMR) are in Figure 3.12 The target is that by 2030, MMR would have decreased to 70/100,000 live births. Evidently, maternal mortality ratio under each of the three scenarios decline. Expectedly, the decline is slowest under No-ERGP-scenario and fastest under ERGP+SDG-scenario. However, despite the optimistic assumption regarding the implementation of ERGP and the additional initiatives under SDGs, the target of 70/100,000 live births is unlikely to be achieved by 2030. . To increase the prospects of achieving this target by 2030 the Nigerian Government should increase health expenditure generally and relating specifically to maternal health. In particular, better-equipped and staffed maternity hospitals should be built and maintained. Given the wide gap between the achievements under ERGP+SDG-scenario,

Nigeria will need considerable assistance from multilateral, bilateral and international NGOs and philanthropist partners in the area of finance, capacity building and equipment. Meanwhile, efficiency, effectiveness and transparency in resource utilization should be stepped up to make the best use of the domestic resources allocated to maternal health and also attract support from partners. As shown in Figures 3.13, 3.14 and 3.15, the simulation results for under-five mortality, neonatal mortality rates and mortality due to neoplasms, cardiovascular and respiratory diseases are similar to those of maternal mortality ratio. Accordingly, the same observations and suggestions apply.

Turning to mortality due to road traffic, Figure 3.16 indicates that the graphs of the three scenarios are diverging from the target. In essence, mortality related to road traffic increase systematically throughout the period. Indeed, the divergence is smallest under No-ERGP-scenario and largest under ERGP+SDG-scenario. The increased mortality is possibly caused by increases in the number of vehicles arising from higher economic growth and associated increases in incomes. This is an undesirable side-effect of desirable economic development. To counteract this undesirable effect of increasing economic prosperity, the Federal Road Safety Commission should be strengthened legally and funded adequately to intensify its preventive and recovery activities. Additional safety standards, including speed limits, should be engineered into vehicles to complement the rules guiding the use of seat belt. Agencies responsible for behavioural changes should be encouraged to intensify sustained public enlightenment as the Nigerian economy develops and prosperity increases.

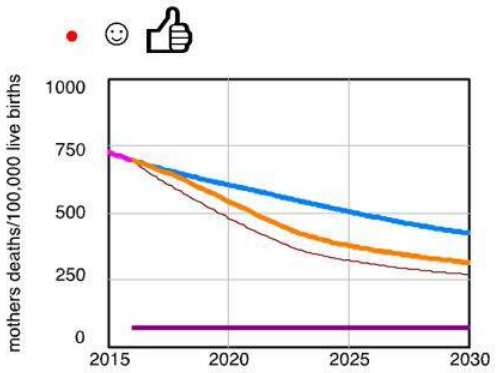


Figure 3.12: Maternal mortality ratio

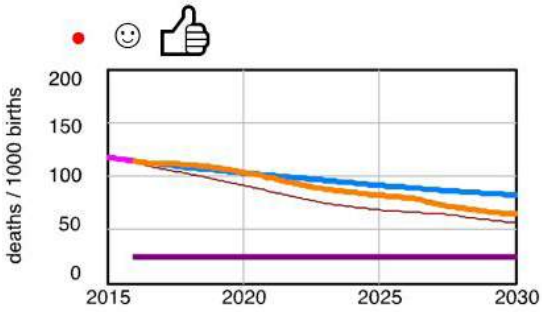


Figure 3.13: Under-five mortality rate

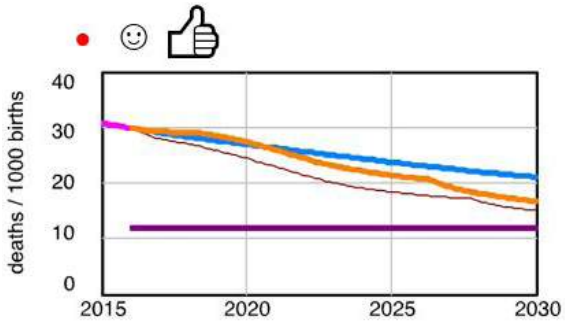


Figure 3.14: Neonatal mortality rate

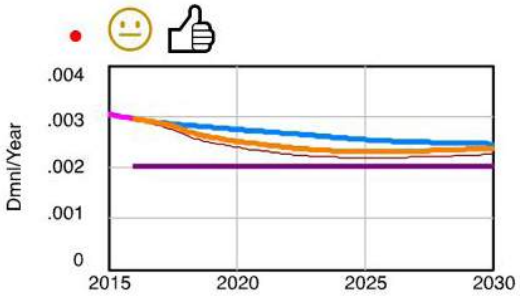


Figure3.15: Mortality due to neoplasms, diabetes, cardiovascular and respiratory diseases

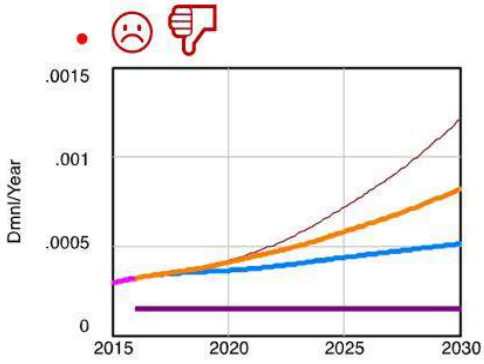


Figure 3.16: Mortality related to road traffic

Figure 3.17 shows the simulation results for contraceptive prevalence. The target for this indicator is to achieve 100 per cent contraceptive prevalence by 2030, meaning that people are using contraceptives in such a way that they have exactly the number of children they desire. This indicator remains low in the No-ERGP-scenario but reaches the target in the Optimistic-ERGP-scenario. In the ERGP+SDG-scenario, the target is reached slightly later, but still before 2030. Low contraceptive prevalence implies a high population growth rate with the attendant increase in demand for jobs and social protection expenditure in the face of rising unemployment rate. Government should, therefore, intensify efforts in the area of female education and empowerment to achieve the 100 per cent contraceptive prevalence as soon as possible. In this regard and for reasons of sustainability, the government should also encourage domestic production of contraceptive products thereby realizing the additional benefits of increased revenue from economic diversification, as well as job creation.

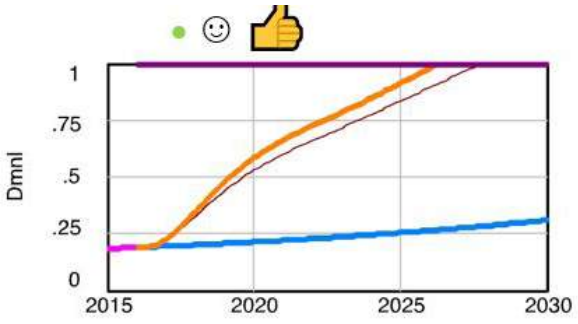


Figure 3.17: Contraceptive prevalence rate

Figure 3.18 presents the simulation results for the adolescent birth rate. The target for this indicator is that by 2030, the adolescent birth rate would be zero, implying complete eradication of adolescent pregnancy and, hence, childbirth. Adolescent birth rates are likely to decline under the three scenarios. The rate of decline is slower under the No-ERGP-scenario than under the Optimistic-ERGP-scenario or the ERGP+SDG-scenario. Since this indicator is driven primarily by income and education, government, at all levels, should promote economic growth and very remunerative job creation to enhance the prospects of meeting the target of zero adolescent birth rate by 2030. Government should also intensify female education and women empowerment to further enhance the prospects of achieving this target by 2030 or earlier. This is imperative because even the more comprehensive ERGP+SDG-scenario is unlikely to achieve this target even if the government implements these policies and programmes as best as possible.

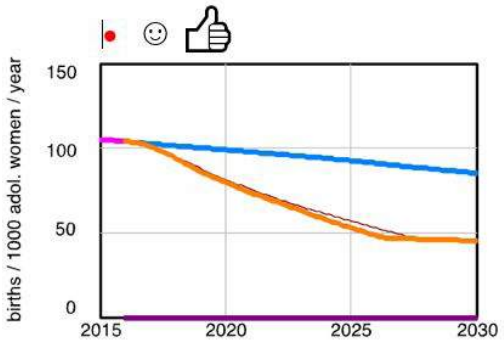


Figure 3.18: Adolescent birth rate

3.1.4. SIMULATION RESULTS OF INDICATORS OF GOAL 4: ENSURE INCLUSIVE AND EQUITABLE QUALITY EDUCATION AND PROMOTE LIFELONG LEARNING OPPORTUNITIES FOR ALL

The indicators incorporated into the iSDG model and for which there are simulation results under this goal are:

a. Secondary Education Completion Proportion

b. Tertiary Education Enrolment Proportion

c. Adult Literacy Rate

d. Adult Literacy Gender Gap

e. Proportion of Female Legislators, Senior Officials and Managers.

Figure 3.19 presents the simulation results for Secondary Education Completion Proportion. The target for this indicator is the proportion of persons aged 20 to 24 years that have completed secondary education should be 100 per cent by 2030. Clearly, it is unlikely that this target can be achieved under any of the three scenarios.

However, the graphs of the three scenarios are moving in the right direction with the ERGP+SDG-scenario delivering the highest proportion of the youth completing secondary education. This is closely followed by achievement under the Optimistic-ERGP-scenario. Possibly, the failure to achieve this target may be due to the low initial level of the indicator (just over 25 per cent in 2016), but it also shows the need for considerable additional policy effort beyond the ERGP and SDG to enhance the prospects of achieving this target by 2030. This is another area where the private sector, non-profit organizations, community-based organizations and philanthropists can partner with the government to mobilize additional funds to build, equip and staff more secondary schools. To ensure that the participation of profit-oriented private organizations does not leads to the exclusion of students from humble background, government at all levels should establish scholarship and bursary schemes as well as provide grants to secondary schools operated by non-profit and community-based organizations. To assure quality and standards, government should regularly inspect all schools to monitor the quality of teachers, teaching and instructional materials.

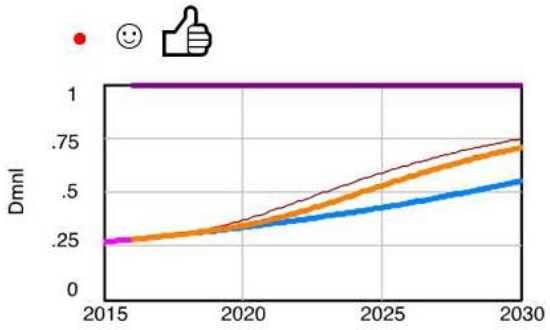


Figure 3.19: Secondary education completion proportion

The simulation results for tertiary education enrolment proportion shown in Figure 3.20 is quite similar to that of secondary education completion rate. The target is that by 2030, all persons between the ages of 20-29 should be enrolled in universities, technical, professional, vocational and other post-secondary training institutions.

Evidently, the achievement under ERGP+SDG-scenario, which is the highest of the three, is far below the target. Accordingly, additional policies and programmes similar to those proposed for secondary education completion rate will be necessary. In addition, the National Universities Commission (NUC) should be equipped to carry out proper scrutiny before licensing private universities and mount regular rigorous accreditation programmes to promote high standards in all universities, regardless of the ownership.

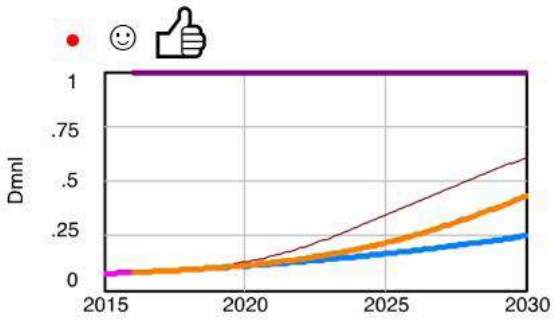


Figure 3.20: Tertiary education enrollment proportion

Figure 3.21 presents the simulation results for the adult literacy rate. The target is to achieve full adult literacy by 2030. The indication is that this target is unlikely to be achieved under any of the three scenarios which already assumes effective implementation of the policies and programmes, especially under the ERGP+SDG-scenario. Accordingly, all levels of government should first ensure effective implementation of the ERG and SDG policies aimed at increasing adult literacy rate. As this will not be enough to achieve the desired target by 2030, several additional initiatives should be articulated and effectively implemented. To this end, partnership with UN Agencies and similar international organizations finance, technology and capacity building.

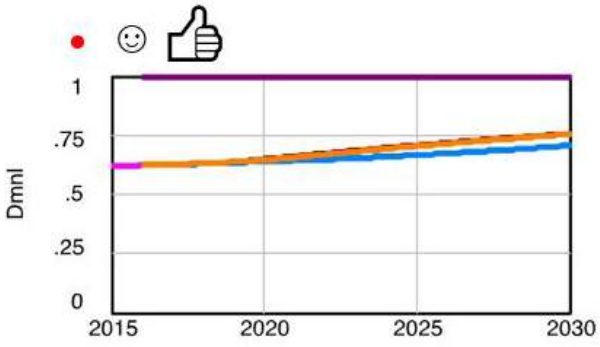


Figure 3.21: Average adult literacy rate

Figure 3.22 shows that the target of closing the gender gap in adult literacy is unlikely to be achieved by 2030 under any of the three scenarios although the graphs all move in desirable directions. Nevertheless, additional efforts and initiatives beyond what is in the ERGP and SDG are required to close the adult literacy gender gap by 2030.

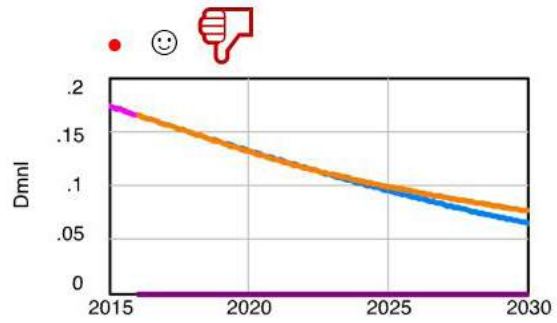


Figure 3.22: Adult literacy gender gap ratio

3.1.5. SIMULATION RESULTS OF INDICATORS OF GOAL 5: ACHIEVE GENDER EQUALITY AND EMPOWER ALL WOMEN AND GIRLS

The only indicator incorporated into the iSDG model and for which there are simulation results under this goal is:

a. Proportion of Female Legislators, Senior Officials and Managers

The simulation results for female legislators, senior officials and managers are shown in Figure 3.23. The indication is that considerable gap persists under the three scenarios. However, the gap is much narrower under Optimistic-ERGP-scenario and ERGP+SDG-scenario compared to No-ERGP-scenario. It should be noted that there are no additional policies in this regard in the SDG. As a result, the simulation results for both scenarios are precisely the same.

The Optimistic-ERGP-scenario assumes that both the effects of the social and market framework on hiring and the difference in hiring between the top and regular employment disappear. The long delay in the system is responsible for the remaining gap. Therefore, even if men and women are hired on an equal basis, due to the length that any position is occupied, it takes a long time for the results in equality for the positions held to show. To address this structural delay, initiatives to enhance the growth of the economy and open up additional job opportunities at the top should be vigorously pursued. An affirmative action by means of which some organizations hire more women should be encouraged. Specifically, there is a need to address the gender imbalance in Nigeria's legislatures. Strong concerns have been expressed about women's poor representation in the National Assembly and the State Houses of Assembly compared to some other African parliaments with more than 30 per cent women in a single or lower house parliament. Rwanda, Namibia and South Africa are ready examples. Therefore, the country need to enact women-friendly electoral laws.. Specifically, consistent with trends around the world, there is a need for some type of electoral gender quotas and incentives to get more women elected into the various Houses of Assembly.

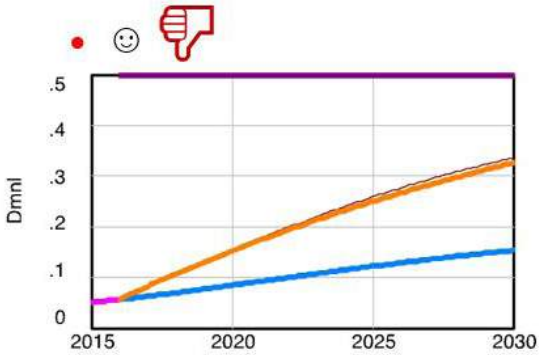


Figure 3.23: Proportion of female legislators, senior officials and managers

3.1.6. SIMULATION RESULTS OF INDICATORS OF GOAL 6: ENSURE AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION FOR ALL

The indicators incorporated into the iSDG model and for which there are simulation results under this goal are:

a. Access to Improved Water Source

b. Access to Improved Sanitation Facility

c. Total Water Withdrawal per Unit of GDP

d. Water Resources Vulnerability Index

The simulation results for access to improved water source are shown in Figure 3.24. The target is that, by 2030, every person will have access to improved water source.

In the No-ERGP-scenario, after an initial improvement, the situation gets worse again regarding access to improved water source. A possible cause of this is that population growth over-compensates gains in physical infrastructure for safe water and sanitation. Another possible cause is that costs for physical infrastructure investments are expected to rise in the future so that even if the population were not growing faster, increasing investments for replacements would be needed to maintain the status quo. The Optimistic-ERGP-scenario, on the other hand, reaches the target in good time. The reason for this is two-fold. First, there is more spending resulting in increasing physical infrastructure for the provision of safe water. Second, the population is growing slower than in the No-ERGP-scenario as a result of family planning policies. It follows from this that the same infrastructure can be used to serve a higher percentage of the population. Importantly, due to past measures, the initial situation concerning this indicator is already relatively good, so that the gap to be closed is relatively small to start with, which makes target attainment feasible.

The ERGP+SDG-scenario and the Optimistic-ERGP-scenario do not differ in terms of policies because the latter already reaches the goal, his

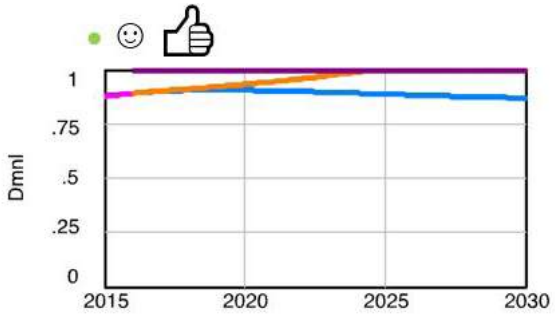


Figure 3.24: Access to improved water sources

The simulation results for access to improved sanitation facility are shown in Figure 3.25. The target for this indicator is that, by 2030, all persons will have access to improved sanitation facility.

In contrast to the results on the provision of safe water, the level of access to improved sanitation situation is quite bad: roughly two-thirds of the population are not covered, leaving a large gap to be closed. As a result, neither of the two scenarios is likely to achieve the target by 2030. While the initial situation in the No-ERGP-scenario is mostly stagnant, the Optimistic-ERGP-scenario at least leads to a notable improvement so that, by 2030, over half of the population will have access to improved sanitation facility. Owing to additional investment in improved sanitation facility in the ERGP+SDG-scenario, the target of full access to improved sanitation facility is likely to be achieved before 2030.

Accordingly, government at all levels should ensure effective implementation of the policies and programmes for improved sanitation facility articulated in the ERGP and the SDGs to guarantee the achievement of the target in reality. To this end, government at all levels should seek partnerships with domestic and foreign organizations to secure additional finance, technology and the capacity building needed to enhance the prospects of achieving this target.

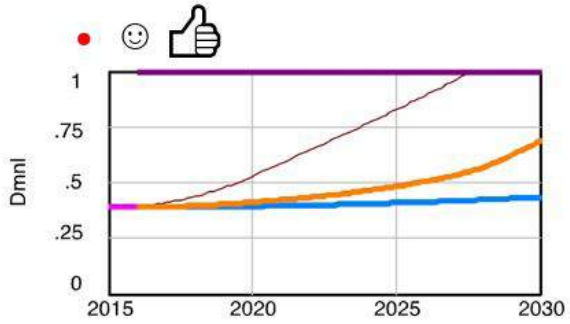


Figure 3.25: Access to improved sanitation facility

Figure 3.26 shows the simulation results for total water withdrawal per unit of GDP. The target is that, by 2030, arising from improved water efficiency, the total water withdrawal per unit of GDP will not exceed 0.0001. The prospects of achieving this target under each of the three scenarios are not bright. The indication points to a need to dramatically improve efficiency in water utilization in Nigeria. To achieve this target requires the use of water-saving technologies in all aspects of production in the country. To this end, government, the domestic stakeholders and international partners should assist in accessing the best available water-efficient technology for use in the country. Given that domestic capacity to produce technology is limited as at now, partners should assist in mobilizing necessary financial resources to enable producers access the latest water-efficient technologies. In the medium term, government should encourage domestic production of most equipment to ensure sustainable improvement in water efficiency by producers, especially agricultural producers.

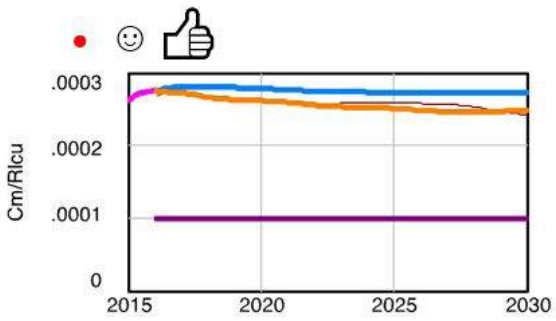


Figure 3.26: Total water withdrawal per unit of GDP

Figure 3.27 shows the simulation results for water resources vulnerability index. The target of this indicator, which is the ratio of water withdrawal to water supply, is that, by 2030, not more than 10 per cent of total water resources should be used to avoid water stress. As shown in the figure, Nigeria was initially within the target range (below 10 per cent of water supply withdrawal in 2016). However, the simulation shows that the situation continuously worsens over time until water scarcity starts being a problem around 2019 in the No-ERGP-scenario and even earlier in the Optimistic-ERGP-scenario. Importantly, the Optimistic-ERGP-scenario yields much worse water scarcity by 2030 than the No-ERGP-scenario, while the ERGP+SDG-scenario is the worst.

The rising water resources vulnerability stresses the need for policies beyond the ERGP to avoid acute water stress. Drawing on the experiences of countries that are already confronting the challenges of water stress, government at all levels should start to incentivize desirable behaviours, promote water-efficient technologies, reuse water for other purposes, among other things.

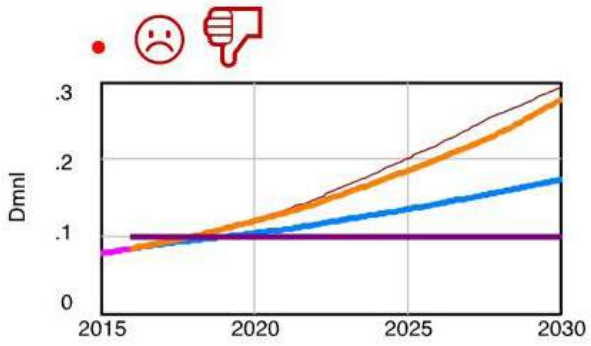


Figure 3.27: Water resources vulnerability index

3.1.7. SIMULATION RESULTS OF INDICATORS OF GOAL 7: ENSURE ACCESS TO AFFORDABLE, RELIABLE, SUSTAINABLE MODERN ENERGY FOR ALL

The indicators incorporated into the iSDG model and for which there are simulation results under this goal are:

a. Percentage of Population with Access to Electricity

b. Share of Renewable Energies in total Final Energy Consumption

c. Primary Energy Intensity of Production

The simulation results for the percentage of the population with access to electricity are shown in Figure 3.28. The target for this indicator is that by 2030, the entire population should have access to electricity. It is clear from the graphs that although there will be considerable progress towards the target under the No-ERGP-scenario, the target is unlikely to be achieved as the progress losses momentum around 2025. Since the policies and programmes under both Optimistic-ERGP-scenario and ERGP+SDG-scenario are basically the same, the target is expected to be achieved before 2020.

The reality in Nigeria however, is that this target cannot be achieved even after 2020, indicating that electricity development policies and programmes have not been effectively and efficiently implemented. Since under the No-ERGP-scenario, considerable progress is likely to be made, the prospects of achieving this target before 2030 under the ERGP+SDG-scenario is brighter if the ongoing initiatives to reform the electricity generation, transmission and distribution segment of the industry continue to be pursued with vigour, transparency and sincerity of purpose by all stakeholders

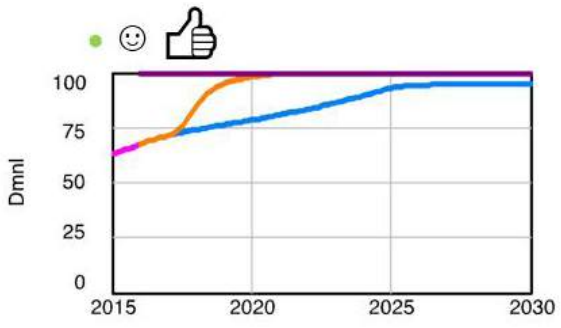


Figure 3.28: Percentage of population with access to electricity

Figure 3.29 presents the simulation results of the share of renewable energies in the final energy consumption. The target for this indicator is that, by 2030, the share of renewable energies in the final energy consumption should be 100 per cent. In essence energy consumption will come exclusively from hydro, solar, wind and other renewable sources.

Thermal, nuclear and similar non-renewable sources will atrophy. It is pertinent to stress that this target is essentially for tractability. While this target is unrealistic, the observation that the graphs under each of the three scenarios are likely to diverge systematically from this somewhat utopian target deserves attention. In order to reverse this trend, as electricity demand grows in tandem with the growth of the economy, government, the private sector and development partners should step up investment in renewable electricity supply to the grid. This way, over time, investment in thermal (coal and hydrocarbon) generation should be de-emphasized while investment in hydro and other renewable electricity supply should be emphasized. In this regard, the revival of interest in the various hydro-electricity projects, especially the Mambila Project, should be sustained.

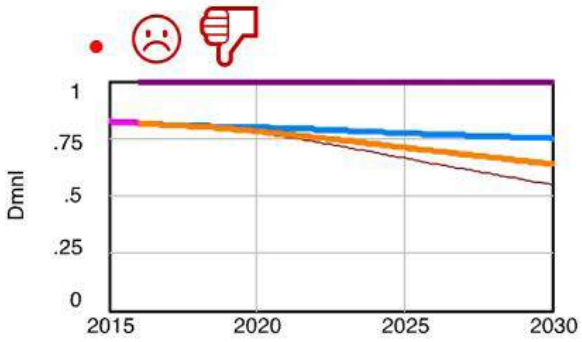


Figure 3.29: Share of renewable energies in the final energy consumption

Figure 3.30 presents the simulation results for primary energy intensity of production. The target for this indicator is that, by 2030, the ratio of primary energy supply to GDP should decline from the 7MJ/US$2011 as at 2015 to 5MJ/US$2011. Clearly, all graphs of the three scenarios are moving in the right direction. However, while it is unlikely that the target will be achieved under the No-ERGP-scenario, the prospects of achieving it are bright under both Optimistic-ERGP-scenario and the ERGP+SDG-scenario.

Indeed, the likelihood is that this target will be achieved under the Optimistic-ERGP-scenario before 2030 and likely to be achieved around 2030 under the ERGP+SDG-scenario. This suggests that the effective implementation of policies under the ERGP is sufficient to achieve the target.

It is important to stress that the attainment of this target under the Optimistic-ERGP-scenario and the ERGP+SDG-scenario depends critically on access to modern energy-saving technologies by energy users. Continued reliance on the old vintage technologies by energy users will make the No-ERGP-scenario a reality. To this end, government should encourage all energy users to gradually replace their obsolete energy-intensive technologies with modern energy-efficient ones.

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Figure 3.30: Energy intensity level of primary energy

3.1.8. SIMULATION RESULTS OF INDICATORS OF GOAL 8: PROMOTE SUSTAINED, INCLUSIVE AND SUSTAINABLE ECONOMIC GROWTH, FULL AND PRODUCTIVE EMPLOYMENT AND DECENT WORK FOR ALL

The indicators incorporated into the iSDG model and for which there are simulation results under this goal are:

a. Real Per Capita GDP Growth Rate

b. Growth Rate of GDP Per Employed Person

c. Material Footprint

d. Per Capita Material Footprint

e. Material Footprint per Unit of Output

f. Domestic Material Consumption Per Unit of Output

g. Unemployment Rate

h. Share of Youth not in Education, Employment or Training.

The simulation results for real per capita GDP growth rate are in Figure 3.31. The target for this indicator is 7 per cent per annum throughout the period. Evidently, under the No-ERGP-scenario, the growth rate decline systematically to reach around 2 per cent by 2030. On the other hand, the growth rate under the Optimistic-ERGP-scenario increase rapidly from 2016 to reach the target growth rate of 7 per cent by 2019 and staying above the target rate for most of the period while decelerating to below 7 per cent by 2030. The additional policies in the ERGP+SDG-scenario lead to similar rapid growth beginning in 2016 to also exceed the target by 2019 and stays above the target up to 2030. The fluctuations and deceleration witnessed under the Optimistic-ERGP-scenario is repeated under the ERGP+SDG-scenario, reflecting the diminishing returns to investment over time. The key driver of growth under these two scenarios is increased investment although there are contributions from improvements in labour productivity as well as the increased agricultural productivity arising from the revolution in agricultural production identified under area harvested that is sustainably managed (see Figure 3.10, above).

Currently, the reality in Nigeria is closer to the No-ERGP-scenario. Consequently, Nigeria needs to ramp up per capita GDP growth rate to over 7 per cent per annum between now and 2030. Accordingly, it is imperative to effectively implement ERGP and SDG policies and programmes. To this end, government at all levels should sustain investment in infrastructure and social protection while providing incentives and support to the private sector in their quest to acquire efficient modern technologies in all sectors of production, ranging from agriculture, mining, manufacturing, electricity generation, transmission and distribution to services. The private sector operators should also seek strategic close gap.

partnerships with their foreign counterparts as they seek to acquire modern efficient and environmentally friendly production technologies. By so doing, the prospects of achieving well over 7 per cent per capita GDP growth rate between now and 2030 can be brighter. In addition, policies and programmes necessary to improve labour productivity in general and agricultural productivity in particular through sustainable management of agricultural land will further prevent the deceleration in per capita growth rates observed the two desirable scenarios.

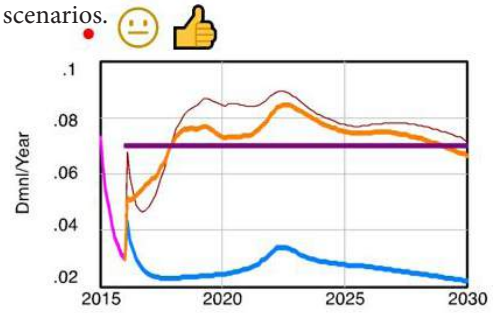

Figure 3.31: Real per capita GDP growth rate

Figure 3.32 presents the simulation results for the growth rate of GDP per employed person. The target for this labour productivity indicator is 3 per cent per person per annum. Even though the targeted labour productivity growth rate is relatively low, the indication is that this target is unlikely to be achieved under the No-ERGP-scenario . Clearly, this target is likely to be achieved throughout the period and exceeded by 2030 under both the Optimistic-ERGP-scenario and the ERGP+SDG-scenario if the policies and programmes envisaged are effectively and efficiently implemented. It is also to be noted that although the targets are achieved under both scenarios, the deceleration tendency observed in the case of per capita GDP growth rate is also present.

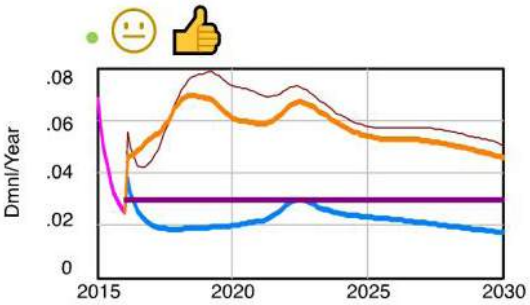

Figure 3.32: GDP per employed person growth rate

The simulation results for material footprint, per capita material footprint, material footprint per unit of output, domestic material consumption, domestic material consumption per capita and material consumption per unit of output are presented, respectively, in Figures 3.33, 3.34, 3.35, 3.36, 3.37, and 3.38. The target for material footprint is 1.2 billion tons per year. That of per capita material footprint is 0 ton per person per year and that of material footprint per unit of output is 25kg per US$ output. The target for material consumption per unit of output is also 25kg per US$ output.

It is observable from Figure 3.33 that under the No-ERGP-scenario, the annual material footprint is likely to be below the target until 2025. This is a reflection of the low level of economic activity compared to the other two scenarios which exceed this target before 2020 and escalate rapidly to reach about 3.7 tons per year in the case of Optimistic-ERGP-scenario and 3.9 tons per year in the case of ERGP+SDG-scenario.

In the case of per capita material footprint, the indication is that the target of 0 ton per capita per year is unlikely to be achieved under the three scenarios (see Figure 3.34). The indication is that the production and consumption patterns are such that any efficiency gains are unlikely to swamp population growth rates to reduce per capita material footprint. It is significant to note that the divergence between the target and actual per capita material footprint is vast for both Optimistic-ERGP-scenario and ERGP+SDG-scenario, reflecting the influence of increased economic activity arising from effective implementation of the envisioned policies and programmes.

With respect to material footprint per unit of output (Figure 3.35), it is equally evident that the target of 25kg/US$ per year is unlikely to be achievable under each of the three scenarios. Moreover, the material footprint per unit of output under the No-ERGP-scenario is rather flat, indicating a fixed coefficient relationship between

output and material footprint and no significant efficiency gains from 2016 to 2030. However, although the material footprint per unit of output tends to rise dramatically under the Optimistic-ERGP-scenario and ERGP+SDG-scenario, it peaks around 2021 and decelerates after that, suggesting significant efficiency gains which are still insufficient to achieve the target.

Both the domestic material consumption and the per capita domestic material consumption are initially within the target range but move out of the target range before 2030 in the Optimistic-ERGP-scenario (see Figures 3.36 and 3.37). For the No-ERGP-scenario these two indicators stay within the target range, but for the absolute indicator it is moving in an undesirable direction, whereas for the per capita version it is stagnating because of population growth.

It would be very unwise to be complacent about these developments because investments into long-lasting physical infrastructure mean that material consumption cannot easily be reduced once it starts showing adverse consequences. To prevent such problems requires early action during times when this is not yet perceived to be a problem. When today's industrialized countries were developing, highly efficient technologies did not exist as we have them today. Hence there is a great opportunity for African countries, like Nigeria to leapfrog such development directly onto a resource efficient path and avoid many looming problems.

Finally, the simulation results for domestic material consumption per unit of output (Figure 3.38) indicates a desirable trend under the three scenarios, suggesting the achievement of considerable efficiency gains in material utilization per unit of output over time. However, the efficiency gains are insufficient to achieve the target under each of the three scenarios. Importantly, while efficiency gains are largest under the Optimistic-ERGP-scenario, it is lowest under ERGP+SDG-scenario. Accordingly, there is a need for policies and programmes that enhance efficiency in material utilization as output grows under the ERGP+SDG-scenario. Again, this calls for modernization of technologies and techniques of production under this scenario in order not to sacrifice sustainability for rapid economic growth.

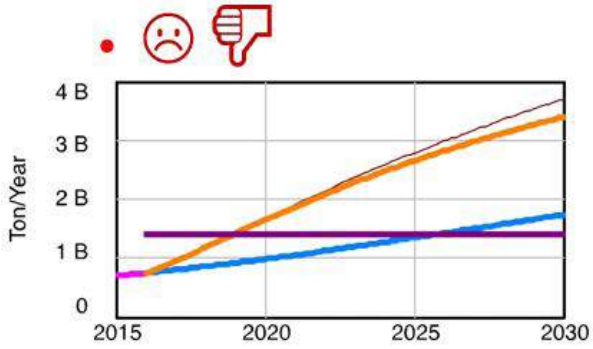

Figure 3.33: Material footprint

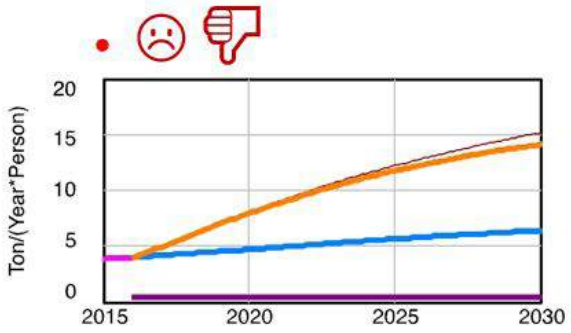

Figure 3.34: Per capita material footprint

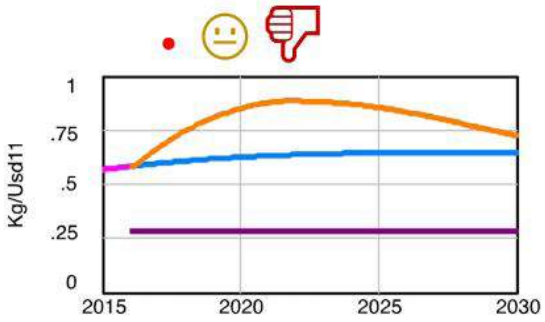

Figure 3.35: Material footprint per unit of output

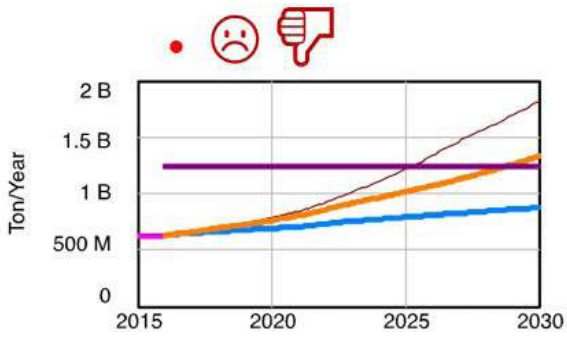

Figure 3.36: Domestic material consumption

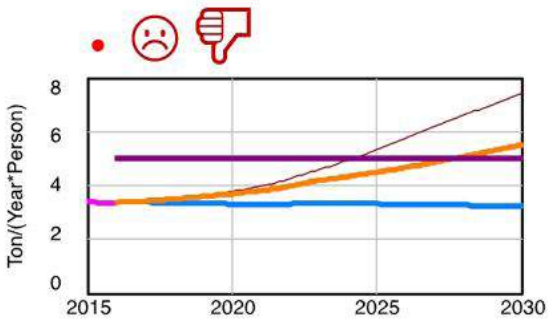

Figure3.37: Per capita domestic material consumption

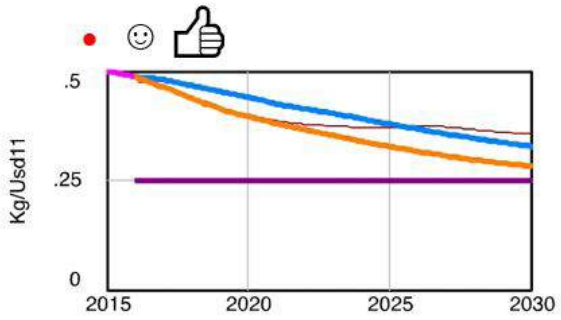

Figure 3.38: Domestic material consumption per unit of output

Figures 3.39 and 3.40 show the simulation results for the unemployment rate and the proportion of youth not in education, employment or training. The target for unemployment rate is 5 per cent, while that for youth not in education, training or employment is 22 per cent, all of which are to be achieved by 2030.

The unemployment rate decreases over time for the three scenarios. It is noteworthy that the unemployment rate declines at virtually the same rate under the three scenarios until around 2020. This may be a reflection of the lag between economic expansion and new employment generation. What is also significant is that the target unemployment rate is unlikely to be achieved under the three scenarios. Accordingly, in addition to effectively implementing the ERGP and SDG policies and programmes, employment-generating initiatives should be articulated and implemented faithfully. In this regard, special incentives would be needed to encourage the expansion of labour intensive activities, especially agriculture, SMEs and textile manufacturing.

The target for proportion of youth not in education, training and employment is likely to be achieved under Optimistic-ERGP-scenario and ERGP+SDG-scenario, while th target is unlikely to be achieved under the No-ERGP-scenario, Clearly, the achievement of the target under Optimistic-ERGP-scenario and EERGP+SDG-scenario is a reflection of expansion in education and training opportunities and not an increase in employment opportunities. Therefore, in addition to effective implementation of the educational and training policies and programmes under ERGP+SDG-scenario, the government should also consider suggestions for expanding employment opportunities to enhance further the prospects of achieving the target sustainably.

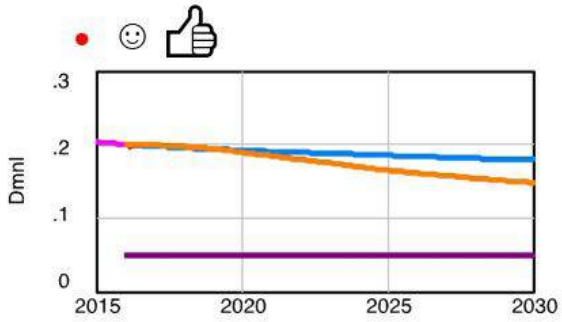

Figure 3.39: Unemployment rate

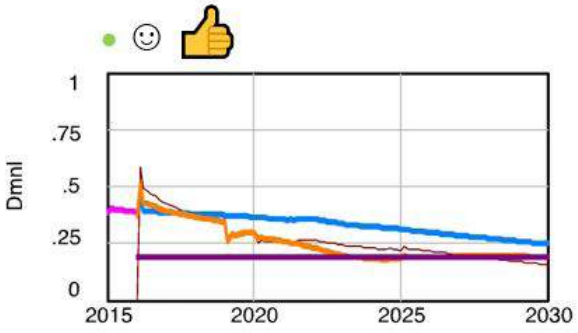

Figure 3.40: Share of youth not in education employment or training

3.1.9. SIMULATION RESULTS OF INDICATORS OF GOAL 9: BUILD RESILIENT INFRASTRUCTURE, PROMOTE INCLUSIVE AND SUSTAINABLE INDUSTRIALIZATION AND FOSTER INNOVATION

The indicators incorporated into the iSDG model and for which there are simulation results under this goal are:

a. Rural Access Transport Index

b. Share of Industry in Total GDP

c. Industry Employment as Share of Total Employment

d. CO_2 Emissions per Unit of Value Added

The simulation results for rural transport access index are presented in Figure 3.41. The target for this indicator is that by 2030, all rural dwellers will have access to transport services. Rural transport access index is likely to diverge from the target under the No-ERGP-scenario and also in the Optimistic-ERGP-scenario. This is a reflection of the preference for new construction as opposed to the maintenance of transport facilities, especially roads. Rural transport access tends to suffer when and where preference is given to the construction of paved roads concentrated mainly in urban areas or linking major urban settlements. The simulation results for the No-ERGP-scenario and also in the Optimistic-ERGP-scenario indicate that this holds true for Nigeria as Federal and State Governments generally prefer new road construction with limited attention to maintenance. The Local Governments, normally responsible for maintenance of rural unpaved roads also tend to be derelict in this regard principally because of serious fiscal pressure.

The simulation result for the ERGP+SDG-scenario incorporates a shift in preference toward maintenance, especially of unpaved roads that are common in rural areas. Under this scenario, the target is likely to be achieved by 2028.

Therefore, to sustainably increase the rural transport access index and increase the likelihood of achieving the target of full rural access by 2030, all levels of government should prioritize proper maintenance of paved and unpaved roads. Given the relatively low road transport intensity in the country and the importance of road and rail infrastructure for social and economic development, government also should sustain its efforts to modernize the transport system. Because of the consequent fiscal pressure that may arise, government should explore alternative financing arrangements for the construction and maintenance of paved roads. The Local Governments should also be resourced and encouraged to concentrate on maintenance of rural paved and unpaved roads to enhance the quality of life in rural areas. This will make the rural areas attractive to the youth as they engage in agricultural production.

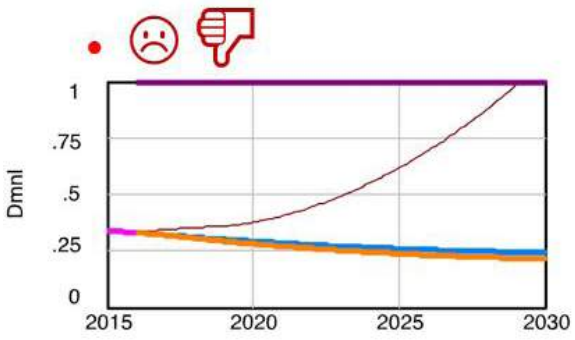

Figure 3.41 Rural transport access index

Figure 3.42 shows the simulation results for the share of industry in GDP. The target for this indicator is that, by 2030, the share of industry in GDP should be at least 46 per cent. As shown, this target is unlikely to be achieved under any of the three scenarios. Indeed, the likelihood is that the share of industry in GDP will decline further from 20 per cent in 2016 to about 18 per cent by 2030 under the three scenarios.

To avoid these undesirable results, the government should provide incentives for enabling primary producers (agriculture and mining) to link up with agro-processors and mineral product beneficiation facilities in the country. In particular, the current practice of exporting crude oil and importing refined products should be terminated to reverse this undesirable trend.

Effective and efficient implementation of these and related industrial development programmes in ERGP would be necessary to enhance the prospects of achieving the target of 46 per cent share of industry in GDP by 2030.

The simulation results for the share of industry in total employment shown in Figure 3.43 reflect the pattern for the share of industry in GDP. It is evident that none of the three scenarios is likely to achieve the target of at least 28 per cent by 2030. Therefore, to also reverse this likely undesirable trend, as government considers the suggestions necessary to increase the share of industry in GDP, special attention should be paid to labour-intensive industries, and high-skill and technology-intensive manufactures. A focus on labour-intensive manufacturing and agro-allied industries will create many jobs and reduce poverty, generate export revenue and increase government revenue through taxes. For this to happen, the government needs to establish more favourable environments for private investment in downstream activities, agricultural processing, manufacturing, innovation and services.

The above implies the revitalization of industrialization strategies and policies to promote enterprise creation and growth in agribusiness and manufacturing sectors to raise the rate of labour absorption and productivity levels

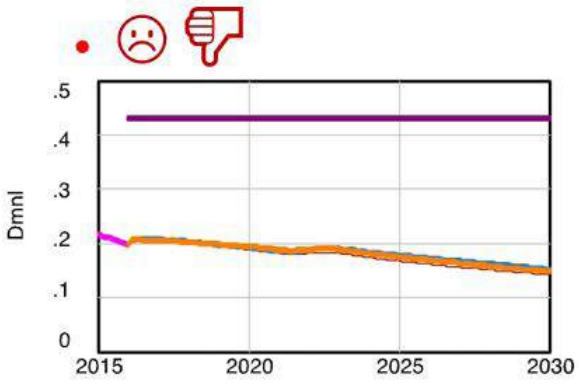

Figure 3.42: Share of industry production in total production (GDP at factor cost)

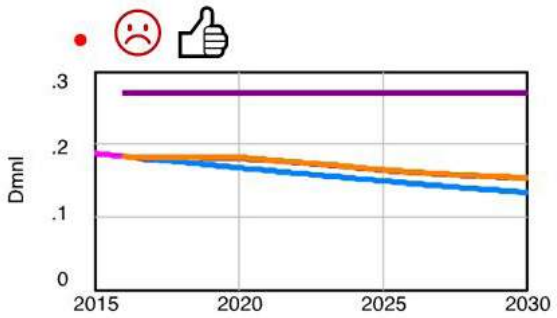

Figure 3.43: Share of Industry in total employment

Figure 3.44 shows the simulation results for industry output per capita. The indicator hardly increases in the *No-ERGP-scenario*, whereas it barely misses the target of 200,000 real naira/(person/year) in the *Optimistic-ERGP-scenario*. While this shows that the measures in the ERGP go into the right direction, the fact that the target is attained even in this very optimistic scenario only in 2030 implies that additional policy efforts beyond the ERGP may be advisable. The *ERGP+SDG-scenario* is slightly better just barely enough to reach the target by 2030.

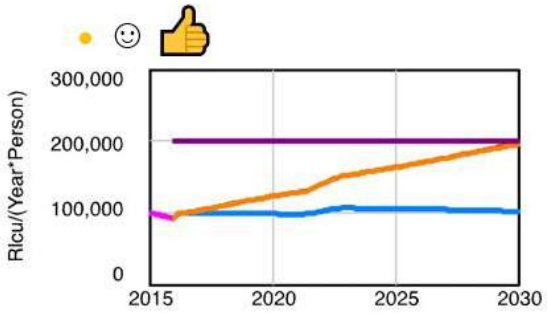

Figure 3.44: Industry production per capita

The simulation results for CO_2 emissions per unit of value added are in Figure 3.45. The target for this indicator is that, by 2030, CO_2 per unit of value added will be 0.2kg/$US2011. The indicator is initially far above the target range due to the high emissions from flaring of natural gas produced as a by-product of oil extraction. The indicator reaches the target range because, in both *Optimistic-ERGP-scenario* and *ERGP+SDG-scenario*, it is assumed that flaring ends by 2030 whereas the *No-ERGP-scenario* assumes that the fraction of extracted gas flared stays constant. Importantly, high flaring also implies a waste of Nigeria's resources and a loss of

potential income. The steady increase in flaring penalties is certainly helpful if properly monitored and enforced.

Figure 3.45: CO2-emissions per unit of value added

3.1.10. SIMULATION RESULTS OF INDICATORS OF GOAL 10: REDUCE INEQUALITY WITHIN AND AMONG COUNTRIES

The indicators incorporated into the iSDG model and for which there are simulation results under this goal are:

a. Proportion of Population below Half of the Median Income

b. Average Labour Share in GDP

c. Disadvantage of the Poorest 40 per cent in Income Distribution Compared to the Average Population

The simulation results for the population below half of the median income are presented in Figures 3.46. The target is that by 2030, the proportion of the population below half of the median income will be zero. In essence, income inequality and poverty would have been reduced significantly. As shown in the figure, while the proportion of the population below half of the median income declines slightly under the No-ERGP-scenario, this target is unlikely to be achieved by 2030. Under the Optimistic-ERGP-scenario the indicator declines significantly in the early 2020s and remain stagnant until the late 2020s when it starts to rise to almost what it is under the No-ERGP-scenario. The indication is that even if the income distribution policies and initiatives articulated in the ERGP is effectively implemented, the impact on income distribution may be encouraging initially but unless these policies and programmes are systematically scaled up and additional policies and programmes are implemented, the improvement is likely to taper off or even reversed closer to 2030. The results under the ERGP+SDG-scenario demonstrate this possibility as the target is achieved early in the 2020s and sustained through till 2030.

It is important, therefore, that the income distribution policies and programmes in the ERGP be vigorously implemented and intensified around 2022 as well as supplemented by additional policies and programmes in order to sustainably achieve this target from then till

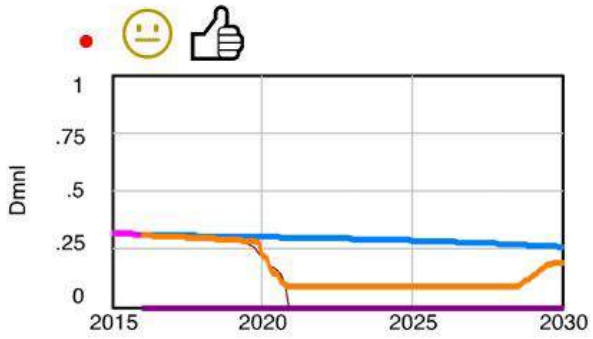

Figure 3.46: Proportion of the population below half of the median income

The simulation results for average labour share in GDP are shown in Figure 3.47. The target for this indicator of functional income distribution is that by 2030, the share of labour in GDP should be at least 50 per cent. Evidently, this target is unlikely to be achieved under the three scenarios. Indeed, the share of labour in GDP tends to decline in all cases. Significantly, the decline is more severe under the Optimistic-ERGP-scenario and ERGP+SDG-scenario suggesting that large and increasing proportion of value added is appropriated by owners of capital.

It is important to introduce appropriate income policies early to reverse this undesirable trend in functional income distribution. This is important to avoid the disruptions associated with likely industrial unrest as workers organize to seek redress. Such disruptions will certainly worsen the enabling environment for local and foreign investors and threaten the much needed sustainable growth.

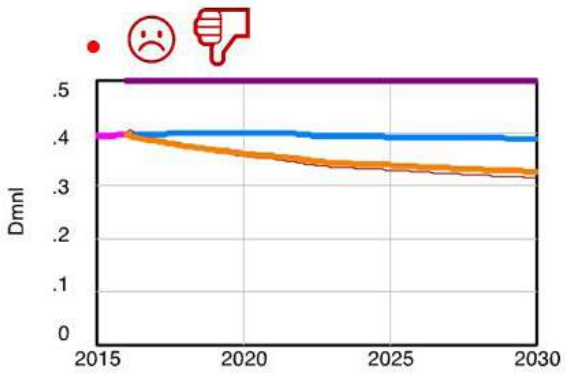

Figure 3.47: Average labour share in GDP

The simulation results for the disadvantage of poorest 40 per cent compared to the population in terms of income are in Figure 3.48. Firstly, it is important to note that the negative target represents a slight advantage of income growth speed of the poorest 40 per cent (expressed as a negative disadvantage of -1 per cent). Anything below -1 per cent is considered to be within the target range. We see very different developments for the two scenarios: The No-ERGP-scenario shows a slow development towards the target, but a failure in reaching it until 2030. In the Optimistic-ERGP-scenario on the other hand, redistributional policies (changed distribution of the fiscal pressure, distribution of subsidies in transfers and the increase of the latter) initially bring about an income growth that is much faster for the poorest 40 per cent, being well within target range. Their initial income growth speed of around 7 per cent in 2016 is the result of their own strong annual income growth vs. a slower growth for the population average. The difference of the growth speeds of the average population vs. the poorest 40 per cent reduces until the early 2020s however, that is the income growth of the poorest 40 per cent declines faster than the income growth of the population as a whole though a slight advantage for the poorest 40 per cent remains, moving briefly out of the target range. During the late 2020s, the income growth of the poorest 40 per cent again decelerates slower than that of the whole population, so that the overall advantage of the poorest 40 per cent increases again.

Figure 3.48: Disadvantage of the poorest 40 per cent in Income Distribution Compared to the Average Population

3.1.11. SIMULATION RESULTS OF INDICATORS OF GOAL 11: MAKE CITIES AND HUMAN SETTLEMENTS INCLUSIVE, SAFE, RESILIENT AND SUSTAINABLE.

The indicators incorporated into the iSDG model and for which there are simulation results under this goal are:

a. Proportion of Urban Waste Collected and Properly Disposed

b. Mean Annual Exposure to Particulate Matter of sizes <2.5 micrometres

The simulation results for the proportion of urban waste collected and properly disposed are shown in Figure 3.49. The target for this indicator is that by 2030, all of the urban waste would be collected and properly disposed. The results show that this target is unlikely to be achieved under the No-ERGP-scenario. Under the Optimistic-ERGP-scenario the target is likely to be achieved only in 2030 while under the ERGP+SDG-scenario, the target is likely to be achieved well before 2030. Evidently, the additional expenditure included in the the ERGP+SDG-scenario, if effectively and efficiently utilized in urban waste collection and proper disposal activities, the target is likely to be achieved before 2030. It is important to note that urban waste management is primarily the responsibility of sub-national governments in Nigeria. Specifically, the State Governments are more active in urban waste management than the urban Local Governments.

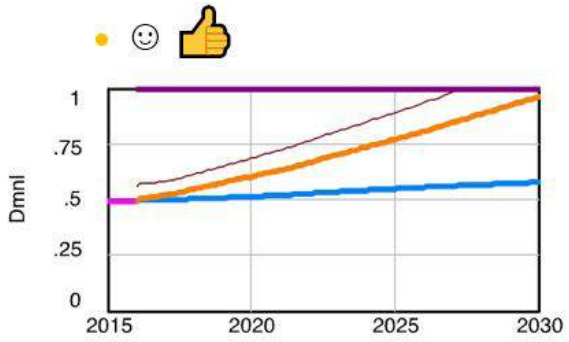

Figure 3.49: Proportion of urban waste collected and disposed

The simulation results for the mean annual exposure to particulate matter is presented in Figure 3.50. The target for this indicator is that by 2030, this indicator should be zero.

Rather than decreasing towards the goal, this indicator is actually increasing (without any substantial difference between the scenarios) being very far from eliminating this health risk reaching around 90 microgram/(m2·a) in 2030. This means that the policies aimed at reducing air pollution (e.g. road-worthiness inspections) are insufficient. This suggests that the ERGP may not contain sufficient policies for creating the envisioned situation until 2030. The ERGP+SDG-scenario does not improve this indicator either primarily because not all envisioned policy measures could be implemented in the current iSDG-Nigeria version.Nevertheless, it is important to strengthen the environmental pollution policies and programmes in order to reverse this undesirable trend and, indeed, move towards achievement of the target. To this end, policies on cook-stoves as they relate to biomass, fuel efficiency enhancement and/or fuel switch to LPG or kerosene, reduction in illegal refining of oil, clean air regulations for industries and households should be articulated and implemented vigorously.

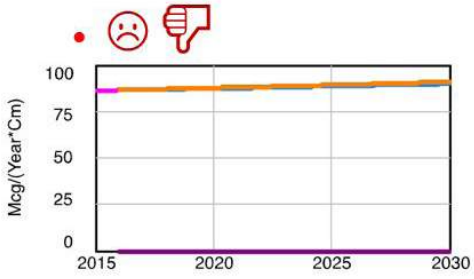

Figure 3.50: Mean annual exposure to particulate matter of sizes < 2.5 micrometers

3.1.12. SIMULATION RESULTS OF INDICATORS OF GOAL 14: CONSERVE AND SUSTAINABLY USE OCEANIC, SEAS AND MARINE RESOURCES

The indicators incorporated into the iSDG model and for which there are simulation results under this goal are:

a. Proportion of Fish Stock Sustainably Exploited

b. Proportion of Territorial Waters Protected

The simulation results for the proportion of fish stock sustainably exploited are shown in Figure 3.51. The target for this indicator is that, by 2030, all fish stock will be sustainably exploited. The simulation results show that under the three scenarios, the proportion of fish stock sustainably exploited is likely to fall contrary to the desired trend. As overfished stocks offer lower catch, this may lead to declining returns to fishing efforts, while endangering the nutrition of the people.

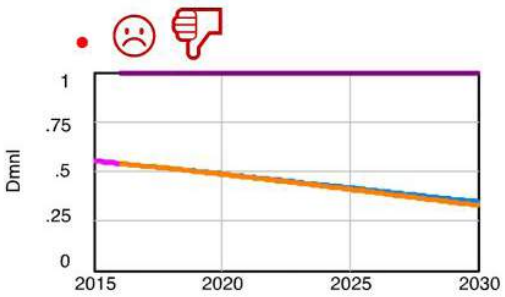

Figure 3.51: Proportion of fish stocks sustainably exploited

Figure 3.52 presents the simulation results for the proportion of territorial waters protected. The target for this indicator is that by 2030, at least 5 per cent of the territorial waters should be protected.

Marine and lacustrine protection has not been a policy priority in the past, and this has not changed through the ERGP. Hence considerable extra-effort is necessary to reach this target. To this end, it is important to move beyond declaration of water bodies as protected areas to enforcement of the declarations. This will require investment in patrol ships to prevent fishing as well as oil and gas exploration activities in these waters. The simulation results for ERGP+SDG-scenario show that with increased investment in enforcement of protected waters, it is possible to achieve this goal.

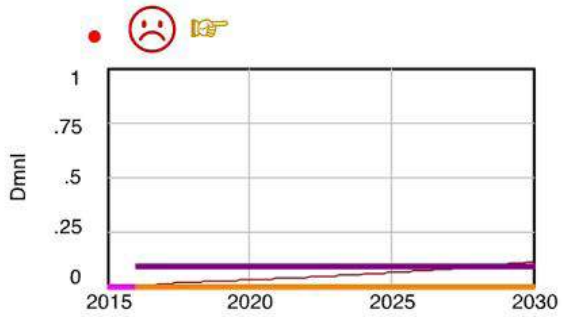

Figure 3.52: Proportion of territorial waters protected

3.1.13. SIMULATION RESULTS OF INDICATORS OF GOAL 15: PROTECT, RESTORE AND PROMOTE SUSTAINABLE USE OF TERRITORIAL ECOSYSTEMS, SUSTAINABLY MANAGE FORESTS, COMBAT DESERTIFICATION AND HALT AND REVERSE LAND DEGRADATION AND HALT BIODIVERSITY LOSS

The indicators incorporated into the iSDG model and for which there are simulation results under this goal are:

a. Proportion of Terrestrial Areas Protected

b. Forest Cover

c. Red-List Index

The simulation results for the proportion of terrestrial areas protected are shown in Figure 3.53. The target for this indicator is that by 2030, at least 25 per cent of the terrestrial areas would have been protected. This target is likely to be achieved under both the Optimistic-ERGP-scenario the ERGP+SDG-scenario. Therefore, provided the initiatives for protecting terrestrial areas embedded in the ERGP and supplemented by SDG are effectively implemented, the prospect of achieving this target by 2030 is quite bright.

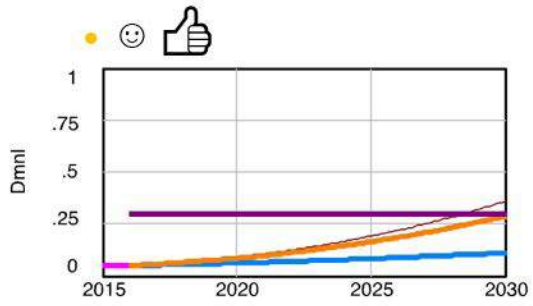

Figure 3.53: Proportion of terrestrial areas protected

Figure 3.54 presents the simulation results concerning forest cover. The target forest cover by 2030 is 25 per cent of Nigeria's surface area. It turns out that this target is unlikely to be achieved under each of the three scenarios. However, with vigorous implementation of policies and programmes in the ERGP+SDG-scenario, it is likely that the forest cover will improve considerably, but definitely not enough to achieve the target. Public investments in reforestation as well as in protected areas should be significantly increased beyond what is proposed in the ERGP+SDG-scenario in order to achieve the target forest cover.

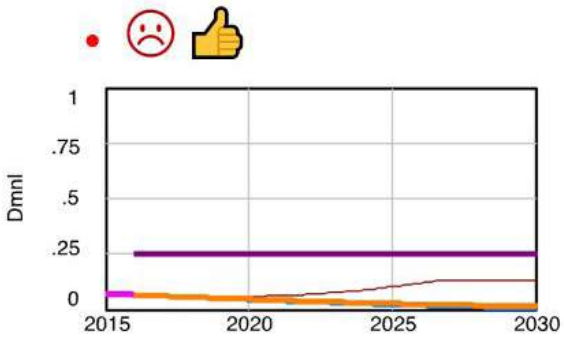

Figure 3.54: Forest cover

The simulation results for the Red-Line Index are shown in Figure 3.55. The target for this indicator is that, by 2030, this index should be around 5 per cent. This target is unlikely to be achieved under any of the three scenarios. The indication is that biodiversity is not considered a priority in the ERGP such that the effective implementation of the existing policies is likely to increase the rate of biodiversity destruction, especially as deforestation continues uninhibited.

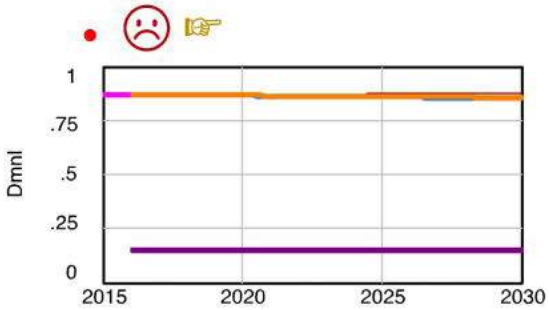

Figure 3.55: Red-List-index

3.1.14. SIMULATION RESULTS OF INDICATORS OF GOAL 16: PROMOTE PEACEFUL AND INCLUSIVE SOCIETIES FOR SUSTAINABLE DEVELOPMENT, PROVIDE ACCESS TO JUSTICE FOR ALL AND BUILD EFFECTIVE, ACCOUNTABLE INSTITUTIONS AT ALL LEVELS

The indicators incorporated into the iSDG model and for which there are simulation results under this goal are:

a. Violence-Related Mortality

b. Bribery Incidence

c. Normalized Governance Index

Figures 3.56, 3.57 and 3.58 present the simulation results for the indicators of, respectively, violence-related mortality, bribery incidence and normalized governance index. Evidently, the indicators of violence-related mortality, bribery incidence and normalized governance index all exhibit substantial improvements in the Optimistic-ERGP-scenario, especially when compared to the No-ERGP-scenario. The latter scenario also shows some improvement for violence-related mortality but not for bribery and the normalized governance index. The ERGP+SDG-scenario is only better for the violence-related mortality, but not for the other two indicators. The reason is that this indicator profits slightly from improved health care coverage (the same amount of injuries resulting in fewer deaths). All together, the prospects of achieving the targets of these three indicators under each of the three scenarios are not bright.

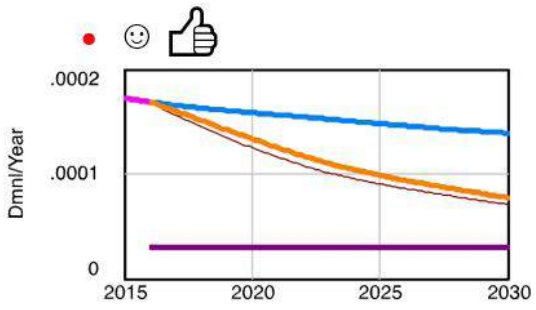

Figure 3.56: Violence-related mortality

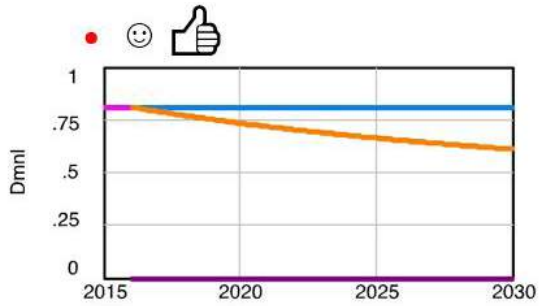

Figure 3.57: Bribery incidence

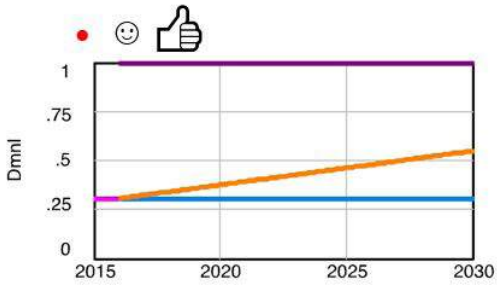

Figure 3.58: Normalized governance index

3.1.15. SIMULATION RESULTS OF INDICATORS OF GOAL 17: STRENGTHEN THE MEANS OF IMPLEMENTATION AND REVITALIZE THE GLOBAL PARTNERSHIP FOR SUSTAINABLE DEVELOPMENT.

The indicators incorporated into the iSDG model and for which there are simulation results under this goal are:

a. Domestic Revenue as Share of GDP

b. Direct Taxes as a Share of GDP

c. Indirect Taxes as a Share of GDP

d. Domestic Taxes as a Share of Domestic Revenue

e. Grants as a Share of Domestic Revenue

The simulation results for domestic revenue, direct taxes and indirect taxes as respective shares of GDP are presented in Figures 3.59, 3.60 and 3.61. Whereas the target for domestic revenue is 11 per cent of GDP, the results show that only about 8 per cent can be realized in the No-ERGP-scenario. The Optimistic-ERGP-scenario and ERGP+SDG-scenario, on the other hand, show quick improvement, reaching the target very early and then far surpassing it.

While the direct taxes as share of GDP, is shown to stay flat considerably below target in the No-ERGP-scenario it is likely to rise under the Optimistic-ERGP-scenario to 17.5 per cent by 2030,

which is slightly below the target of 20 per cent. However, under the ERGP+SDG-scenario, this target is likely to be achieved by 2030. The situation is very similar for the indirect taxes as a share of GDP, only that the maximum achievable under these scenarios is still lower than the target.

These simulation results suggest that with effective implementation of the revenue collection efforts specified under the ERGP+SDG-scenario, the targets are most likely to be achieved. Therefore, the ongoing efforts to increase efficiency of tax collection along with the expansion of tax base should be intensified. If and when increases in the tax rates become imperative, these should be progressive and not regressive.

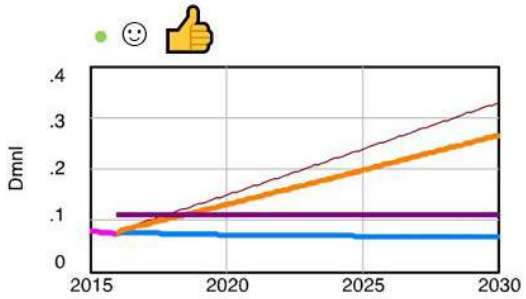

Figure 3.59: Domestic revenue as a share of GDP

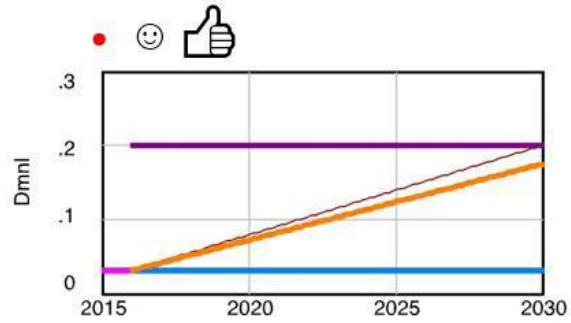

Figure 3.60: Direct taxes as a share of GDP

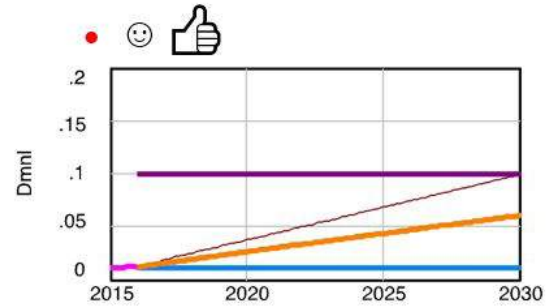

Figure 3.61: Indirect taxes as a share of GDP

The simulation results for the share of domestic taxes in total domestic revenue are shown in Figure 3.62. The target is that the share of domestic taxes in total domestic revenue should reach 80 per cent by 2030. By implication, international trade tax and other domestic revenue should account for no more than 20 per cent by 2030. Under the No-ERGP-scenario, this target is unlikely to be attained as the share remains the same throughout the period because of the assumption that taxes and their collection efficiencies will not change much.

However, under both the Optimistic-ERGP-scenario and the ERGP+SDG-scenario, the target can be achieved by 2025 and slightly surpassed by 2030 primarily because of the assumptions on broadening of the tax base and increasing collection efficiency, the residual contributions being taxes on international trade and other domestic revenue. Therefore, effective implementation of the tax revenue effort should be sufficient to achieve this target.

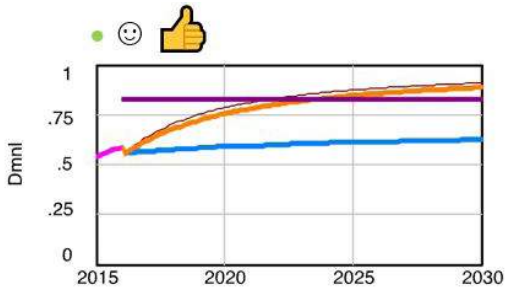

Figure 3.62: Proportion of domestic revenue from domestic taxes

The simulation results for the ratio of grants to total domestic revenue are shown in Figure 3.63. The target is that by 2030, the ratio should be 100 per cent implying that grants and domestic revenue should be equal in order to ameliorate fiscal pressure associated with the expenditure requirements to attain most of the SDGs. The results, however, point in the opposie direction.

The tendency for the ratio to decline further under the Optimistic-ERGP-scenario and the ERGP+SDG-scenario is a result of the faster growth of domestic revenue than grants.

While this may be desirable, as it reduces vulnerability to vagaries in donor assistance, it may also increase fiscal pressure.

Therefore, while government should sustain initiatives to increase domestic revenue, it should also actively seek grants, as much as possible, to reduce the fiscal pressure likely to build up as expenditure necessary to achieve most of the SDGs are incurred.

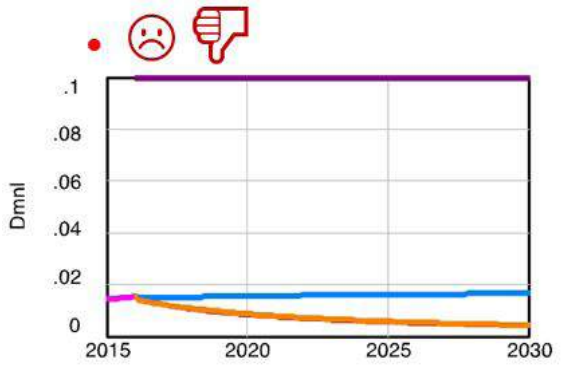

Figure 3.63: Grants as a share of domestic revenue

The simulation results for the ratio of interest on public debt to export earning are in Figure 3.64. After initial desirable development, this indicator develops in an undesirable direction out of the target range (below 10.75 per cent) in the No-ERGP-scenario. In the Optimistic-ERGP-scenario, debt service climbs down to zero because the debt profile goes to zero as well. The assumptions on increased government revenue should be scrutinized again by experts for potential over-optimism. Due to the higher tax revenue and more favourable economic development in the ERGP+SDG-scenario, the interest payment is reduced to zero even earlier than anticipated.

Figure 3.64: Interest on public debt as a share of exports

3.2 OVERALL COMPOSITE PERFORMANCE INDEX OF EACH OF THE SDGS

While each SDG is fundamentally composed of a number of indicators, the simulation results of which are analysed in Section 3.1, it can be useful for rapid overview to calculate a composite performance of for each SDG. To this end, the composite SDG performance is a simple average of the targets achieved by each indicator, implying that each indicator has equal weight in arriving at the composite performance of the relevant goal. This composite performance of each goal has been normalized to 1 base on the target value specified in the Agenda 2030 or the estimated 2030 target by experts from the Technical Team and modelling experts.

The individual SDG composite performance, therefore, runs from 0 to 1: A value of 1 indicates that the target for the 2030 goal is likely to be fully achieved, while 0 means no improvement is recorded in the composite goal performance, compared to the situation in 2015. Any value in between 0 and 1 describes to what degree the gap between the achievement in 2015 and 2030 target is likely to closed. This results in the Composite Performance Index for each of the 17 SDG presented in Figure 3.65.

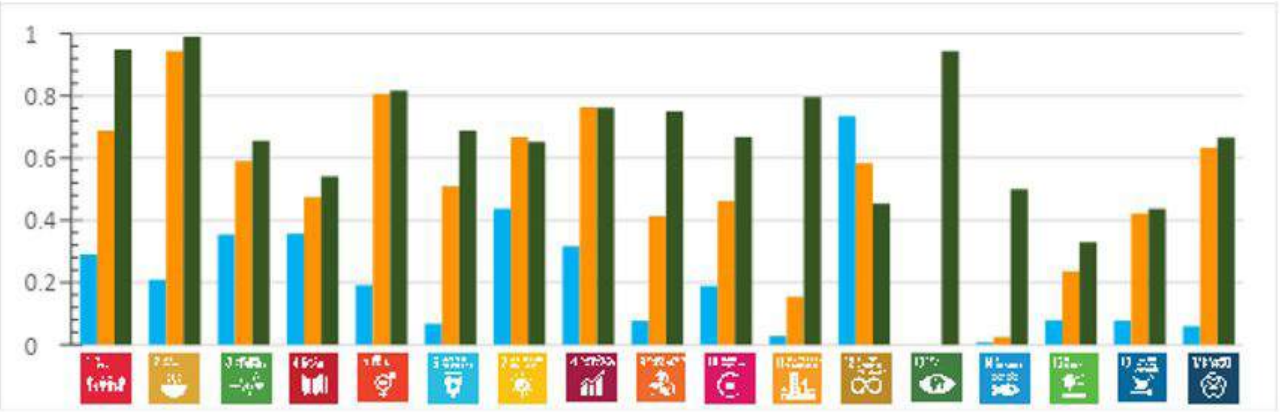

Figure 3.65: Average SDG-Goal performance for each SDG on a scale from 1 (target for all SDG indicators attained for this goal) to 0 (no closure of the initial gap of SDG indicators relative to their respective targets). No-ERGP-scenario (blue), Optimistic-ERGP-scenario (orange), ERGP+SDG-scenario (brown)

It can be seen in Figure 3.65 that under the No-ERGP-scenario, all SDGs except SDG 12 show a composite performance index below 50 per cent. Indeed, under this scenario, the composite performance index of 12 of the 17 goals is below 30 per cent. Under the Optimistic-ERGP-scenario, the composite performance index of nine SDGs is at least 50 per cent while the composite performance index of four SDGs is below 30 per cent. Under the ERGP+SDG-scenario, the composite performance index of 7 SDGs is above 70 per cent, while that of another six SDGs is above 50 per cent. Significantly, the composite performance index of none of the 17 goals is below 30 per cent, implying that the composite performance of all SDGs under the ERGP+SDG-scenario is higher than those of the Optimistic-ERGP-scenario, and the No-ERGP-scenario. Importantly, therefore, apart from Goal 2 (Ending Hunger by 2030) the composite performance index of all other goals under the ERGP+SDG-scenario is below the 2030 target. It follows then that under the best possible scenario, the prospects of achieving most of the SDG targets by 2030 are not bright.

Consequently, it is imperative for government at all levels and other stakeholders, including the development partners, to focus on effective and efficient implementation of the policies and programmes under the ERGP+SDG-scenario because doing so will enhance the prospects of securing some improvements in most of the SDGs. It is important, however, to note that effective implementation of the policies and programmes of the ERGP+SDG-scenario, may be enough to achieve only one of the 2030 SDGs, namely ending hunger in Nigeria by 2030 (Goal 2).

To ensure that the remaining 16 SDGs get achieved by the 2030 targets, significant additional policies and programmes should be articulated and effectively implemented. In this regard, special attention should be paid to policies and programmes aimed at achieving SDG 12, 14 and 16 with the composite performance index lower than 50 per cent, as can be seen in Figure 3.65.

To the extent that the task of ensuring achievement of the SDGs , using the instrument of ERGP, is not that of the Federal Government alone,it is imperative to involve actively the sub-national governments, especially the state governments. Hence, the states and local governments would need to mainstream SDG policies and programmes into their plans and budgets to complement the efforts of the Federal Government to achieve the SDGs by the target date or before it.

CHAPTER FOUR

SYNERGY AND POLICY COHERENCE

This chapter evaluates the synergy and coherence of the various policy interventions wrapped up in the three scenarios under discussion. As a background to the synergy assessment, it is understood that a policy or intervention can be implemented in isolation or a package of policies, such as is contained in the ERGP. In light of this, there are interactions between the policies: one policy may strengthen or weaken the effect of another policy. For example, under the Optimistic-ERGP-scenario, by simulating in isolation each of the intervention areas that together make up the scenario, the performance improvement in the SDG resulting from such simulation in isolation may be determined. This represents implementing, for example, only the educational policies without also simulating the changes of the other policies that make up the Optimistic-ERGP-scenario. The changes of policies in the scenario can also be simulated together. In this case, the effect of the composite policy scenario (Optimistic-ERGP-scenario or ERGP+SDG-scenario) on an SDG can be higher than the linear sum of the effects of the decomposed scenarios. It can, however, also be lower. This difference between the aggregate individual and combined effects of policies implies contributions that cannot be attributed to any single intervention alone; it can only arise from the interaction of the different intervention areas.

If this difference in contributions is positive, it implies a desirable synergy, because the performance of the combined policy scenario is higher than what should be expected from simulating its component policies in isolation. However, if it is negative, it is an undesirable synergy because the performance of the combined policy scenario is lower than what should be expected from simulating its component policies in isolation. For desirable synergies, the policies interact more in ways to mutually reenforce each other while for undesirable synergies, they interact more in ways to mutually weaken each other to some degree. Mutual weakening of policies, that is, undesirable synergies, may indicate policy incoherencies such as a trade-off, a goal conflict of policies, or unintended side-effects on a non-target policy. These would need to be identified to minimize undesirable synergies.

4.1 RESULTS OF THE SYNERGY ASSESSMENT

A formal synergy assessment was carried of which only the highlights are presented here. Figure 4.1 shows only the synergies from the Optimistic-ERGP-scenario and the ERGP+SDG-scenario for comparison: desirable and undesirable synergies. In the Optimistic-ERGP-scenario there are 6 positive synergies and these, on average, are responsible for a 6.9 per cent performance increase in the goals where they occur. On the other hand, the 10 negative synergies amount to -16.9 per cent average performance of the goals for which they occur. The average net synergy for the 16 goals that see an improvement is -8.0 per cent. When averaged over all 17 goals, positive, negative and net synergies are 2.4 per cent, -9.9 per cent and -7.5 per cent, respectively. The fact that negative synergies are higher than positive ones should stimulate a search for policy combinations that increase positive and reduce negative synergies given that such combinations will improve policy coherence.

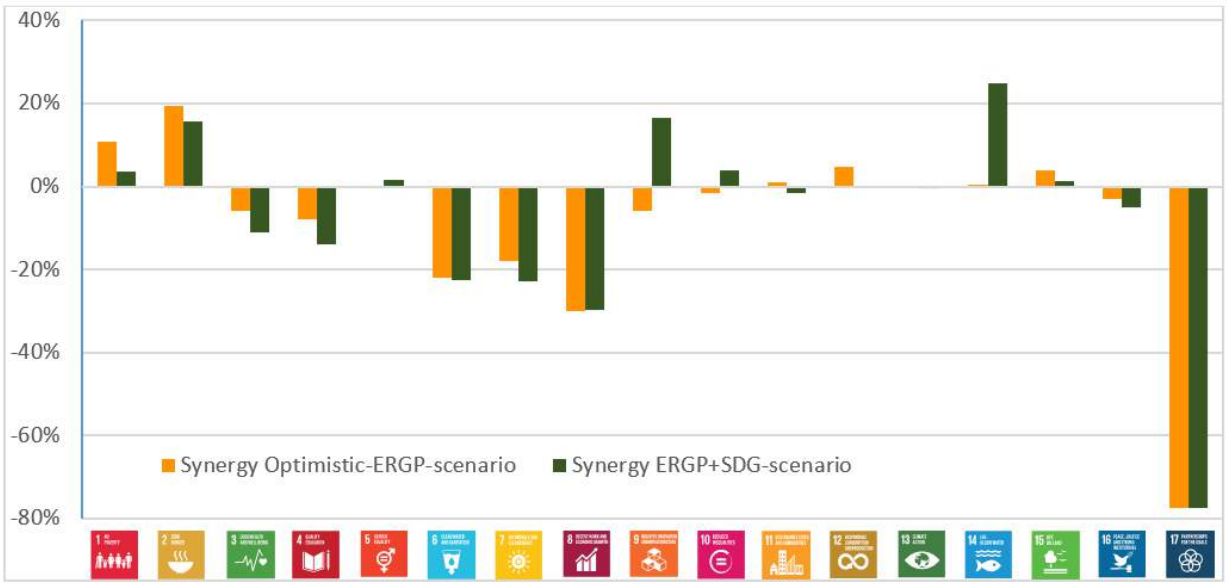

Figure 4.1: Comparison of synergies of the Optimistic-ERGP-scenario and the ERGP+SDG-scenario

For the ERGP+SDG-scenario, the number of positive synergies is 8 compared to 6 for the Optimistic-ERGP-scenario. Similarly, their average performance-increase effect has increased from 6.9 per cent to 8.4 per cent. Although the negative synergies reduced from 10 to 9, nevertheless, their average performance-decrease effect has worsened slightly from -16.9 per cent to -20.5 per cent (most notable for Goals 3, 4, 6, 7 and 16. The average net effect of positive and negative synergies (now for the 17 ERGP+SDG-scenario instead of only 16 goals in the Optimistic-ERGP-scenario) has improved from -8.0 per cent to -6.9 per cent. In other words, on average, the policy incoherence has been reduced because improvements of positive synergies overcompensate the worsening of the negative synergies.

4.2 POLICY COHERENCE ASSESSMENT

To deepen understanding of the policy coherence and, hence the need for prioritization, it is helpful to gain an understanding of how important the measures in an intervention area in terms of the total performance including synergies for each Goal. One way to get such an understanding is to perform a so-called drop-out-analysis. To this end, an additional simulation was performed of the Optimistic-ERGP-scenario less one intervention area.

The results are informative as they give an indication as to how important the measures in each intervention area are.

The results explained below apply to the Optimistic-ERGP-scenario, and they depend on the strength of the policies, for example, the level of expenditures, and also the combination of policies.

GOAL 1 PERFORMANCE

Figure 4.2 shows Goal 1 performance-contributions from the various intervention areas ranging from agriculture expenditure to waste/sanitation expenditure on the vertical axis, while the horizontal axis shows the performance difference between and excluding the respective policies in the policy package for each goal. Most of intervention policies have a positive effect on Goal 1 performance (bars to the right of the 0 line) while a few others have negative effects (bars to the left of the 0 line). The chart shows that the performance improvement of Goal 1 in the Optimistic-ERGP-scenario needs the combination of several policies. Not surprisingly, both the increase and the redistribution of subsidies and transfers improve performance.

Interestingly however, the manner of redistributing these is less important for goal performance than the redistri

bution of fiscal pressure. Other important direct policy levers are the increase in the expenditure on health and family planning expenditure and, to a smaller degree, education and renewable energy. However, the performance improvement of the Optimistic-ERGP-scenario also depends strongly on assumed improvements of inflation, governance, expenditure optimization, and agricultural improvements that are not under direct government control (e.g. prices/value added of agricultural products).

On the negative side, it can be seen that the tax increases have an undesirable influence on poverty. This may indicate that the fiscal pressure redistribution in the Optimistic-ERGP-scenario is insufficient to compensate the effects of fiscal pressure increases on the poor.

The simulations also indicate that for poverty reduction, it may be better if the changes planned in the transport sector were not implemented.

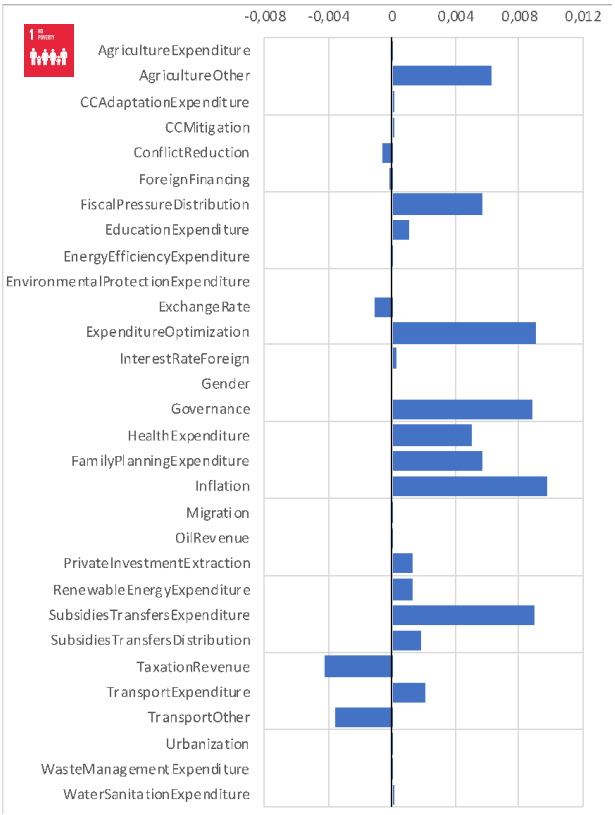

Figure 4.2: Goal 1 performance-contributions of intervention areas from drop-out-analysis for the Optimistic-ERGP-scenario

GOAL 2 PERFORMANCE

The analysis shows that the performance improvement in terms of hunger reduction is very much fostered by changes in agriculture expenditure. This includes expenditure increases in sustainable agriculture training and not only general agricultural expenditure increases. The improvement also relies on agricultural improvements that are not under direct government control (e.g. prices/value added of agricultural products). To a lesser degree, other assumed improvements not under direct government control also play a role, such as inflation reduction, governance improvements and expenditure optimization.

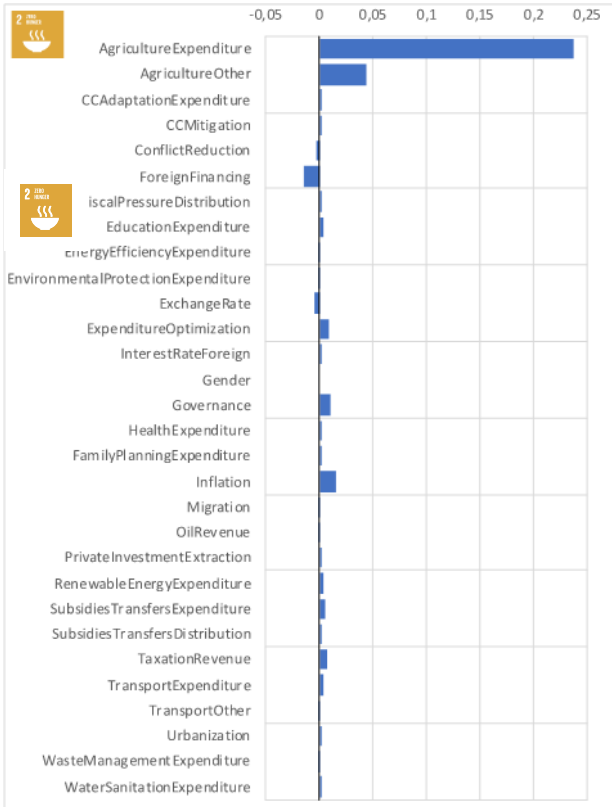

Figure 4.3: Goal 2 performance-contributions of intervention areas from drop-out-analysis for the Optimistic-ERGP-scenario

GOAL 3 PERFORMANCE

Improvements in Goal 3 performance (health) were found to be more dependent on increases in family planning expenditure than in health expenditure increases. Increases in education expenditure and subsidies and transfers also contribute.

Tax increases have a negative effect on health, which suggests that the redistribution of fiscal pressure may be insufficient to prevent negative effects on the poor as already mentioned under Goal 1. Indeed, some changes in the transport policies have adverse effects on health, too, for example, the deterioration of the unpaved road network implies that people may only go to the doctor when their health condition has worsened severely. Furthermore, it becomes apparent that the health improvements of the Optimistic-ERGP-scenario are to some degree also dependent on assumed changes that are only partially under government control, e.g. successes in expenditure optimization, inflation reduction or improvements in governance.

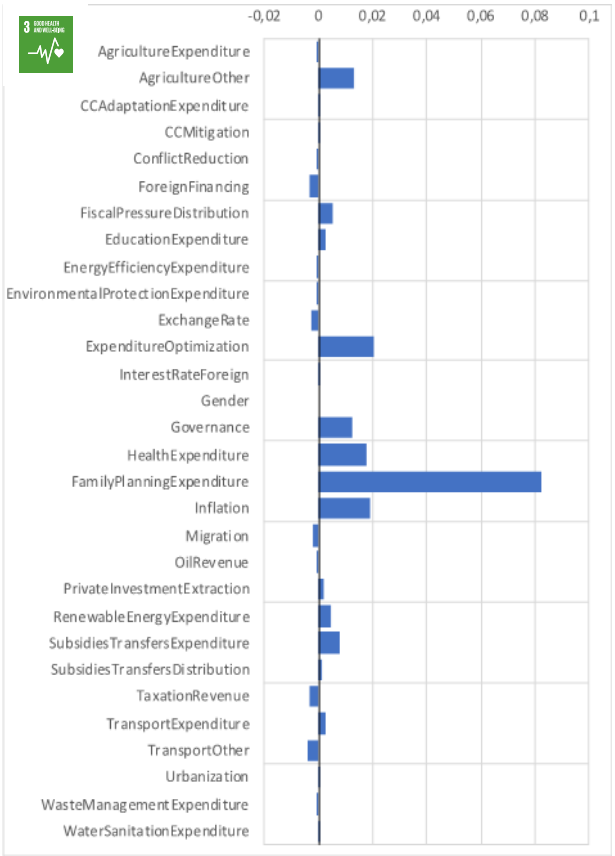

Figure 4.4: Goal 3 performance-contributions of intervention areas from drop-out-analysis for the Optimistic-ERGP-scenario

GOAL 4 PERFORMANCE

Overall improvements in Goal 4 are not very large. It is not too surprising that increased education expenditure is the most critical area for improved education (Goal 4 performance). Increased expenditure on renewable energy also contributes (e.g. light for studying after sunset) as well as subsidies and transfers and family planning expenditure. The other contributors all have assumed changes not completely under governmental control, especially strong are reductions in inflation and also expenditure optimization, governance improvements and agricultural improvements that are not under direct government control (prices/value added of agricultural products, etc).

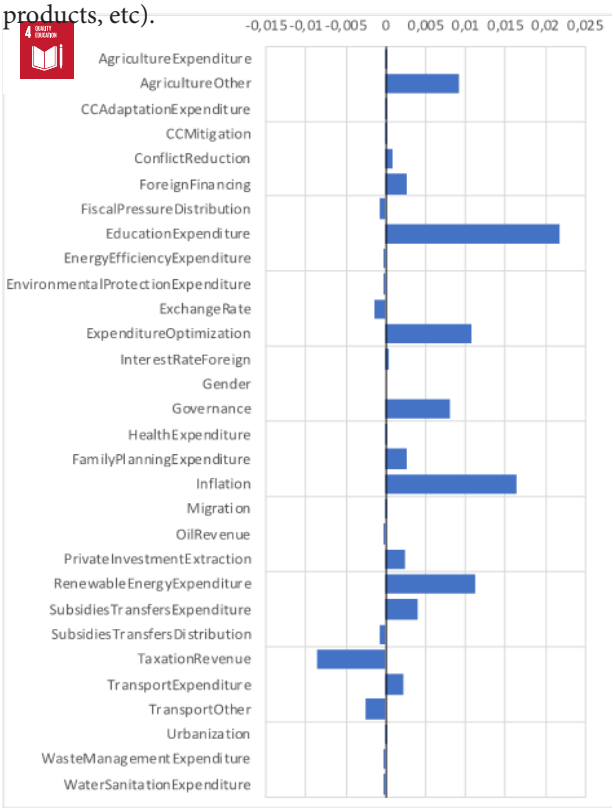

Figure 4.5: Goal 4 performance-contributions of intervention areas from drop-out-analysis for the Optimistic-ERGP-scenario

GOAL 5 PERFORMANCE

The increase in family planning expenditure has the strongest effect on improving gender equality. The reason is that contraceptive prevalence is one of the two indicators determining goal performance. Its effect is stronger than that of other assumed improvements of gender equality, because those have longer delays, whereas family planning expenditure has relatively short-term effect. Note again, though, that contraceptive prevalence only means that families have the number of children they want. The latter changes much slower than contraceptive prevalence.

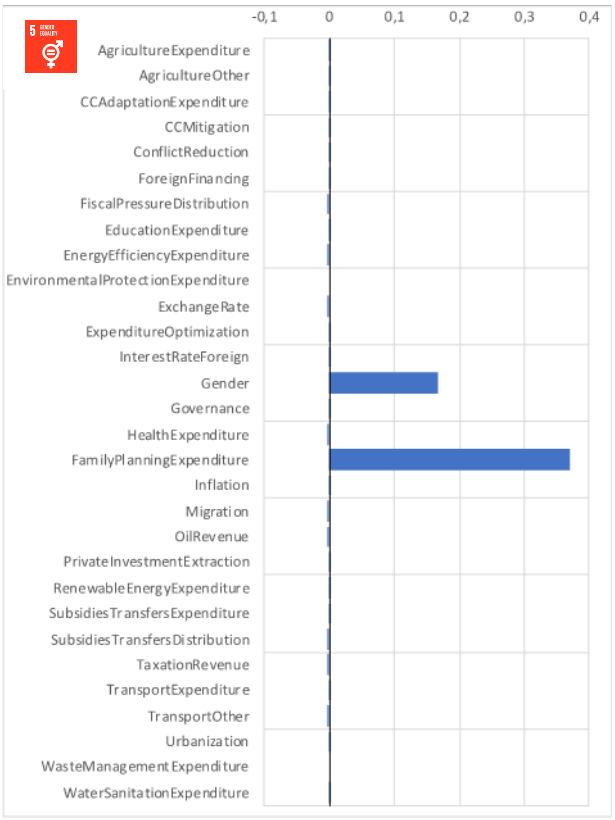

Figure 4.6: Goal 5 performance-contributions of intervention areas from drop-out-analysis for the Optimistic-ERGP-scenario

GOAL 6 PERFORMANCE

Interestingly, the improvements in water and sanitation are more dependent on increased family planning expenditure and increased subsidies and transfers than they are on the increased expenditure on water and sanitation. For the former, that is because a lower population means higher access at the same level of expenditure. For the latter, however, this is because poverty is an impediment to access to clean water and sanitation, while wealthy people do not rely on government aid to satisfy this basic human need. It is also to be noted that the improvements are dependent upon assumed optimizations of expenditure, and reduced inflation.

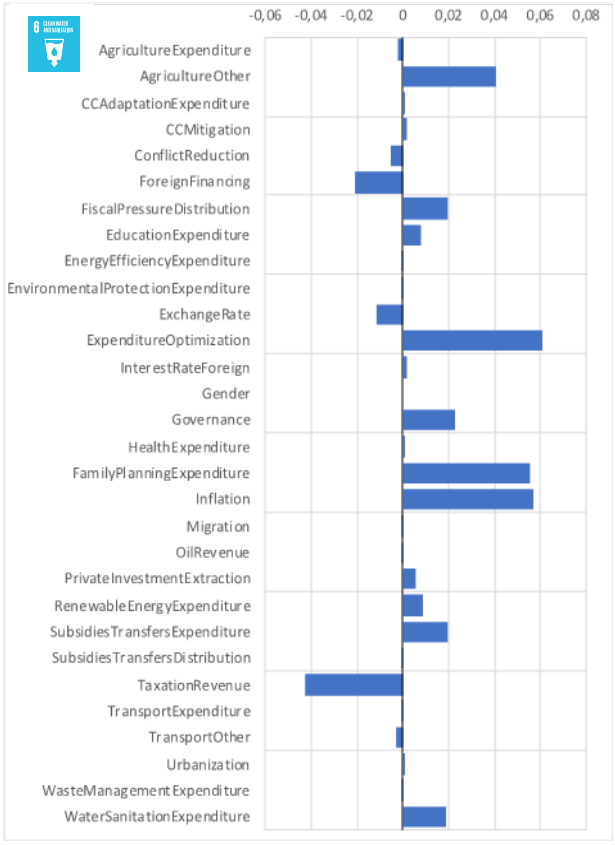

Figure 4.7: Goal 6 performance-contributions of intervention areas from drop-out-analysis for the Optimistic-ERGP-scenario

GOAL 7 PERFORMANCE

The only policy that contributes to the performance of Goal 7 is increased investments in renewable energies. This is, however, not too surprising.

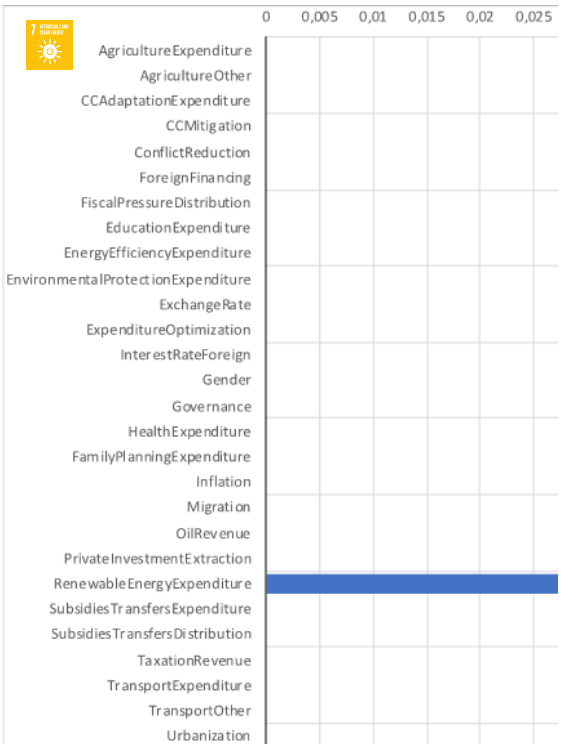

Figure 4.8: Goal 7 performance-contributions of intervention areas from drop-out-analysis for the Optimistic-ERGP-scenario

GOAL 8 PERFORMANCE

Interestingly, the policy that influences the performance of Goal 8 the most is family planning expenditure. The reason is that this goal is in part determined by indicators of resource use which increase with population. Furthermore, resource use also increases with investment into oil, gas, or solid mineral mining, which is why this goal reacts to private investment in extraction.

Increasing taxes has a positive influence on this goal. This may seem surprising at first and for several reasons. First, in conjunction with the other policies, the increased taxes hardly hurt economic growth because the government also has money to spend on things that enhance growth. Second, this goal performance is also driven by the unemployment rate and the share of youth not in education employment or training which both profit from the higher taxes because the government has more money to spend in these sectors.

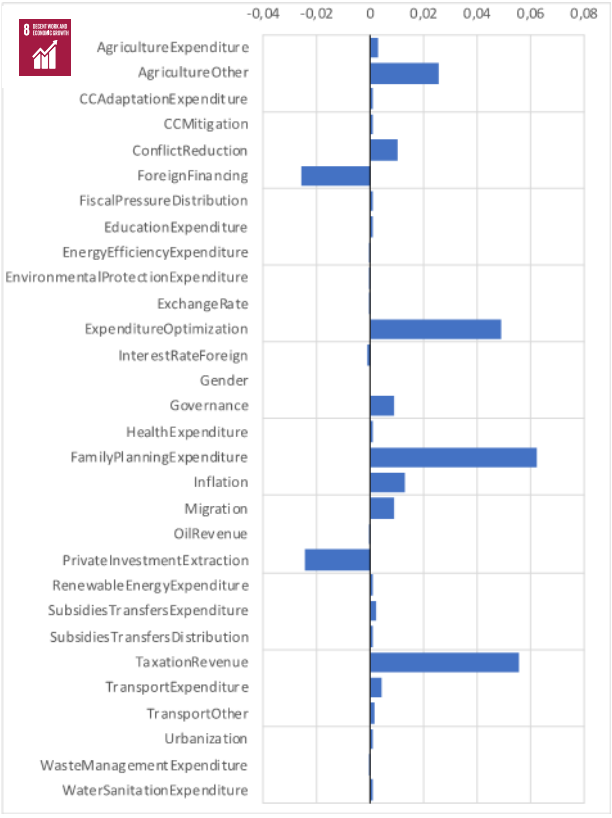

Figure 4.9: Goal 8 performance-contributions of intervention areas from drop-out-analysis for the Optimistic-ERGP-scenario

GOAL 9 PERFORMANCE

The assumed changes in climate change mitigation have a dominating influence on the performance of Goal 9. The reason for this is the reduction in flaring of natural gas, which is responsible for large CO_2 emissions, which is one of the drivers of this indicator.

Private investment in the extraction of minerals, oil and gas fosters the performance of this Goal. which also is driven by indicators of industrial production.

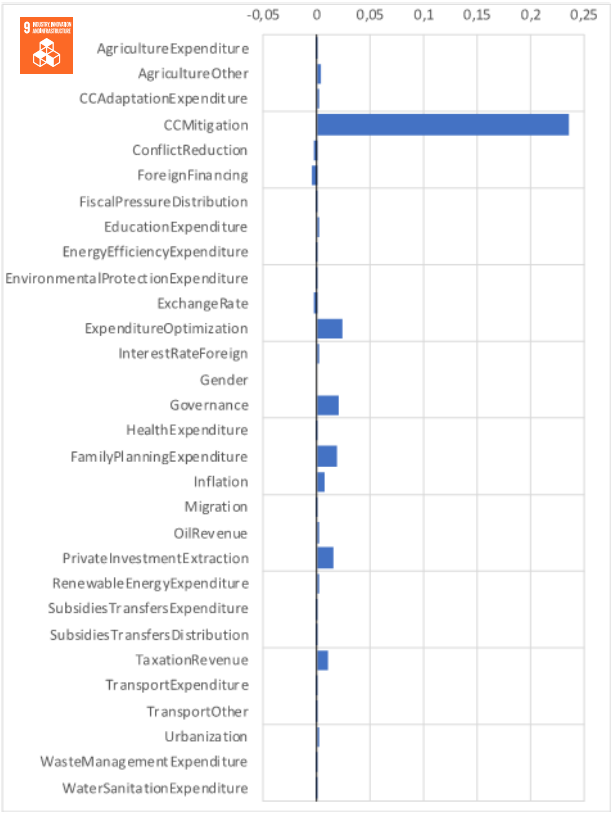

Figure 4.11: Goal 10 performance-contributions of intervention areas from drop-out-analysis for the Optimistic-ERGP-scenario

GOAL 10 PERFORMANCE

Naturally, subsidies and transfers, as well as their redistribution to the poor, especially the redistribution of financial pressure away from the poor, is helpful for the performance of Goal 10 to reduce inequalities. And, of course, increasing taxes increases the leverage of subsidies and transfers, so that it has a strong positive influence. Family planning expenditure has a negative influence on equality and this is explained by the fact that while incomes are higher for all with increased family planning expenditure,

they rise stronger for the more wealthy than they rise for the poor.

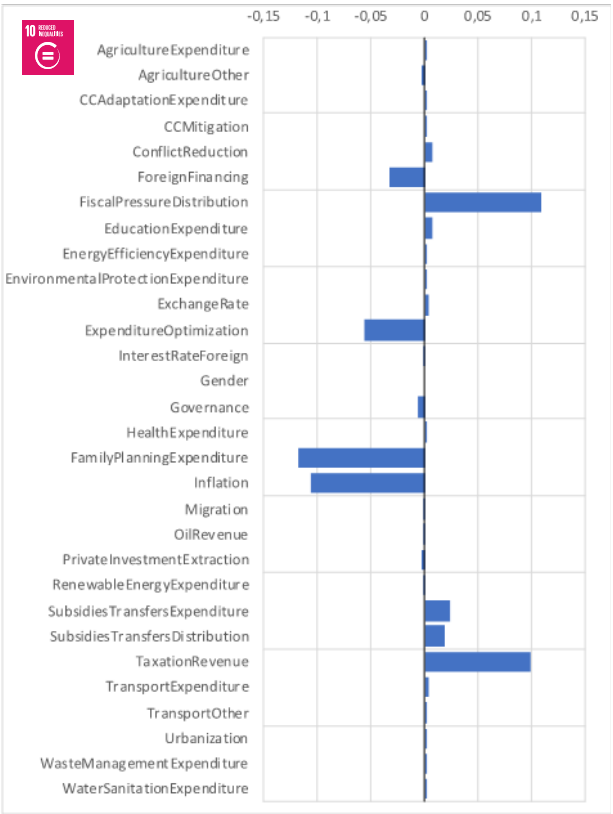

Figure 4.11: Goal 10 performance-contributions of intervention areas from drop-out-analysis for the Optimistic-ERGP-scenario

GOAL 11 PERFORMANCE

This indicator reacts strongly to increased family planning expenditure and this is because a lower population means that with the same spending, and thus the same waste collection in absolute terms, the percentage of the urban population that profits from it is higher (proportion of urban waste collected and disposed is one of the indicators of this goal). The same holds for assumed lower urbanization rates in the Optimistic-ERGP-scenario. Notably, the performance of this goal also hinges on the successful optimization of expenditures and reduced inflation rates. Should the two latter assumptions not come true fully, the performance would be reduced substantially.

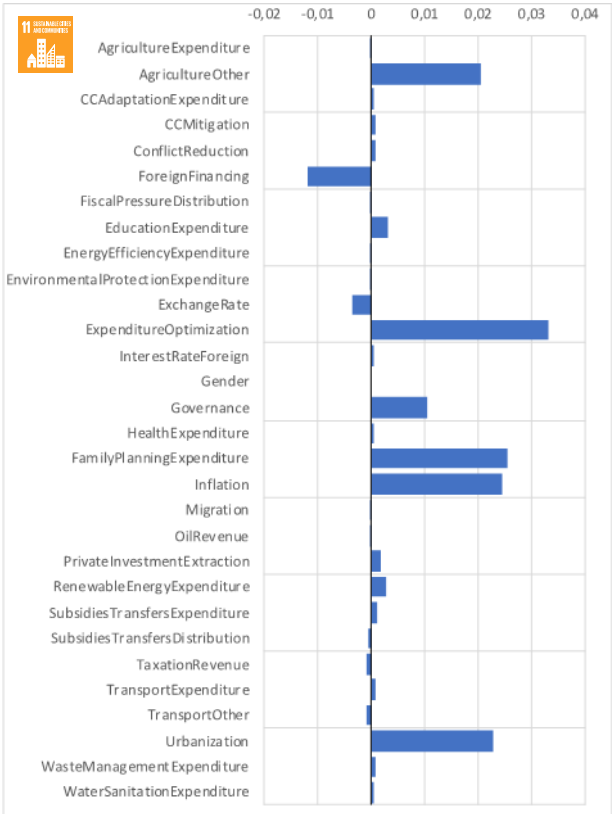

Figure 4.12: Goal 11 performance-contributions of intervention areas from drop-out-analysis for the Optimistic-ERGP-scenario

GOAL 12 PERFORMANCE

The performance of Goal 12 is driven exclusively by indicators of resource use. Consequently, this indicator suffers strongly from increased private investments into extraction (oil, gas, mining). The assessment reveals that most policy changes have an undesirable influence on responsible resource use and this is because they all tend to increase economic growth and, in the absence of policies decoupling resource use and growth, that means the performance of Goal 12 is going down. The changes in transport policies in the Optimistic-ERGP-scenario help this goal and the only reason is because these policies are harmful to economic growth. The latter also holds for increased foreign financing.

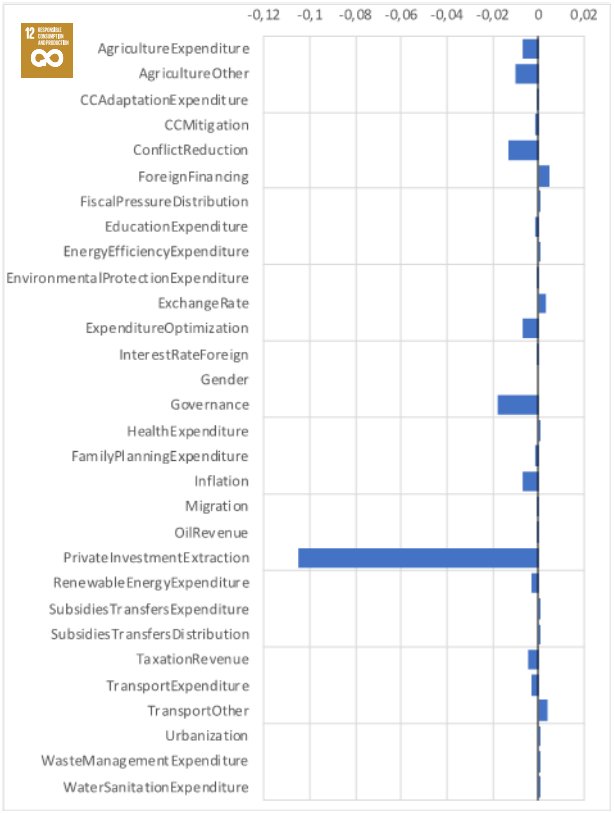

Figure 4.13: Goal 12 performance-contributions of intervention areas from drop-out-analysis for the Optimistic-ERGP-scenario

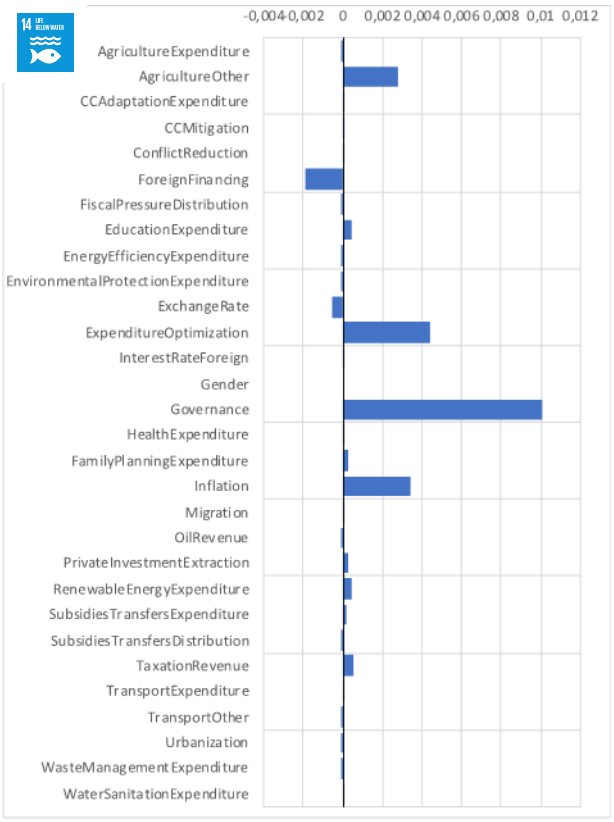

Figure 4.14: Goal 14 performance-contributions of intervention areas from drop-out-analysis for the Optimistic-ERGP-scenario

GOAL 13 PERFORMANCE

There are no policies in the Optimistic-ERGP-scenario that reduce the impacts of natural disasters and climate change to any degree. Consequently, Goal 13 performance could not be assessed.

GOAL 14 PERFORMANCE

There is no increase of environmental protection expenditure directed at marine conservation in the Optimistic-ERGP-scenario. Consequently, there are only a few other policies with very small contributions to this Goal. Most importantly, marine protection profits from the existing expenditure being used more efficiently through improvements of governance. Also, the Goal will benefit from the assumed changes in agriculture not under government control (e.g. increased added value), expenditure optimization and inflation reduction.

GOAL 15 PERFORMANCE

For terrestrial protection, the situation is basically very similar to marine protection. The only exception is that increased expenditure relating to training on sustainable agriculture practices has an additional positive influence because the sustainable agriculture revolution that the scenario includes means that biodiversity is harmed less than it would be for conventional commercial agriculture.

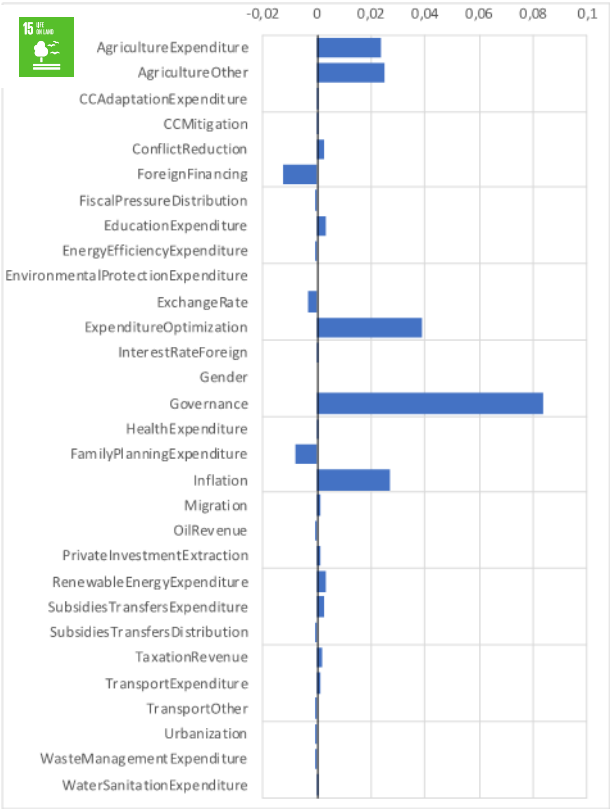

Figure 4.15: Goal 15 performance-contributions of intervention areas from drop-out-analysis for the Optimistic-ERGP-scenario

GOAL 16 PERFORMANCE

Not surprisingly, the major contributor to Goal 16 are improvements in governance.

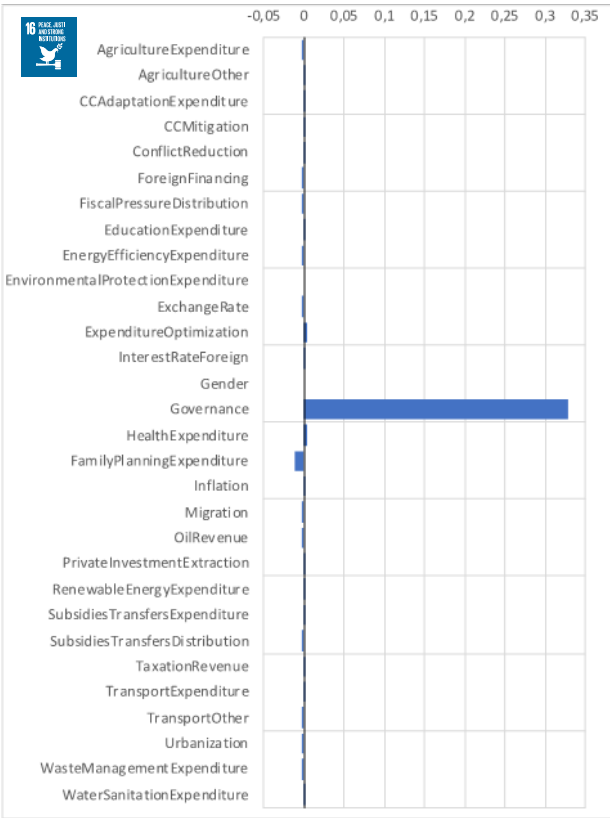

Figure 4.16: Goal 16 performance-contributions of intervention areas from drop-out-analysis for the Optimistic-ERGP-scenario

GOAL 17 PERFORMANCE

The performance of Goal 17 profits mostly from increased tax revenues.

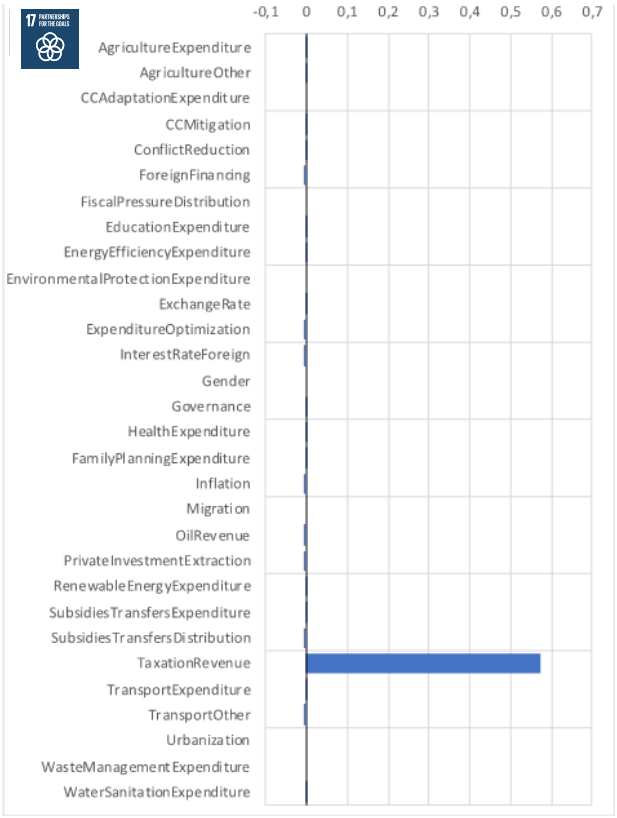

Figure 4.17: Goal 17 performance-contributions of intervention areas from drop-out-analysis for the Optimistic-ERGP-scenario

4.3 RESULTS OF THE POLICY COHERENCE ASSESSMENT ACROSS GOALS FOR SELECTED POLICIES

The study also examined policy coherence not merely from the perspective of the goals, but also from the perspective of effects of one policy intervention area across goals. Some major insights from the ERGP Optimistic Scenario are outlined below.

4.3.1 POLICIES THAT PROFIT MANY SDGS (STRONGLY COHERENT)

From the assessment, these policies include expenditure optimization, governance, education expenditure, subsidy and transfers expenditure, renewable energy expenditure, family planning expenditure and transport expenditure. Figure 4.18 shows that expenditure optimization, which includes increase in the involvement of the private sector from 0 per cent to 50 per cent profits most policy

areas as this dramatically increases the financial leverage of government. This intervention area also includes a reduction of the consumption share of government expenditure, a reduction of administrative and other expenditure and a reduction of government salaries and wages as a share of [govt.] consumption (in spite of an increase in the average salary of public sector workers). An exception to the positive effects is SDG 10 on which expenditure optimization has a negative influence through an increase in the percentage of population below half median income and through decreasing the labour share.

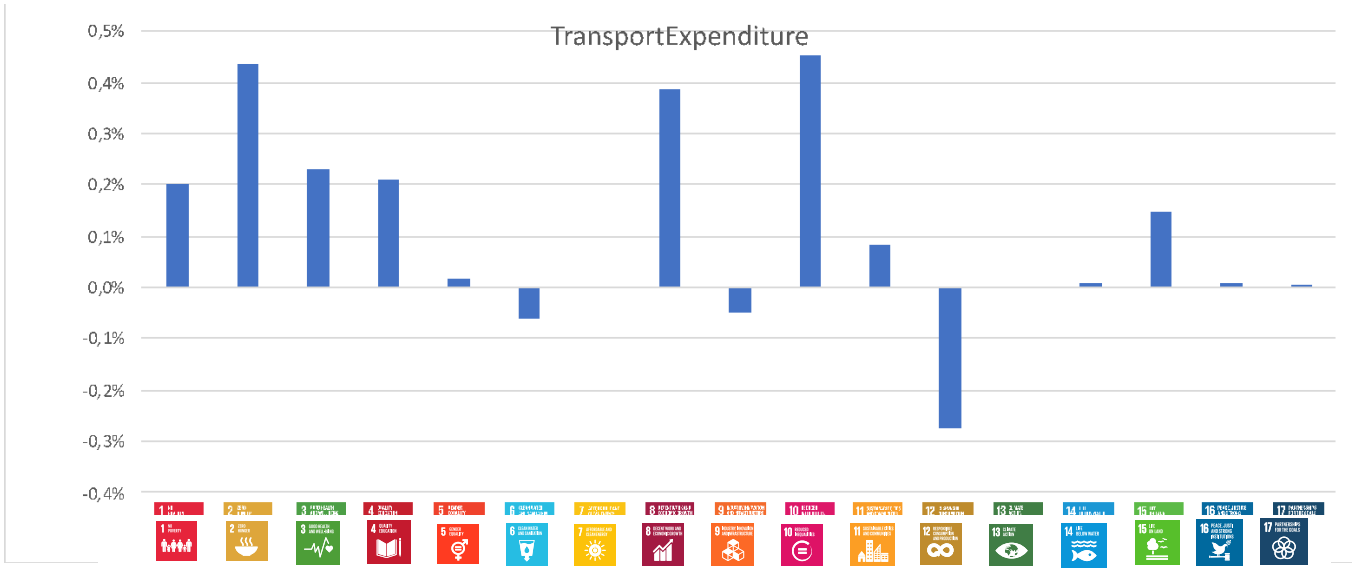

Figure 4.18: Contributions from drop-out analysis of assumptions on increased Expenditure Optimization in the Optimistic-ERGP-scenario to the performance of the SDGs

Figure 4.19 similarly shows the positive influence of improved governance on many sectors, which is not surprising either. The increases are, however, strongest in SDG 16, which relates to promoting a just, peaceful and inclusive society, and this is supposed to measure governance.

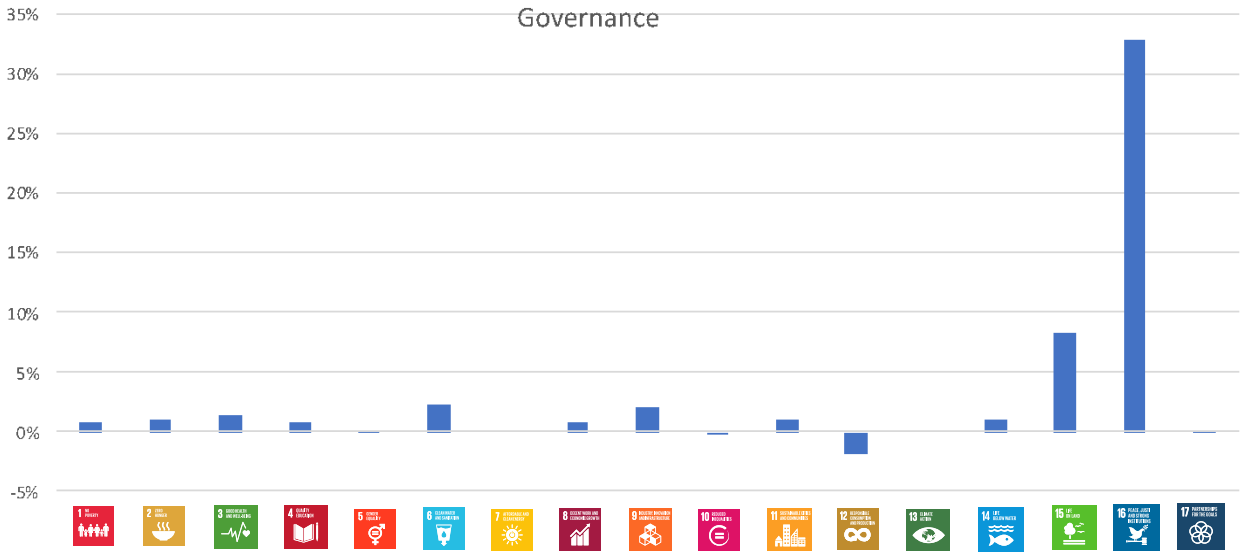

Figure 4.19: Contributions from drop-out analysis of assumptions on improved governance in the Optimistic-ERGP-scenario to the performance of the SDGs

Increased education expenditure also has a very positive influence on almost all SDGs (Figure 4.20). The only exception is SDG 12 (Ensure sustainable consumption and production patterns), which is harmed by any increase of economic growth brought about by better education. It should be explored in future versions of iSDG if implementation of policies aimed at decoupling resource use from economic growth could turn this into a positive contribution.

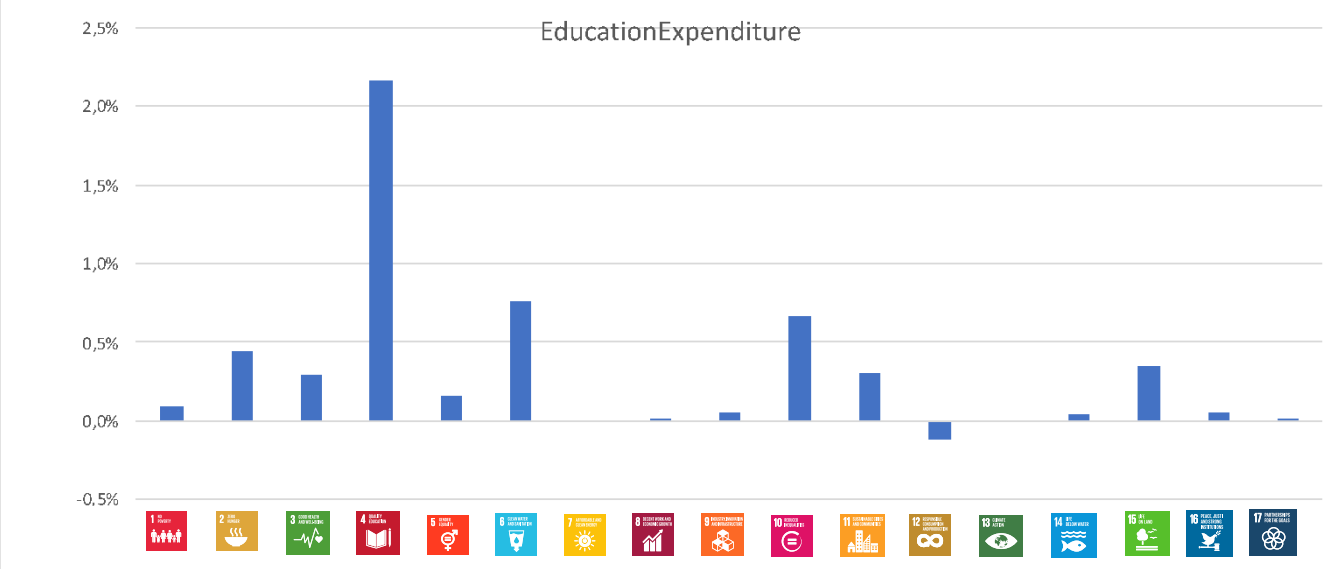

Figure 4.20: Contributions from drop-out analysis of increased Education Expenditure in the Optimistic-ERGP-scenario to the performance of the SDGs

Interestingly, Figure 4.21 shows that increased expenditure for subsidies and transfers not only influences the SDGs related to poverty and inequality positively (Goals 1, 2 and 10), but also a number of other SDGs such as 3, 4, 6. This is because higher incomes increase the ability of families to gain access to, for example, clean water & sanitation, good education or health care.

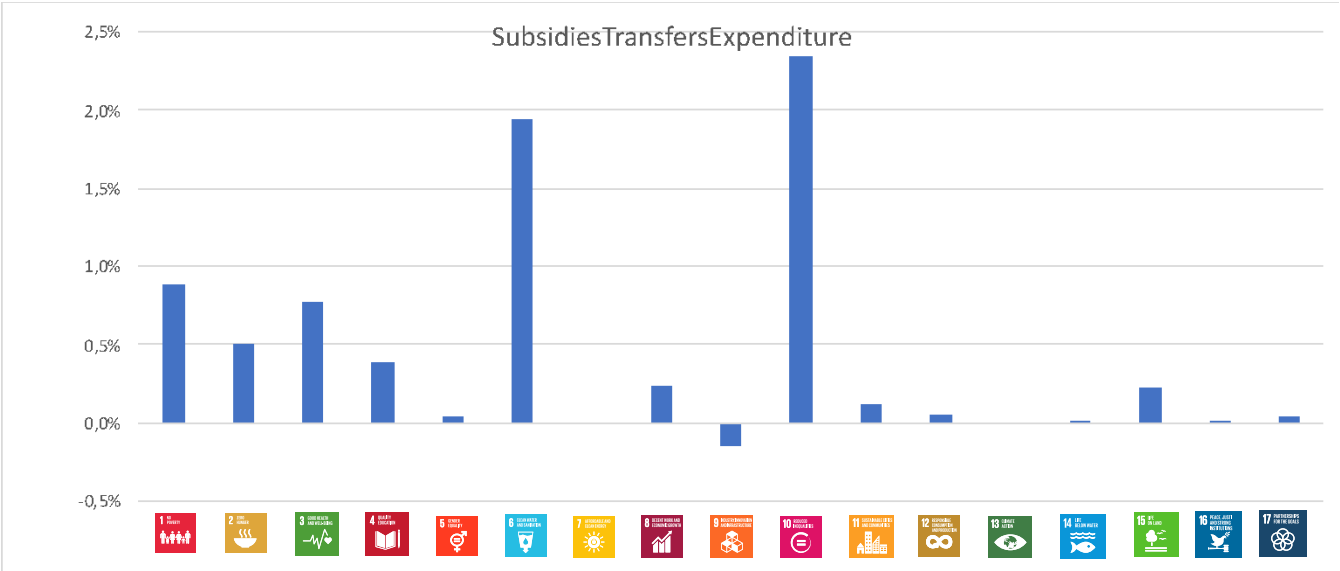

Figure 4.21: Contributions from drop-out analysis of increased subsidies and transfers expenditure in the Optimistic-ERGP-scenario to the performance of the SDGs

Figure 4.22 shows that renewable energy expenditure also has a positive influence on almost all the SDGs because electricity is such an important enabler. The exception for SDG 12 is because the enhanced economic growth that improved electricity supply brings about increased resource use.

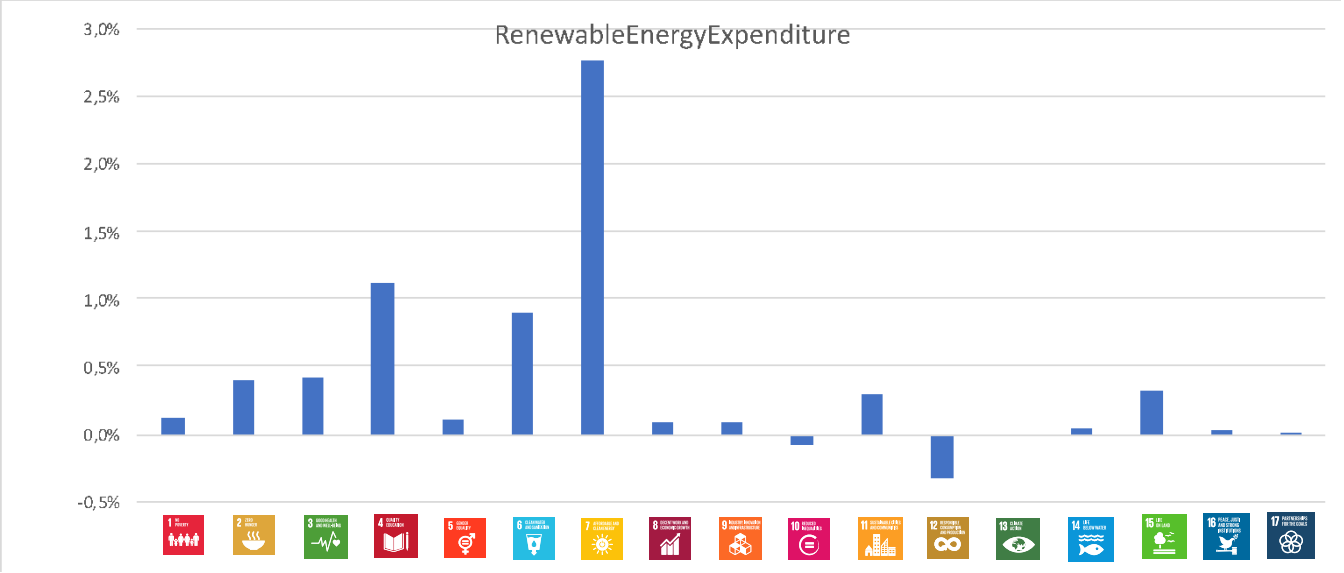

Figure 4.22: Contributions from drop-out analysis of assumptions on increased renewable energy expenditure in the Optimistic-ERGP-scenario to the performance of the SDGs

Figure 4.23 shows that family planning expenditure not only has a positive influence on the SDGs that are based on the indicator contraceptive prevalence (Goals 3 and 5) but also on other goals, and the size of the contribution of this policy is quite large for many of the SDGs (over 5 per cent for SDGs 6, 8). This is because the leverage of most government expenditures increases if population growth can be slowed down, more so as a higher population means that the expenditure is distributed over more heads. Note that Goal 10 (equality) suffers because while family planning expenditure actually reduces poverty through economic growth, that same growth increases the incomes of the wealthy even more than the incomes of the poor.

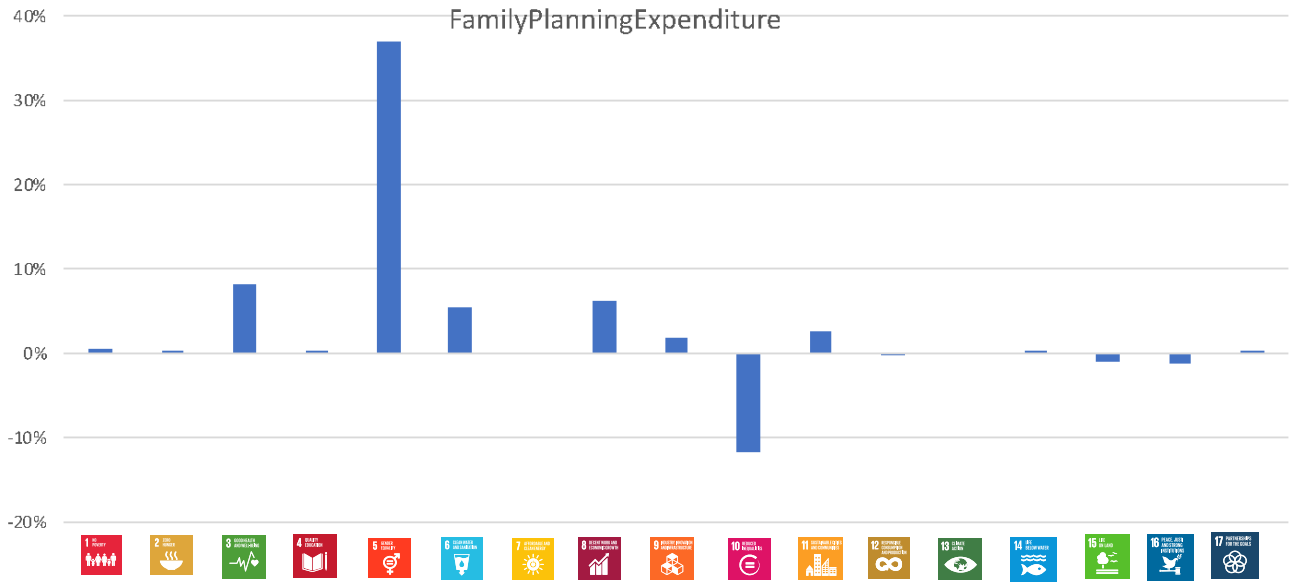

Figure 4.23: Contributions from drop-out analysis of increased family planning expenditure in the Optimistic-ERGP-scenario to the performance of the SDGs

Figure 4.24 shows that increased transport expenditure produces desirable influences on most goals. However, the total contributions are small, as indicated by the scale of the Y-axis. This may indicate that while this is an interesting policy lever, the level of expenditure is not high enough or other policies may need to be changed to improve the impact of this policy (especially how the expenditure is used, i.e. for which types of transport infrastructure construction and the level of their maintenance etc.). Also observable from the chart is the negative influence of the policy on a few Goals: 6, 9, 12.

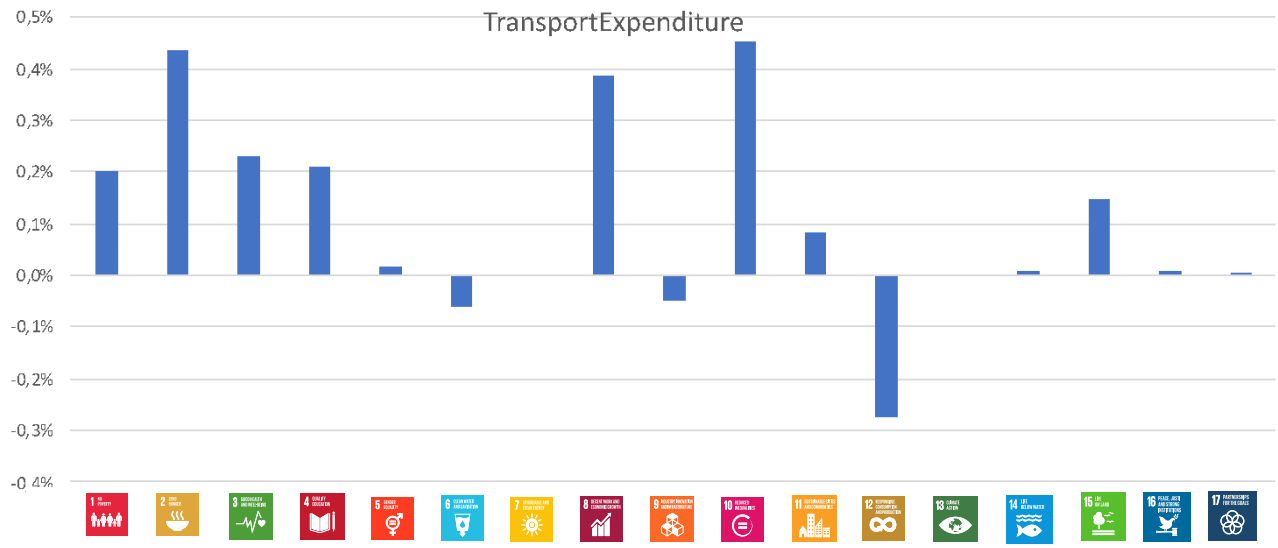

Figure 4.24: Contributions from drop-out analysis of assumptions on increased transport expenditure in the Optimistic-ERGP-scenario to the performance of the SDGs

4.3.2 POLICIES THAT ARE HARMFUL TO MANY SDGS (POLICY INCOHERENCE)

As shown above, some policies/interventions have desirable influences on the SDGs. However, there are also policies that have undesirable effects on many goal performances. The assessment reveals two of these as Transport Other (transport expenditure reallocation policies) and increased Foreign Financing in the Optimistic-ERGP-scenario. These two examples are illustrated in Figures 4.25 and 4.26.

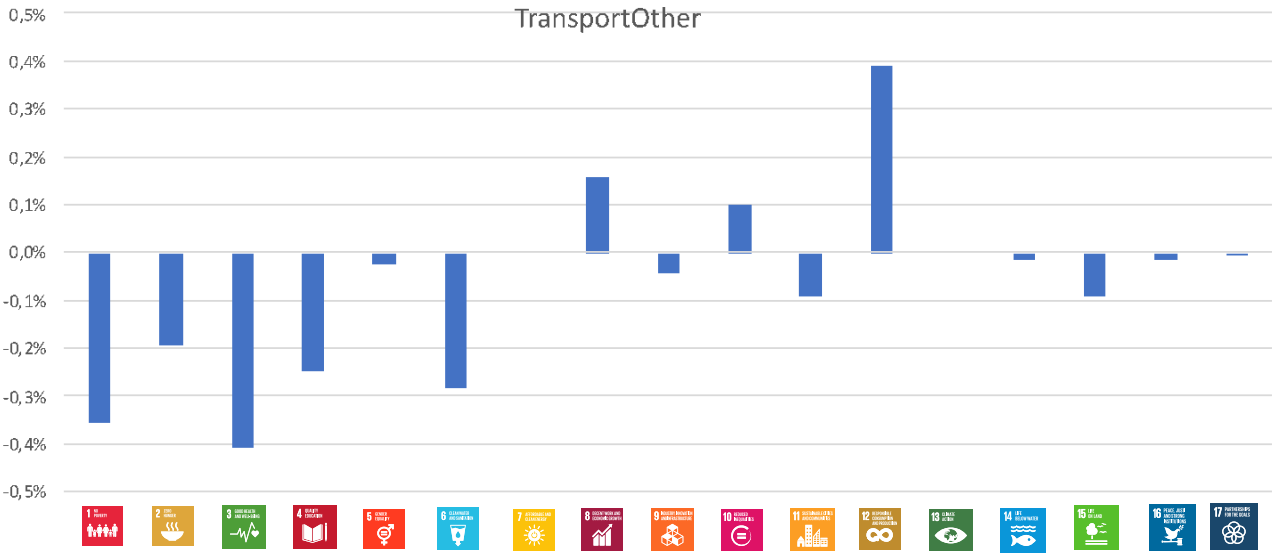

Figure 4.25: Contributions from Drop-Out Analysis of Transport Expenditure Reallocation Policies in the Optimistic-ERGP-scenario to the Performance of the SDGs

The changes in the transport sector which involve a reallocation of spending towards paved roads and especially rail have undesirable effects on the performance many goals. The overall expenditure for unpaved roads sees a reduction, and within unpaved expenditure all is used for upgrading to paved roads that means none for rehabilitation. As a result, for example, health and education facilities are harder to reach in rural areas, and access to markets for farming products is much lower. Poverty reduction suffers most because of reduced access to health care. The only SDGs that profit from this infrastructure policy are Goals 8, 10 and 12: Lower transport expenditure means lower economic growth which means lower resource use, the indicators of which factor into 8 and 12.

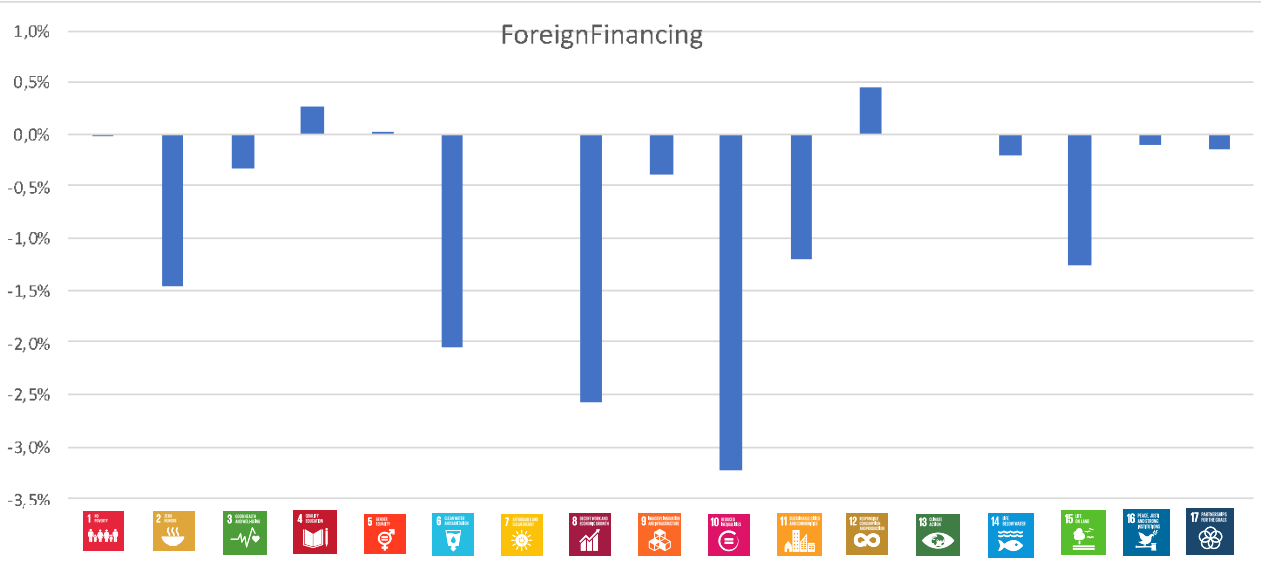

Figure 4.26: Contributions from drop-out analysis of increased foreign financing in the Optimistic-ERGP-scenario to the performance of the SDGs

Figure 4.26 shows the mostly negative impact of foreign financing. This is hard to interpret because in 2030 foreign financing in the analysis is negative as there is a government surplus. However, the Optimistic-ERGP-scenario has a focus on foreign financing. Since this also holds for times of surplus, this means that the government is instead paying back debt or even giving loans to foreign entities than to domestic ones. Since this is harmful for GDP, it is also harmful to many SDGs (with the exception of Goal 12, which, as usual, profits from lower GDP).

In effect, from Sections 4.2 and 4.3, it is clear that many of the policy interventions together have desirable effects across Goals. In other words, improvements in a Goal performance do not derive only from the interventions targeted at that Goal but also from the positive effects of interventions aimed at other Goals. The policies synergize to increase economic productivity, which together with the assumed increased revenue collection efficiency increases governmental leverage. Increased production and increased governmental leverage then foster further improvements in many (but not all) development areas. The assessment also shows that some policies have undesirable effects across Goals. Indeed, the negative synergies are more than the positive ones. This implies that there are important trade-offs between policies. The undesirable side-effects of some policies on non-target areas can be quite significant. The identification of such policies is a step in the right direction as it should lead to implementation of mitigating measures. Importantly, it is the need to search for policy combinations that increase positive and reduce negative synergies, that is, for combinations that improve policy coherence. The ERGP+SDG-scenario is one step into that direction, though there could be further room for improvement in future versions if iSDG that incorporate additional aspects not yet covered, e.g. sub-national disaggregation.

4.4 SOME SENSITIVITY ANALYSES

It will be recalled from Section 2.10.2 that the Optimistic-ERGP-scenario is a mixture of policy interventions such as changed expenditure and taxation levels, as well as assumptions on future developments (e.g. exchange rate, interest rate, different dimensions of governance etc.). Furthermore, the Optimistic-ERGP-scenario, as the name suggests, makes very optimistic assumptions (e.g. full and effective implementation). Since the ERGP+SDG-scenario builds on the Optimistic-ERGP-scenario, it shares the same optimism for uncosted policies and assumptions.

In order to assess how successful the policy changes could be under more pessimistic assumptions, scenarios were run that assume that those optimistic assumptions of the Optimistic-ERGP-scenario and the ERGP+SDG-scenario do not materialize. The ERGP-costed-policies-only-scenario is a scenario that uses only the expenditure and taxation changes of the Optimistic-ERGP-scenario, but exclude the optimistic assumptions for all other scenario variables (settings = to No-ERGP-scenario). Similarly, an SDG-costed-policies-only-scenario was run: it used the policy variable settings of the ERGP+SDG-scenario for the expenditure and taxation policies but for the rest used the settings of the No-ERGP-scenario.

The results, entailing a comparison of the Optimistic-ERGP-scenario and the ERGP-costed-policies-only-scenario showed that for many SDGs the performance is only slightly lower in the ERGP-costed-policies-only-scenario. This means that the performance increase compared to the No-ERGP-scenario does not depend too much on the optimistic assumptions for these variables. This means that the performance in these areas in the ERGP+SDG-scenario comes mostly from the costed policy interventions, and relies relatively little on the optimistic assumptions regarding favourable developments that are hardly controlled by the government. Again there are some exceptions: Goals 5, 9, 14, 15 and 16 are much more reliant on these assumptions. In addition, for Goal 12, the more optimistic assumptions lead to a worsening of performance, again.

The important message from the sensitivity analysis is that there are some goals (although not the majority) for which performance does hinge substantially on optimistic assumptions for the future development of variables that are not under direct government control. This means that there is considerable uncertainty as to whether the improvements in these areas would come to pass, even if all government interventions were implemented perfectly.

CHAPTER FIVE

COSTING OF THE SDG EXPENDITURE

This chapter presents the estimates and analyses of the additional costs of implementing the various policies and programmes necessary to achieve the SDG targets and, hence, the composite performance of each of the 17 goals presented earlier. The estimated additional costs of implementing the policies and programmes of the Optimistic-ERGP-scenario and the ERGP+SDG-scenario are the differences compared to the cost of implementing the No-ERGP-scenario. The trends of annual nominal and real costs are presented in Sections 5.1 and 5.2. This is followed in Section 5.3 by an estimated cumulated additional cost for each scenario for the entire period until 2030. Finally, the implications for government fiscal balance are presented in Section 5.4

5.1 COSTING IN NOMINAL TERMS

Figure 5.1 shows the trend of total nominal government SDG expenditure and its main components, namely, social and economic services expenditure and expenditure for subsidies and transfers. Beginning with the total SDG expenditure as expected, the lowest annual costs are for SDG expenditure under the No-ERGP-scenario. However, the annual cost of SDG expenditure under the Optimistic-ERGP-scenario is highest despite the revelation in Figure 3.2.1 that the composite performance index of the SDGs is generally lower than under the ERGP+SDG-scenario. This is due to a reallocation of subsidies and transfers more towards the poorer segments of the population in the ERGP+SDG-scenario as well as the deliberate redistribution of fiscal pressure away from the poor. Through these reallocations, the absolute expenditure on subsidies and transfers can be reduced and in 2030 become smaller than in the No-ERGP-scenario. The other types of government social and economic services expenditure directed at SDG attainment are substantially higher in the ERGP+SDG-scenario compared to the Optimistic-ERGP-scenario.

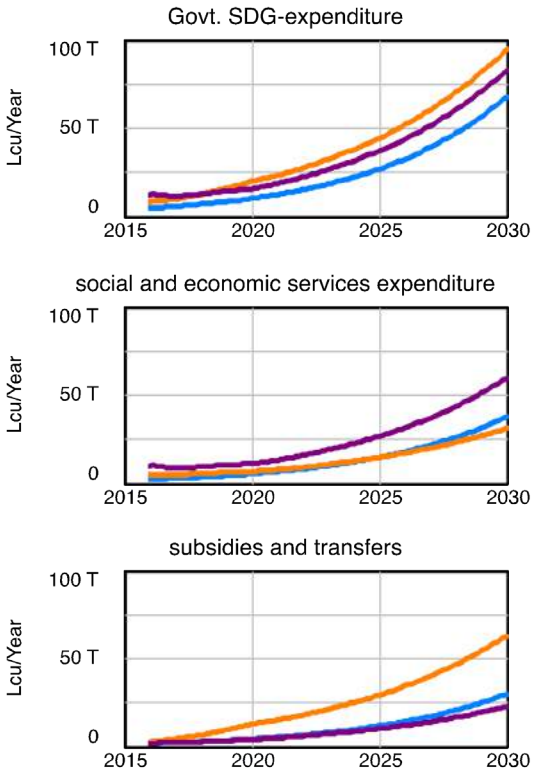

Figure 5.1: Nominal Annual government SDG expenditure and disaggregation by social and economic services expenditure and nominal expenditure for subsidies and transfers for the No-ERGP-scenario, Optimistic-ERGP-scenario and the ERGP+SDG-scenario (LCU: local currency units i.e. Naira)

Turning to private sector SDG expenditure, Figure 5.2 reveals that under both ERGP+SDG-scenario and Optimistic-ERGP-scenario it is assumed that the private sector will invest substantially in the SDG attainment as well. Unlike the part borne by the government, private nominal SDG expenditure increases much more in the ERGP+SDG-scenario than it does in the Optimistic-ERGP-scenario. Hence, it is higher in the former scenario all the time. The overall government contributions are higher because the 50-50 per cent share of private and government expenditure applies to expenditure added in the policy scenarios only, so that government expenditure is higher by the historical expenditures which were assumed to be zero for the private sector in the past in the Optimistic-ERGP-scenario as well as in the No-ERGP-scenario.

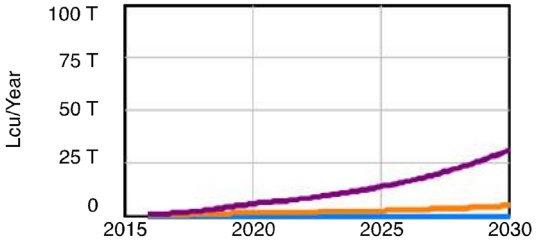

Figure 5.2: Nominal Annual private SDG expenditure No-ERGP-scenario **(light blue),** Optimistic-ERGP-scenario **(orange) and the** ERGP+SDG-scenario **(purple) (LCU: local currency units i.e. Naira).**

5.2 COSTING IN REAL TERMS

Since the No-ERGP-scenario makes different assumptions on inflation than the other scenarios, a comparison of deflated expenditure may be more helpful, as shown in Figure 5.3. In real terms, the annual expenditure in the No-ERGP-scenario is increasing relatively slowly, whereas there is a faster increase in the other two scenarios. This is mainly because expenditures are mostly defined as percentages of GDP because government revenue increases with economic growth, which is stronger in the Optimistic-ERGP-scenario and the ERGP+SDG-scenario.

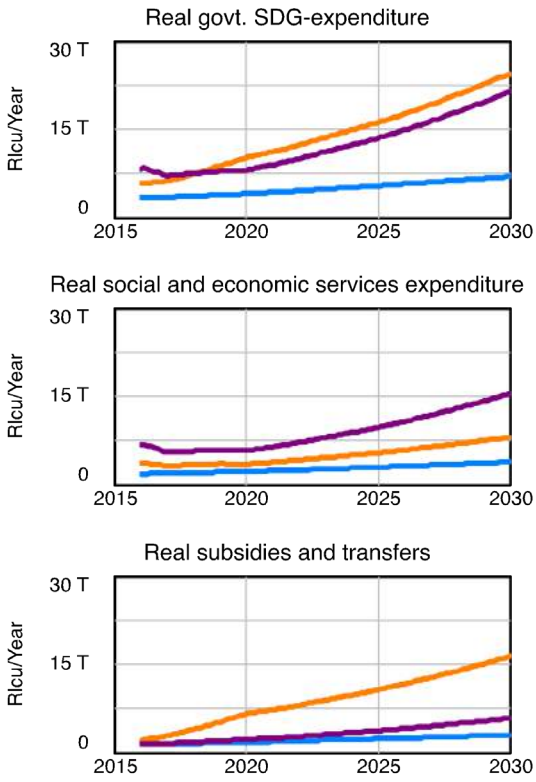

Figure 5.3: Real government SDG expenditure and disaggregation by social and economic services expenditure and nominal expenditure for subsidies and transfers for the No-ERGP-scenario, Optimistic-ERGP-scenario **and the** ERGP+SDG-scenario **(RLCU: real local currency units i.e. real Naira)**

Note the mildly widening gap between the cost of the two scenarios: The cost-advantage of the ERGP+SDG-scenario compared to the Optimistic-ERGP-scenario increases slightly with time.

Figure 5.4 shows the contribution from the private sector in terms of SDG expenditure. It is obvious when comparing to Figure 5.3 that while the contribution is still lower than from the government, it is still a substantial contribution coming from the private sector, e.g. about a third of the total annual SDG expenditure comes from the private sector in 2030 for the ERGP+SDG-scenario.

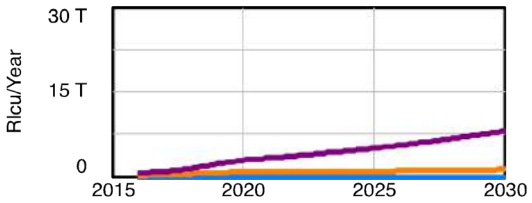

Figure 5.4: Real private SDG expenditure No-ERGP-scenario **(light blue),** Optimistic-ERGP-scenario **(orange) and the** ERGP+SDG-scenario **(purple) (RLCU: real local currency units i.e. real Naira)**

5.3 CUMULATED ADDITIONAL COSTING

For government SDG expenditure, the nominal additional SDG expenditure beyond what is required under the No-ERGP-scenario amounts to **N183 trillion** in nominal terms or about **N100 trillion** in real terms for the Optimistic-ERGP-scenario. For the ERGP+SDG-scenario the corresponding figures are **N126 trillion** in nominal terms or about **N83 trillion in real terms**.

For private SDG expenditure, the cumulated SDG related expenditure is **N17 trillion** in nominal terms or **N4 trillion** in real terms for the Optimistic-ERGP-scenario and **N163 trillion** in nominal terms or **N42 trillion** in real terms in the ERGP+SDG-scenario.

The above represent expenditures related to SDG attainment only. When looking at total government expenditure, i.e. including the optimistic assumptions on interest payment and public debt as well as administrative and other expenditure, the cumulated spending is lower under the Optimistic-ERGP-scenario compared to the No-ERGP-scenario, but only in nominal terms because of the differing assumptions on the development of inflation. In real terms, total real government expenditure cumulated over the SDG era under the Optimistic-ERGP-scenario by 115 trillion Naira when compared to the No-ERGP-scenario. Under the ERGP+SDG-scenario, however, the cumulated expenditure is higher than under the No-ERGP-scenario by only N104 trillion.

5.4 Government surplus or deficit

It can be seen in Figure 5.5 that while the governmental expenditure in the Optimistic-ERGP-scenario is much higher than in the No-ERGP-scenario this does not mean that more public debt is accumulating. On the contrary, due to the optimistic assumptions of improved revenue collection in addition to taxation changes and due to the benefits of the policies on economic growth, the Optimistic-ERGP-scenario goes into a surplus from about 2020 whereas the No-ERGP-scenario goes ever deeper into deficit. The ERGP+SDG-scenario shows an even larger surplus.

It is important to note that the Optimistic-ERGP-scenario assumes that 50 per cent of the additional SDG-related expenditure comes from the private sector (except subsidies and transfers which come only from the government), i.e. domestic and foreign non-governmental sources. This means that the total spending necessary to get the results of this scenario requires high investments from non-governmental actors, e.g. through public-private-partnerships in projects that help improve the SDGs. Should the latter contributions not materialize, either governmental contributions will have to make up for the gap or the improvements in government fiscal balance would be lower or the level of achievements of the SDGs will be further reduced.

Besides, the improvements resulting from the Optimistic-ERGP-scenario are dependent on many improvements from successful non-budgetary policies (e.g. substantial improvements on many dimensions of governance and optimization of revenue collection and an administration that makes more efficient use of its human resources). Should these assumptions not materialize fully, the need for the support of development partners in achieving the SDGs would be higher. Needless to say, failure to demonstrably improve on governance and efficiency in financial and human resource mobilization

and utilization is likely to adversely affect the prospects of support by the other stakeholders, including the development partners.

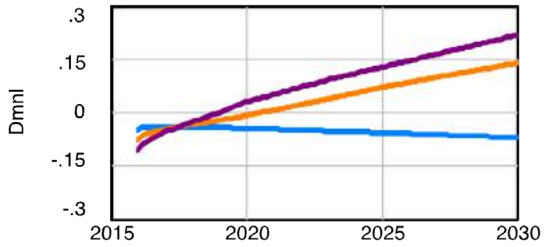

Figure 5.5: Government surplus or deficit as a share of GDP. No-ERGP-scenario **(light blue),** Optimistic-ERGP-scenario **(orange) and the** ERGP+SDG-scenario (purple)

Overall, the cumulated real SDG expenditure by government and the private sector under the Optimistic-ERGP-scenario is **N104 trillion**. For the ERGP+SDG-scenario, the corresponding figure is **N125 Trillion**. It has been noted that government fiscal balance may indeed be in surplus if tax policies, revenue collection efforts as well as expenditure management are efficient and effective with zero leakages.

It should be recalled that the prospects of achieving the SDG targets analysed in Section 3.1 are not bright even if the policies and programmes are effectively and efficiently implemented under the Optimistic-ERGP-scenario and the ERGP+SDG-scenario. Correspondingly, the composite goal performance analysed in Section 3.2 shows that, with the possible exception of SDG-2 (ending hunger by 2030), none of the remaining 16 goals is likely to be achieved by the 2030 target. The implication is that Nigeria will need much more than **N289 trillion** to achieve most of the SDGs. Therefore, Nigeria will need the support of domestic and international partnerships in mobilizing additional financial resources substantially in excess of **N125 trillion in real terms** dedicated to SDG expenditures.

The solicited subject matter experts suggest that to this end, federal and state governments should swiftly develop and effectively implement well-articulated medium-term plans complete with the programmes and projects to be implemented by the MDAs, thereby leading to progressive achievement of the SDGs. Private sector contributions should go beyond the familiar PPPs to include commitments to invest in agriculture, industry and service value chains. Armed with these medium-term development plans, all levels of government should seek strategic partnerships and support from bilateral, multilateral and private philanthropic organizations in support of the planned projects and programmes aimed at achieving the SDGs. Similarly, the private sector should seek strategic partnerships with their international counterparts in a bid to join the global production networks and move up the value chains. This way, the prospects of achieving most of the composite SDGs will be brighter and different from the picture in Figure 3.2.1 above.

CHAPTER SIX

MAIN FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This report presents the results of the application of the iSDG model to the analysis of the prospects of achieving the 17 SDGs by 2030 under three scenarios, namely, the No-ERGP-scenario (Business as Usual scenario), Optimistic-ERGP-scenario, and the ERGP+SDG-scenario. In brief, the definitions of these scenarios are as follows: The No-ERGP-scenario (Business as Usual scenario) assumes no policy changes after 2015 and continuation of pre-ERGP policies only; the Optimistic-ERGP-scenario assumes that the policies and programmes in the ERGP are effectively and efficiently implemented while the ERGP+SDG-scenario, goes beyond Optimistic-ERGP-scenario by identifying integrated policy mixes that could improve SDG performance in those areas where the ERGP has been found insufficient for SDG attainment.

Foremost, the domestication, calibration and simulation of the iSDG model for Nigeria is an innovation that should be encouraged and maintained. The operationalization of the model in Nigeria is an essential addition to the portfolio of models available to policymakers for policy analysis and planning. It is important to stress that the iSDG model is not a substitute for the existing econometric and computable general equilibrium models but a complement. Prior to the domestication of the model in Nigeria, only 64 out of the 169 possible SDG indicators were included in the generic model. Grounds for selection were quantifiability and availability of supporting data. This is not unusual particularly when a new model is being constructed and operationalized, especially in developing countries. As the model is maintained, updated and recalibrated in future, it is anticipated that the data challenges will be addressed so that the very robust capabilities of the model, especially long-term simulation of alternative scenarios, the assessment of achievement of various target indicators, the composite performance index, the synergy and sensitivity analysis will enrich policy planning and provide benchmarks for monitoring, evaluation and impact assessment.

6.1 MAIN FINDINGS/CONCLUSIONS

The analysis of the simulation results for the 64 indicators is summarized in Table 6.1. The legend accompanying the table explains how the symbols used are to be interpreted: The traffic-light icon indicates whether the SDG target is attained by 2030 in the Optimistic-ERGP-scenario. Since many targets are not attained but may still show improvement to varying degrees, it is relevant if the indicators are at least improving in a desirable direction or even worsening which is indicated by the smiley-icons. The last column indicates whether the policy changes in the Optimistic-ERGP-scenario have a desirable impact on this development (thumbs-up) or even make the situation worse (thumbs-down).

The traffic light icons reveal that under the No-ERGP-scenario (Business-as-Usual-scenario), only 2 of the 64 the target indicators are likely to be achieved by 2030. Under the Optimistic-ERGP-scenario, the 2030 targets for only 16 or 25 per cent of the 64 indicators are achieved. Another 5 indicators (7 per cent) are almost achieved. In the ERGP+SDG-scenario, the corresponding figures are: achieved 8 or (39 per cent) achieved, and almost achieved 6 indicators (9 per cent).

TABLE 6.1. SUMMARY OF PERFORMANCE OF INDICATORS UNDER THE THREE SCENARIOS

Goal	Indicator	Degree of target attainment			Direction of development			ERGP impact
		No-ERGP-scenario	Optimistic ERGP-scenario	ERGP+SDG-scenario	No-ERGP-scenario	Optimistic ERGP-scenario	ERGP+SDG-scenario	
1	% of population below international poverty line	●○○	○○●	○○●	→	→	→	↓
1	% of population below national poverty line	●○○	○○●	○○●	→	→	→	↓
1, 3	Average access to basic health care	●○○	●○○	●○○	→	→	→	↓
1, 11, 13	Mortality from natural disasters	●○○	●○○	○○○	↑	↑	→	↑
1, 11, 13	% of population affected by natural disasters	●○○	●○○	○○○	↑	↑	→	↑
1, 11	Economic damage from natural disasters as % of GDP	●○○	●○○	○○○	↑	↑	→	↑
2	Prevalence of undernourishment	●○○	○○○	○○○	→	→	→	↓
2	Prevalence of stunting	●○○	○○●	○○●	→	→	→	↓
2	Prevalence of malnutrition	●○○	○○●	○○●	→	→	→	↓
2	Agriculture production in tons per worker	●○○	●○○	○○●	→	→	→	↓
2	Sustainable agricultural area %	●○○	○○●	○○●	↑	→	→	↓
3	Maternal mortality ratio	●○○	●○○	●○○	→	→	→	↓
3	Under five mortality rate	●○○	●○○	●○○	→	→	→	↓
3	Neonatal mortality rate	●○○	●○○	●○○	→	→	→	↓
3	Cardiovascular, neoplasm, diabetes & respiratory mortality	●○○	●○○	●○○	→	→	→	↓
3	Road traffic mortality	●○○	●○○	●○○	↑	↑	↑	↑
3	Contraceptive prevalence rate	●○○	○○●	○○●	→	→	→	↓
3	Adolescent birth rate	●○○	●○○	●○○	→	→	→	↓
4	% of 20 - 24-agers completed secondary school	●○○	●○○	●○○	→	→	→	↓
4	% of 20 - 29-agers enrolled in tertiary education	●○○	●○○	●○○	→	→	→	↓
4	Adult literacy rate	●○○	●○○	●○○	→	→	→	↓
4, 5	Gender gap in adult literacy	●○○	●○○	●○○	→	→	→	↑
5	% of female legislators senior officials & managers	●○○	●○○	●○○	→	→	→	↓
6	Access to improved water source	●○○	○○●	○○●	↑	→	→	↓
6	Access to improved sanitation facility	●○○	●○○	○○●	→	→	→	↓
6	Water withdrawal per unit of GDP	●○○	●○○	●○○	→	→	→	↓
6	Water resources vulnerability index	●○○	●○○	●○○	↑	↑	↑	↑
7	% of population with access to electricity	○○○	○○●	○○●	→	→	→	↓
7	Renewable % in final energy consumption	●○○	●○○	●○○	↓	↓	↓	↑
7	Energy intensity level of primary energy	●○○	○○●	○○○	→	→	→	↓
8	Real GDP growth rate per capita	●○○	○○○	○○●	↑	↑	↑	↓
8	Real GDP growth rate per employed person	●○○	○○●	○○●	↑	↑	↑	↓
8, 12	Material footprint	●○○	●○○	●○○	↓	↓	↓	↑
8, 12	Material footprint per capita	●○○	●○○	●○○	↓	↓	↓	↑
8, 12	Material footprint per GDP	●○○	●○○	●○○	↓	↑	↑	↑
8, 12	Domestic material consumption	○○●	●○○	●○○	↓	↓	↓	↑
8, 12	Per capita domestic material consumption	○○●	●○○	●○○	↑	↓	↓	↑
8, 12	Domestic material consumption per GDP	●○○	●○○	●○○	→	→	→	↓
8	Unemployment rate	●○○	●○○	●○○	→	→	→	↓
8	% youth not in employment, education, training	●○○	○○●	○○●	→	→	→	↓
9	Rural access index	●○○	●○○	○○●	↓	↓	→	↑
9	Industry production as % of GDP	●○○	●○○	●○○	↓	↓	↓	↑
9	Per capita industry production	●○○	○○○	○○○	↓	→	→	↓
9	% of total employment in industry	●○○	●○○	●○○	↓	↓	↓	↓
9	CO2 emissions per unit of value added	●○○	○○●	○○●	→	→	→	↓
10	Income growth rate: gap of average pop vs. poorest 40%	●○○	○○●	○○●	↑	↑	↑	↓
10	% population below half median income	●○○	●○○	○○●	→	↑	→	↓
10	Average labor share	●○○	●○○	●○○	↓	↓	↓	↑
11	% of urban waste collected and disposed	●○○	○○○	○○●	→	→	→	↓
11	Exposure to PM 2.5	●○○	●○○	●○○	↓	↓	↓	↑
14	% of fish stocks sustainably exploited	●○○	●○○	●○○	↓	↓	↓	↑
14	% of territorial waters protected	●○○	●○○	○○●	↓	↓	→	↑
15	% of terrestrial area protected	●○○	○○○	○○●	→	→	→	↓
15	Forest cover %	●○○	●○○	●○○	↓	↓	→	↓
15	Red list index	●○○	●○○	●○○	↓	↓	↓	↑
16	Violence-related mortality	●○○	●○○	●○○	→	→	→	↓
16	Bribery incidence	●○○	●○○	●○○	↓	→	→	↓
16	Government effectiveness	●○○	●○○	●○○	↓	→	→	↓
17	Domestic revenue as % of GDP	●○○	○○●	○○●	↓	→	→	↓
17	Direct taxes as % of GDP	●○○	●○○	○○●	↓	→	→	↓
17	Indirect taxes as % of GDP	●○○	●○○	○○●	↓	→	→	↓
17	% revenue from domestic taxes	●○○	○○●	○○●	→	→	→	↓
17	Grants as % of domestic revenue	●○○	●○○	●○○	→	↓	↓	↑
17	Interest on public debt as % of export	●○○	○○●	○○●	↓	→	→	↓

Legend:		
Degree of Target attainment	2030-Target attained	○○●
	2030-Target almost attained (=barely missed)	○●○
	2030-Target not attained	●○○
Direction of development	Desirable: moving towards / deeper into target range	☺
	not (or hardly) approaching target range	☹
	Undesirable: varying direction: alternating between desirable and dundesirable or vise versa	😐
Policy impact	Desirable impact of *Optimistic-ERGP-scenario*	👍
	Undesirable impact of *Optimistic-ERGP-scenario*	👎
	None or hardly any change in *Optimistic-ERGP-scenario* compared to *No-ERGP-scenario*	👉

Results of the composite performance index presented in in Chapter 3 (Figure 3.65) and reproduced here below corroborate this finding.

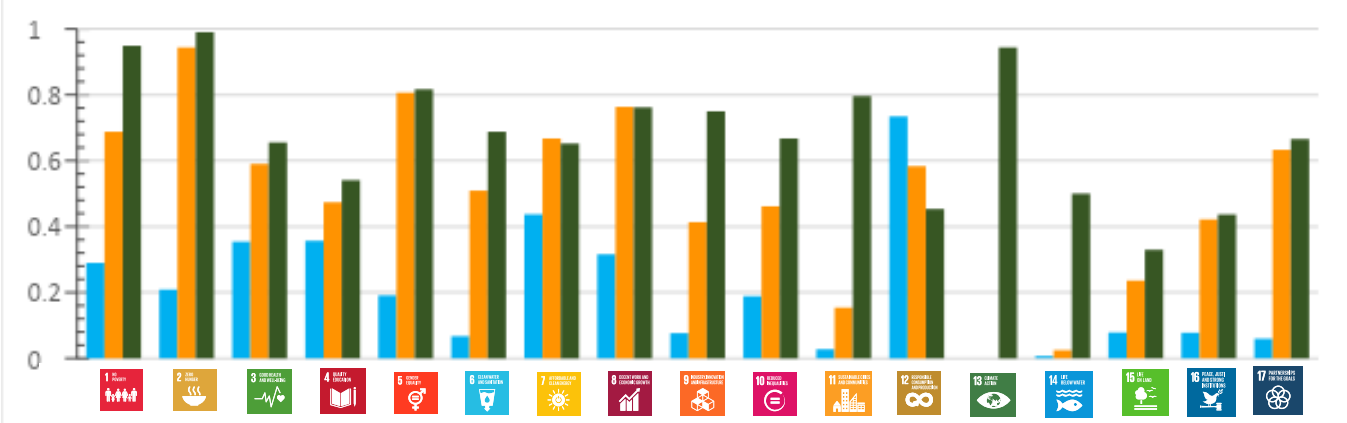

Figure 6.1: Average SDG-Goal performance for each SDG on a scale from 1 (target for all SDG indicators attained for this goal) to 0 (no closure of the initial gap of SDG indicators relative to their respective targets). No-ERGP-scenario (blue), Optimistic-ERGP-scenario (orange), ERGP+SDG-scenario (green)

Specifically, under the best scenario (ERGP+SDG-scenario) only the 2030 target of Goal 2 (End Hunger) is likely to be achieved. The 2030 targets for the remaining 16 SDGs are unlikely to be achieved even if the ERGP and supplementary SDG policies and programmes are well funded and efficiently and effectively implemented.

The many red traffic lights (43 out of 64 indicators) in Table 6.1 above show that over two-thirds of the SDG-sub-indicators do not reach the respective targets by 2030 in the Optimistic-ERGP-scenario. Moreover, the 20 “frownies” in the Optimistic-ERGP-scenario express that almost a third of indicators are not even developing in a desirable direction in the years ahead (they are not moving towards the targets). The 15 ”thumbs down” symbols point to a surprising number of indicators for which the Optimistic-ERGP-scenario leads to a worse performance than the No-ERGP-scenario. In addition, for another 5 indicators, the Optimistic-ERGP-scenario fails to bring about substantial improvements. Thus, what becomes clear from the simulations is that not only is the ERGP insufficient to reach the SDGs even under optimistic assumptions, but it is even counterproductive for some indicators. Even the ERGP+SDG scenario policies leave notable gaps in

achievement of the SDGs. Therefore, to improve on the achievement of the 2030 targets for virtually all the indicators for which iSDG simulation results are available, there is a need to articulate and effectively implement significant additional SDG-related policies and programmes (to be implemented by both federal and sub-national governments) so as to increase the percentage of indicators for which the 2030 targets are achievable.

The results of the synergy and sensitivity analysis show that, indeed, several policies and programmes have positive and negative spill-overs on other indicators. This is typical of all policy interventions which inevitably have three effects, namely, the desired and intended effects, the desired and unintended effects, and the undesired and unintended effects. The capability of iSDG model to identify these three effects is particularly useful in policy planning. The results of the exercises presented in Chapter 4 reveal those policies that are likely to have either or all of these effects. Clearly, the iSDG model is a veritable tool for identifying such effects to provide an evidence base for undertaking policies likely to ameliorate the undesired effects and consolidate/enhance the desirable but unintended effects. The capability of iSDG in carrying out sensitivity analyses demonstrated in Chapter 4 should also provide insights into the robustness of the likely effects. This feature of iSDG should, therefore, be used regularly for these purposes.

The simulations relating to the prospects of achieving the SDGs by 2030 are predicated on the Federal Government's ERGP. To the extent that the task of ensuring achievement of the SDGs is not that of the Federal Government alone using the instrument of ERGP, the active involvement of the sub-national governments, especially the state governments, is imperative. To this end, the states and local governments would need to mainstream SDG policies and programmes into their plans and budgets to complement the efforts of the Federal Government to achieve the SDGs by the target date or before.

Analysis of the costing of SDG expenditures, presented in Chapter 5, reveals that the annual SDG expenditure for the Optimistic-ERGP-scenario, is likely to increase systematically until 2030. Importantly, the SDG expenditure under ERGP+SDG-scenario is lower than under the Optimistic-ERGP-scenario because of the considerable efficiency gains realizable under ERGP+SDG-scenario.

When SDG expenditure is decomposed into those related to social and economic services and those related to subsidies and transfers, the results are quite different. While the annual SDG expenditure on social and economic services is higher under the ERGP+SDG-scenario, compared to the Optimistic-ERGP-scenario, the reverse is the case for the subsidies and transfers because of improved efficiency and better targeting associated with the ERGP +SDG-scenario. It was also assumed by the experts on the Policy Team that the private sector will contribute 50 per cent of SDG expenditure. Accordingly, the absolute increase in annual private sector expenditure is highest under ERGP+SDG-scenario.

The cumulated SDG expenditure is estimated at N183 trillion in nominal terms or about N100 trillion in real terms for the Optimistic-ERGP-scenario. For the ERGP +SDG-scenario the corresponding figures are N126 trillion in nominal terms or about N83 trillion in real terms.

For private SDG expenditure, the cumulated SDG related expenditure is N17 trillion in nominal terms or N4 trillion in real terms for the Optimistic-ERGP-scenario and N163 trillion in nominal terms or N42 trillion in real terms in the ERGP+SDG-scenario. It was pointed out that since it is unlikely that more than one SDG (Goal 2) is likely to be achieved under ERGP+SDG-scenario, Nigeria will need to spend a lot more on SDG expenditure items in order to achieve more goals.

6.2. RECOMMENDATIONS

The major findings summarized above provide a basis for the following recommendations.

- The iSDG model, which has been successfully domesticated in Nigeria, should be maintained and utilized in complementing the existing models in the Ministry and Finance, Budget and National Planning. To this end, the government should consider domiciling both the iSDG-Research model and the iSDG User Interface in the Ministry; while collaborating with NISER and other research/academic institutions to ensure continuous calibration and improvement of the research version of the model. The Government should also consider collaborating with relevant academic institutions to establish an advanced degree course in system dynamics modelling to continue producing modelling experts for the sustainability of the iSDG model in Nigeria.
- The National Bureau of Statistics (NBS) should be supported with necessary resources to produce reliable data to enable the incorporation of many more SDG indicators into the iSDG model. In particular, sub-national data should be enriched to enable simulation of alternative policy scenarios at the Federal and State levels.
- The capacity building component of the domestication for Nigerian modelling experts and the policymakers who are expected to make good use of the User Interface version of the iSDG should be sustained; and the planned stepping down of the domestication and capacity building training to the sub-national level should be done as a priority to ensure alignment of states and national development strategies to the SDGs.
- To improve on the achievement of 2030 targets for virtually all the indicators for which iSDG simulation results are available, there is a need to articulate and effectively implement significant additional SDG-related policies and programmes so as to increase the percentage of indicators for which the 2030 targets are achievable. In light of the strong need for implementation of additional policies and programmes to those in the ERGP, it is important that the sub-national governments are actively involved by mainstreaming SDG-related policies and programmes into their plans and budgets.
- Planners and policymakers should make effective use of the iSDG model to identify the likely unintended, desirable and undesirable impacts of policies on other indicators to provide a guide to the design and implementation of complementary or ameliorative policies as may be necessary.
- In order to increase the prospects of achieving many more SDGs beyond Goal 2 under the ERGP +SDG Scenario, Nigeria will need much more than the estimated cost of N125 trillion in real terms. It will, therefore, be necessary for the domestic and international partners to provide significant financial support substantially in excess of the N125 trillion in real terms.
- Meanwhile, government at all levels should intensify their domestic resource mobilization efforts and explore other innovative financing mechanisms, including channelling remittances to development projects through issuance of diaspora bonds and securitization of future streams of revenue from government infrastructure assets, among other things. This should be complemented by other supports, especially in the areas of capacity building, access to technology and complementary trade policies.

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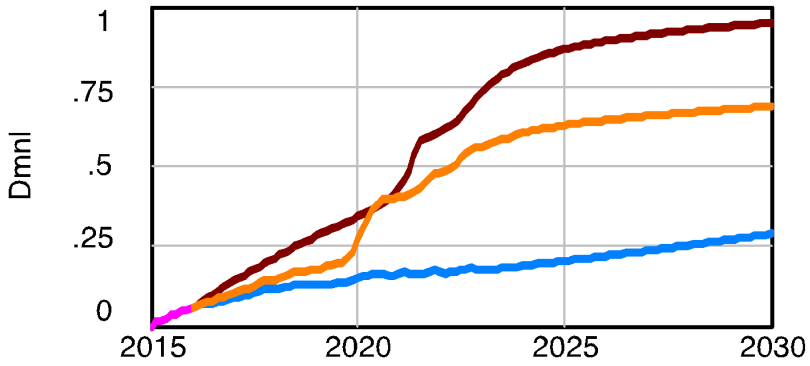
Annexe 01:

STRUCTURAL LIMITATIONS IN ACHIEVING THE SDGS

Since the ERGP+SDG-scenario, unlike the other ones, did not impose a budget ceiling, the fact that it only reaches one SDG fully, suggests that the attainment of many SDGs may be limited. The vital question then is how fundamental these limitations are for each of the SDGs. This question is answered in the context of the following discourse in which the performance of each goal in the ERGP+SDG-scenario is discussed (relative to the goal performance in the Optimistic-ERGP-scenario and the No-ERGP-scenario).

Several cases must be distinguished: In some cases, the goal performance may run against a hard limit below the goal that is reached at a certain expenditure level such that any additional expenditure will not improve it any further. More often, though, diminishing returns could set in very strongly for spending on a policy or a set of policies in an intervention area. This essentially means that, for example, a doubling of expenditure will always yield an improvement of performance, but with every further doubling of expenditure, the degree by which the indicator(s) edges closer to the goal becomes smaller and smaller. Therefore, the answer to the question regarding what it costs to get as close as possible to the SDGs is itself contingent upon a decision on what expenditure level the marginal performance increase gets to the threshold after which any additional spending becomes a waste. This is essentially a political decision. For the definition of the ERGP+SDG-scenario, however, such decisions had to be made. These decisions are not to be understood to be normatively prescriptive. Instead, they represent a proposition that is supposed to inspire a discussion among political decision-makers. Such a discussion may lead to the setting-up of modified scenarios that can be tested using iSDG-Nigeria again in future projects, and the results of these simulations are fed back to the policymakers again.

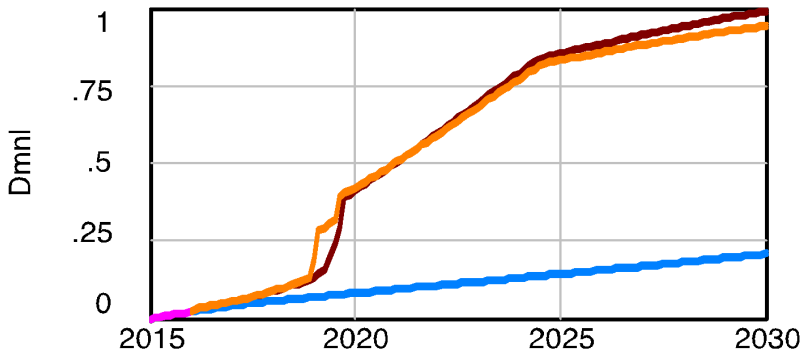
Figure A0.1: Goal 1 Performance No-ERGP-scenario, Optimistic-ERGP-scenario, ERGP+SDG-scenario



The performance of this goal is driven by the following indicators:

- Proportion of population below poverty line (1/4)
- Proportion of population below national poverty line (1/4)
- Average access to basic health care (1/4)
- Mortality due to disasters (five-year average) (1/16)
- Proportion of population affected by natural disasters (five-year average) (1/16)
- Economic damage due to natural disasters as a share of GDP (five-year average) (1/8)
- As the Figure A0.1 shows, while the Optimistic-ERGP-scenario yields substantial improvements of Goal 1 performance, it does not even come close to reaching the goal. The ERGP+SDG-scenario, on the other hand, almost reaches Goal 1, but the annual improvement seems to decrease when getting closer to the target.

Figure A0.2: Goal 2 Performance No-ERGP-scenario, Optimistic-ERGP-scenario, ERGP+SDG-scenario



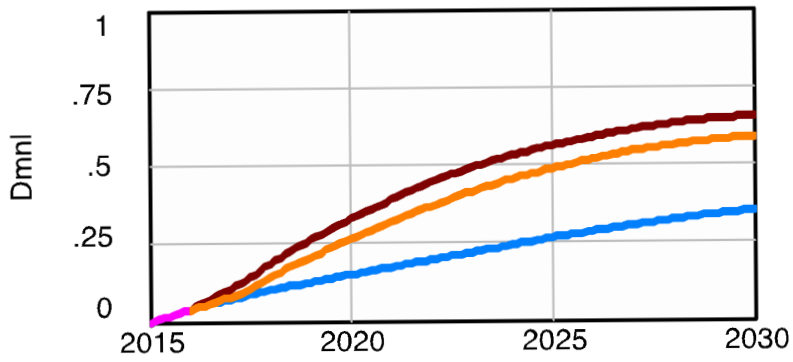
The performance of this Goal is driven by the following indicators:

- prevalence of undernourishment (1/4)
- prevalence of stunting (1/8)
- prevalence of malnutrition (1/8)
- total agriculture production in tons per labour unit (1/4)
- proportion of harvested area sustainably managed (1/4)

This Goal is already almost reached in the Optimistic-ERGP-scenario (performance 0.94) because of increased general agricultural expenditure and because of increased expenditure in sustainable agriculture training. The latter leads to the target for proportion of harvested area sustainably managed being reached under the Optimistic-ERGP-scenario already.

Interestingly, although these policy variables are not increased further in the ERGP+SDG-scenario because of diminishing returns , the goal performance still increases, as the above figure shows. That is because the indicator total agriculture production in tons per labour unit performs substantially better in the ERGP+SDG-scenario. This improvement is the result of increased agricultural productivity which is the result of interventions in many sectors such as education, health but most importantly due to improvements in infrastructure density in rural areas (access to markets for farmers) that results from the radically different policy applied in the ERGP+SDG-scenario focusing on unpaved roads.

Figure A0.3: Goal 3 Performance No-ERGP-scenario, Optimistic-ERGP-scenario, ERGP+SDG-scenario

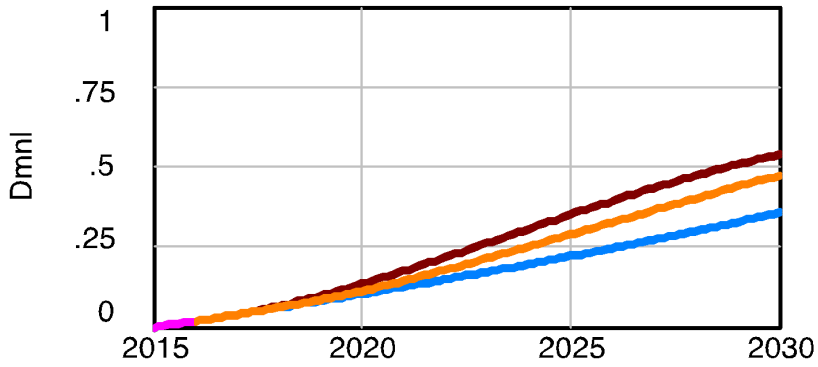


The performance of this goal is driven by the following indicators:

- Average access to basic health care (3/12)
- Maternal mortality ratio (1/12)
- Neonatal mortality rate (1/12)
- Under-five mortality rate (1/12)
- Cardiovascular neoplasm diabetes and respiratory mortality (1/6)
- Road traffic mortality (1/6)
- Contraceptive prevalence rate (1/12)
- Adolescent birth rate (1/12)

Figure A95 shows substantial progress in the No-ERGP-scenario but even much more so in the Optimistic-ERGP-scenario. The ERGP+SDG-scenario shows only a slight improvement over the latter scenario.

Figure A0.4: Goal 4 performance No-ERGP-scenario, Optimistic-ERGP-scenario, ERGP+SDG-scenario

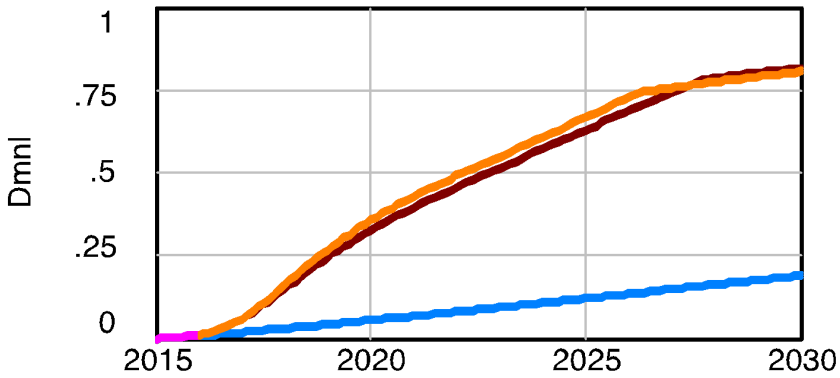


The performance of this goal is driven by the following indicators:

- Adult literacy gender gap ratio (1/4)
- Average adult literacy rate (1/4)
- Proportion of population aged 20 to 24 that has completed secondary school (1/4)
- Proportion of population aged 20 to 29 that has enrolled in tertiary education (1/4)

Although there is a notable improvement in all three scenarios in terms of education (Goal 4 performance, see Figure A0.4), the performance increases of the Optimistic-ERGP-scenario and even the ERGP+SDG-scenario leave much to be desired.

Figure A0.5: Goal 05 performance No-ERGP-scenario, Optimistic-ERGP-scenario, ERGP+SDG-scenario

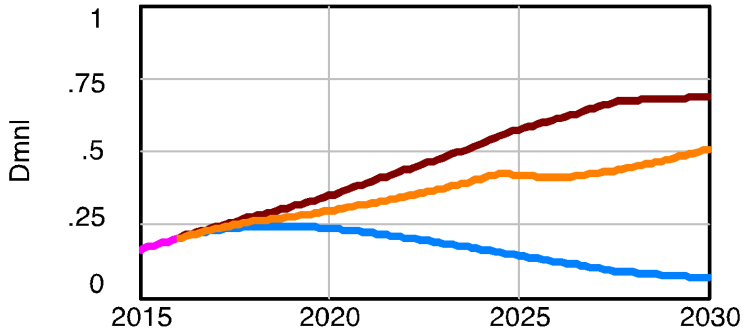


The performance of this goal is driven by the following indicators:

- Contraceptive prevalence rate (1/2)
- Percentage of female legislators and senior officials (1/2)

It can be seen in Figure A0.5 that while the Optimistic-ERGP-scenario exhibits substantial improvements of gender equity, the ERGP+SDG-scenario fares not much better and does not reach the goal either. Furthermore, both show signs of saturation that become even more pronounced around a performance level of 0.75.

Figure A0.6: Goal 06 performance No-ERGP-scenario, Optimistic-ERGP-scenario, ERGP+SDG-scenario

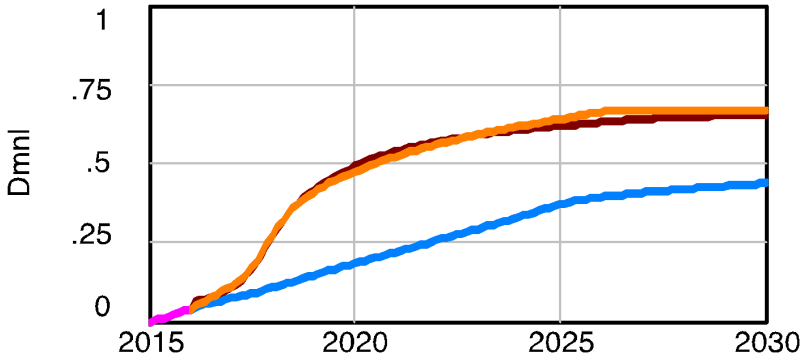


The performance of this goal is driven by the following indicators:

- Access to improved water source (1/3)
- Access to improved sanitation (1/3)
- Total water withdrawal per unit gdp (1/6)
- Water resources vulnerability index (1/6)

The fact that in the No-ERGP-scenario the performance actually goes down below the initial value after it first increased, emphasizes the importance of policies in this area. This is due to a reduction in access to improved water source. The Optimistic-ERGP-scenario increases goal performance but is still insufficient to reach the goal. The ERGP+SDG-scenario allows for further improvement, but there are some obvious saturation tendencies.

Figure A0.7: Goal 7 performance No-ERGP-scenario, Optimistic-ERGP-scenario, ERGP+SDG-scenario

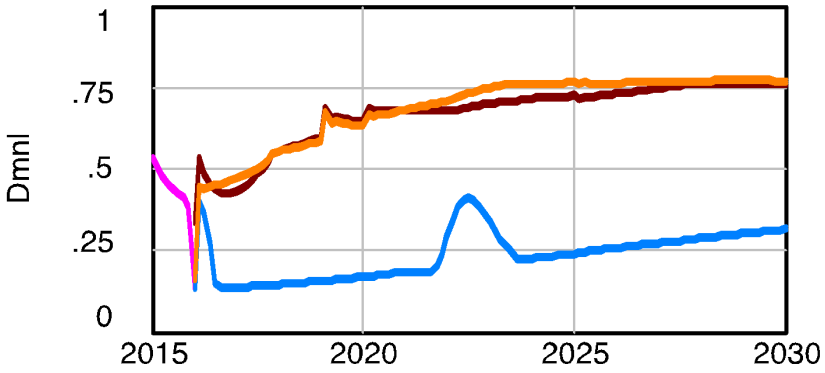


The performance of this Goal is driven by the following indicators:

- Percentage of population with access to electricity (1/3)
- Renewable share in total final energy consumption (1/3)
- Energy intensity level of primary energy (1/3)

There is a notable improvement in No-ERGP-scenario and a much greater one in the Optimistic-ERGP-scenario and the ERGP+SDG-scenario both of which do not differ much in performance. Also, neither of the two reaches the Goal, and the trajectory suggests saturation.

Figure A0.8: Goal 8 performance No-ERGP-scenario, Optimistic-ERGP-scenario, ERGP+SDG-scenario

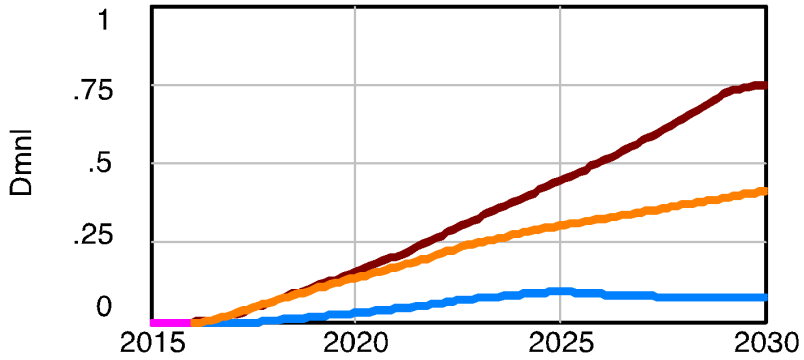


The performance of this goal is driven by the following indicators:

- Real per capita GDP growth rate (1/5)
- GDP per employed person growth rate (1/5)
- Unemployment rate (1/5)
- Share of youth not in education employment or training (1/5)
- Material footprint
    - absolute (1/30)
    - per capita (1/30)
    - unit of GDP (1/30)
- Domestic material consumption
    - absolute (1/30)
    - per capita (1/30)
    - unit of GDP (1/30)

While for Goal 8 there is some improvement in the No-ERGP-scenario, there is a much greater improvement in the Optimistic-ERGP-scenario and the ERGP+SDG-scenario, which do not differ much in performance. Neither of the scenarios reaches the Goal and the trajectories of the latter two suggest saturation. The hump in the No-ERGP-scenario results form an oscillatory behaviour of the GDP growth rate. In fact, there are also oscillations for the other two scenarios, but since these happen within the target range, they cannot be seen in the performance measure. The smaller-scale fluctuations are from the share of youths not in education, employment or training.

Figure A0.9: Goal 9 performance No-ERGP-scenario, Optimistic-ERGP-scenario, ERGP+SDG-scenario

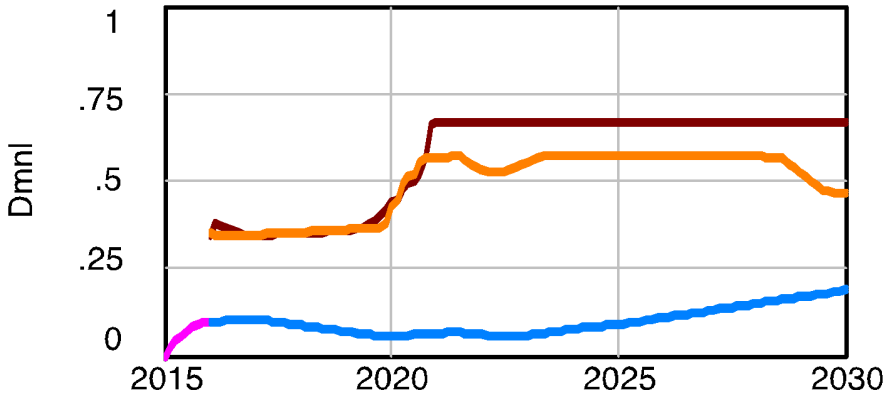


The performance of this goal is driven by the following indicators:

- CO2 emissions per unit of value added (1/3)
- Pc industry production (1/6)
- Industry production as share of GDP fc (1/6)
- Industry employment as share of total employment (1/6)
- Rural access index (1/3)

It becomes clear when looking at Figure A0.9, that business-as-usual, i.e. the No-ERGP-scenario, would lead to a very undesirable trend of the performance of Goal 9. The Optimistic-ERGP-scenario yields substantial improvements and about the same level of performance improvement with the ERGP+SDG-scenario. Still even in that scenario the goal is not reached fully by 2030. There are also signs of saturation towards the end of the SDG era.

Figure A0.10: Goal 10 performance No-ERGP-scenario, Optimistic-ERGP-scenario, ERGP+SDG-scenario



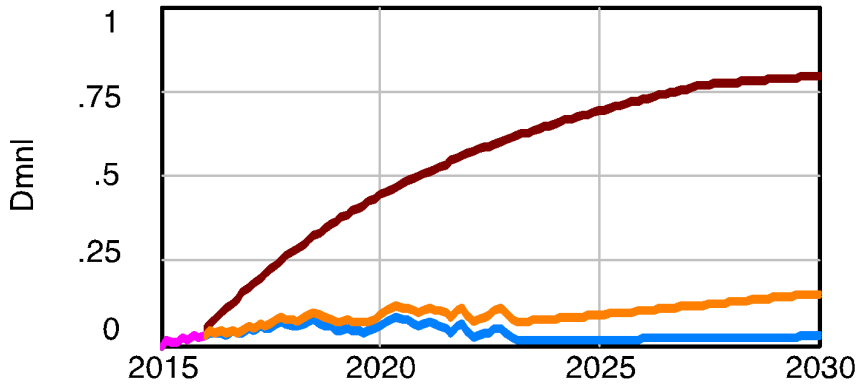
The performance of this goal is driven by the following indicators:

- Bottom 40 per cent income growth to average income growth gap (1/3)
- Proportion of population below half the median income (1/3)
- Average labour share (1/3)

For the No-ERGP-scenario, there is, first, a decline of goal performance and then a slight increase. Still the final result is hardly better than that of 2016. The trajectories of the Optimistic-ERGP-scenario and the ERGP+SDG-scenario are initially very sim

ilar, but the latter one rises higher than the former, saturating at 0.66 while the former drops again just before 2030. Responsible for that is the development of the population below half the median income, which is dropping to zero in the ERGP+SDG-scenario while it is hitting a floor higher than that in the Optimistic-ERGP-scenario and towards the end starts rising again (see Figure 74).

Figure A0.11: Goal 11 performance No-ERGP-scenario, Optimistic-ERGP-scenario, ERGP+SDG-scenario

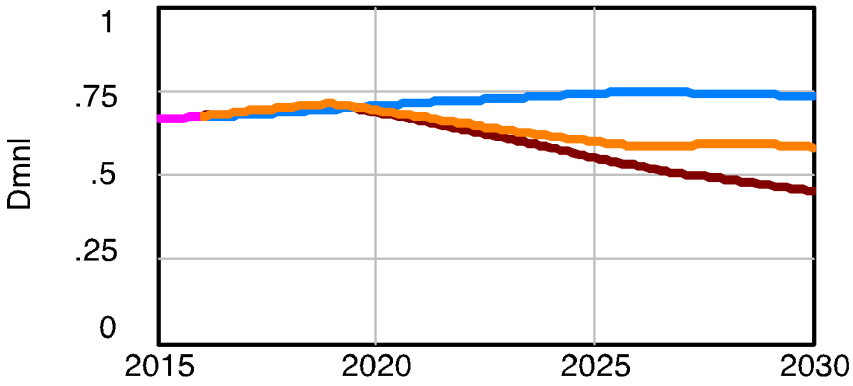


The performance of this goal is driven by the following indicators:

- Proportion of urban waste collected and disposed (1/6)
- Mean annual exposure to particulate matter of 2.5 micrometers size (1/6)
- Mortality related to natural disasters (five-year average) (1/6)
- Proportion of population affected by natural disasters (five-year average) (1/6)
- Economic damage due to natural disasters as a share of GDP (five-year average) (1/3)

Figure A0.11 shows that concerning the performance of Goal 11, the Optimistic-ERGP-scenario is only marginally better than the No-ERGP-scenario. The ERGP+SDG-scenario, however, performs much better. It still does not reach the target, but there is an obvious deceleration as the Goal is being approached in spite of continued investment.

Figure A0.12: Goal 12 performance No-ERGP-scenario, Optimistic-ERGP-scenario, ERGP+SDG-scenario

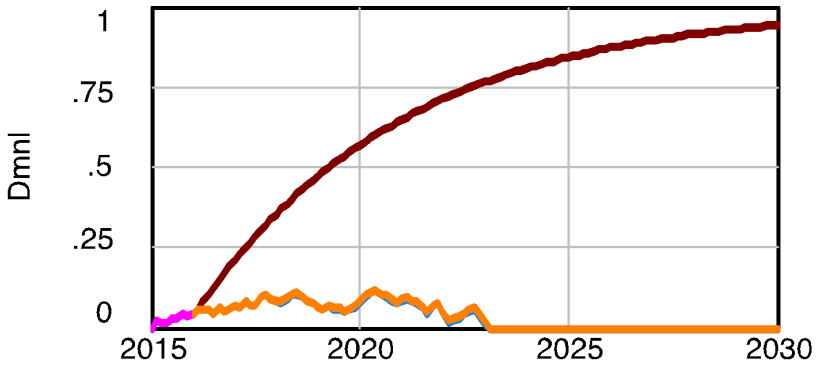


The performance of this goal is driven by the following indicators:

- Material footprint
    - absolute (1/6)
    - per capita (1/6)
    - unit of GDP (1/6)
- Domestic material consumption
    - absolute (1/6)
    - per capita (1/6)
    - unit of GDP (1/6)

FigureA0.11 shows that a combination of the applied policies is clearly counterproductive to achieving the goal. The performance is worst in the ERGP+SDG-scenario and best in the No-ERGP-scenario with the Optimistic-ERGP-scenario being in between. Unfortunately, the country actually moves closer to the goal in 2016 than in 2030 for the two policy scenarios.

Figure A0.13: Goal 13 performance No-ERGP-scenario, Optimistic-ERGP-scenario, ERGP+SDG-scenario

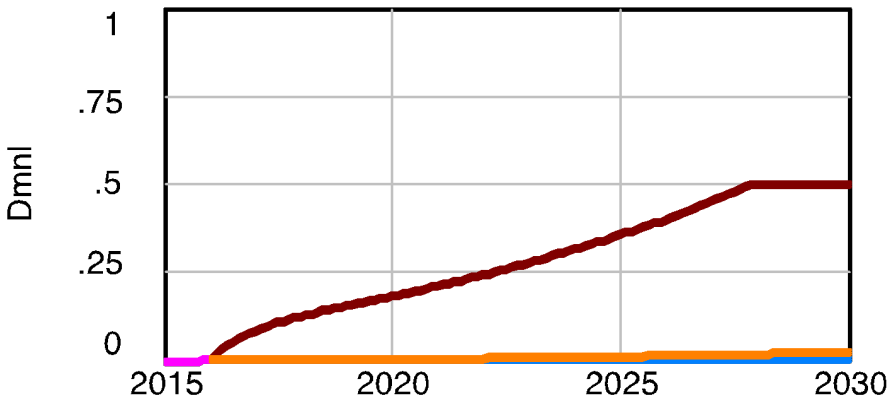


The performance of this goal is driven by the following indicators:

- Mortality due to disasters (five-year average) (1/2)
- Proportion of population affected by natural disasters (five-year average) (1/2)

When comparing Figures A0.13 and A0.11, there are obvious similarities with the difference that Goal 13 is saturating at a higher level than Goal 11. That is because this goal is driven only by climate change impact indicators, while Goal 11 is also driven by them as well as by some other indicators.

Figure A0.14: Goal 14 performance No-ERGP-scenario, Optimistic-ERGP-scenario, ERGP+SDG-scenario

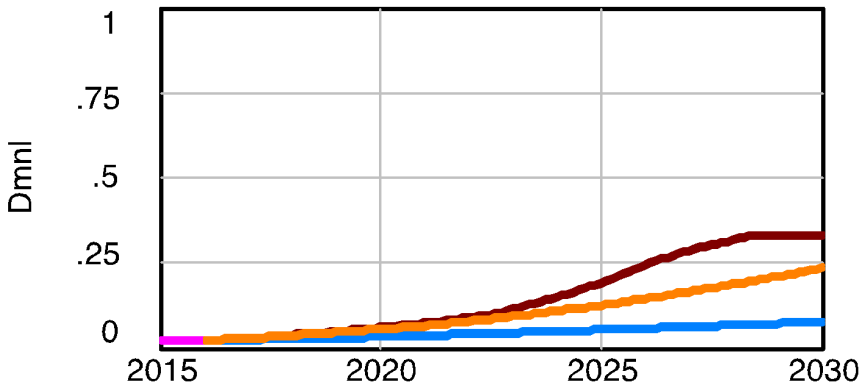


The performance of this goal is driven by the following indicators:

- Proportion of fish stocks sustainably exploited (1/2)
- Proportion of territorial waters protected (1/2)

Figure A0.14 shows that the performance of Goal 14 is hardly any better in the Optimistic-ERGP-scenario, compared to the No-ERGP-scenario. Still in 2030 only about half of the discrepancy between initial value and target is closed in the ERGP+SDG-scenario.

Figure A0.15: Goal 15 performance No-ERGP-scenario, Optimistic-ERGP-scenario, ERGP+SDG-scenario

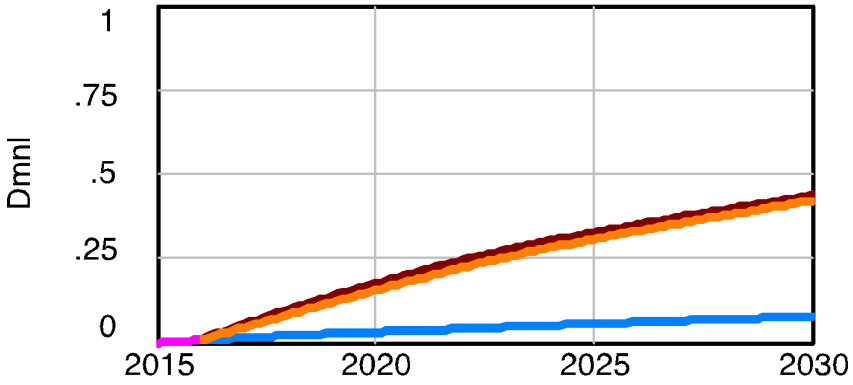


The performance of this goal is driven by the following indicators:

- Proportion of terrestrial areas effectively protected (1/4)
- Forest cover (1/4)
- Red list index (1/2)

Figure A0.15 shows that the performance of Goal 15 is saturated around 0.32 even for the ERGP+SDG-scenario while the performance is even quite a bit lower for the other two scenarios.

Figure A0.16: Goal 16 performance No-ERGP-scenario, Optimistic-ERGP-scenario, ERGP+SDG-scenario

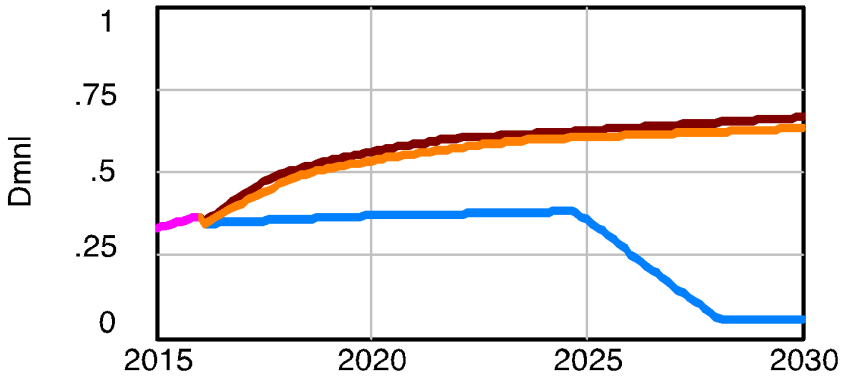


The performance of this goal is driven by the following indicators:

- Violence-related mortality (1/3)
- Bribery incidence (1/3)
- Normalized governance index [government effectiveness] (1/3)

As Figure A0.16 shows, there is very little improvement in the performance of Goal 16 in the No-ERGP-scenario unlike the other two scenarios which have substantial improvement. The ERGP+SDG-scenario is only marginally better than the Optimistic-ERGP-Scenario, though, and does not reach the goal; in fact, not even half of it is reached.

Figure A0.17: Goal 17 performance No-ERGP-scenario, Optimistic-ERGP-scenario, ERGP+SDG-scenario



The performance of this goal is driven by the following indicators:

- Domestic revenue as a share of GDP (1/18)
- Direct taxes as a share of GDP (1/18)
- Indirect taxes as a share of GDP (1/18)
- Proportion of domestic revenue from domestic taxes (1/6)
- Interest on public debt as a share of export (1/3)
- Grants as a share of domestic revenue (1/3)

Figure A0.17 shows a substantial drop in the performance of Goal 17 after an initial slight increase for the No-ERGP-scenario.

This is because public debt increases in that scenario and thus interest on public debt leaves the target range in the mid-2020s and then moves further away from the target. As this indicator continuously stays in the target range for the other two scenarios, goal performance is driven by the improvement from some of the other indicators. Still there are saturating tendencies towards 0.67.

Domestic revenue as a share of GDP is already meeting its target early on and is overperforming after a short while in the Optimistic-ERGP-scenario (Figure 86). Similarly, the indicators proportion of domestic revenue from domestic taxes and interest on public debt as a share of export already attain the respective targets in that scenario (Figures 89 & 91). Direct and indirect taxes are ramped up in the ERGP+SDG-scenario to meet the targets (16.9 per cent and 9.2 per cent of GDP respectively; Figures 87 & 88).

Note that the increase of additional taxes on international trade as a share of GDP in the Optimistic-ERGP-scenario was reduced to zero, as it is not necessary to reach the SDGs. In fact, it would even be harmful in terms of reaching the target for the indicator domestic revenue as share of GDP.

ANNEX 02:

STRUCTURAL TRAPS AND OTHER ISSUES IN THE NIGERIA POWER SECTOR

During the participatory modelling sessions at the workshops, the modelling experts gathered a lot of structural knowledge and insights and cast these into qualitative model structures. Unfortunately, most aspects that were uncovered through this qualitative modelling could not be incorporated into the simulation model iSDG-Nigeria. Much of the data that would have been needed to quantify the model structures developed at the workshop could not be provided. As a result, the structures of the special sectors needed to be severely curtailed based on data availability. However, some key insights and conclusions gained during the exercise should not be lost just because they could not be represented in iSDG-Nigeria. They are thus explained here.

There are a number of structural traps in the power system, that keeps the system from functioning properly and that can only be fixed through structural changes in the system. Importantly, structural trap means that the undesirable situation is self-stabilizing and resisting a change for the better because of the systemic structure which constitutes the trap. And there are many manifestations of the trap, including the investment trap, traps involving actors higher up in the value chain, traps related to estimated billing (instead of metering), load rejection trap, and the GDP trap. Others are the FDI trap, the exclusion for theft trap, the 60-day trap, the poor-neighbourhood-poor-service trap.

1. THE TRAPS

1.1 THE INVESTMENT TRAP

The power distribution companies are suffering from high "commercial losses", which means that the user of the electricity pays only for part of the electricity they use. However, the only way to improve the situation would be to invest in the following aspects:

- Providing every connection with an electricity meter

Carrying out inspections to discover electricity theft (bypassing of meters or illegal connections, bill payment delays)

- Increasing distribution capacity and replacing old technology to reduce load-shedding, thus improving reliability of service and, hence, the willingness of customers to register and pay rather than stealing electricity
- Human resource capacity of high quality

Since, however, the energy distribution companies are financially unviable because of the commercial losses they incur, they lack the money to make these investments. Of course, banks are unlikely to give loans to distribution companies because of lack of financial viability. According to the experts, this problem is aggravated by the reality that the total loans that Nigerian banks can give to the electricity sector have been capped. While this provision is understandable as it was put in place to protect the banking system from the systemic risks in the power sector, it naturally enegenders these very risks by closing the door on one possible way out.

1.2 TRAPS INVOLVING ACTORS HIGHER UP IN THE VALUE CHAIN

The effects of these commercial losses travel up the value chain because if distribution companies cannot pay transmission and generation companies for their services, then the latter will tend to either produce less electricity and if they do not follow that incentive, they

may themselves become financially unviable and unable to pay their fuel bills, which again tends to limit their generation power. Either way, lower generation means more load-shedding. This poorer service quality incentivizes people to steal electricity which, in turn, tends to ramp-up the commercial losses. Furthermore, if too little money moves up the value chain that may also prevent necessary investments into transmission and generation capacity, which again tends to reduce electricity service quality, which, once more, strengthens people's tendency to steal electricity or pay their bills late.

1.3 TRAPS RELATED TO ESTIMATED BILLING (INSTEAD OF METERING)

While in the long run, it appears to be a necessity for improving revenue collection, the estimated billing that occurs because of the lack of meters tends to produce incentives for distribution companies against installing meters. This may sound counterintuitive at first but it becomes understandable knowing that distribution companies have the possibility to overestimate the bills of registered electricity users to reduce their commercial losses (overbilling). This means that with every customer that moves from being estimated to being metered reduces the leverage of overbilling for distribution companies and, therefore, one of the few ways that distribution companies can use to improve revenue collection.

There is a second incentive for distribution companies against the installation of meters: estimated customers cannot tamper with or bypass their meter because they simply don't have one. Estimated billing can, therefore, be perceived as a lower risk for distribution companies in terms of revenue collection efficiency, unless this type of malpractice can be prevented. Unfortunately such behaviours are built on dissatisfaction with service quality, to which estimated billing contributes.

These economic incentives suggest that the system of estimated billing, instead of installing meters, tends to be self-sustaining. These incentives create invisible policy resistance that expresses itself in lower-than-expected meter installation rates. It is important to understand that this policy resistance is not caused by lack of character but that it has structural causes (the perverse incentives).

Importantly, this trap has two additional very undesirable consequences: when people perceive being overbilled (even though they may find it hard to prove it), their ensuing dissatisfaction with the service may incentivize some of them in the direction of electricity theft or late bill payment, which again reduces revenue collection efficiency, thereby further increasing commercial losses.

Alternatively, customers may conduct "billing adjustment malpractice": The billing adjustment complaint mechanism is actually supposed to protect customers against overbilling. If however, customers collude with the inspectors, this mechanism can overshoot its goal by reducing the bill below actual consumption. In a situation of perceived overbilling and poor service quality, some customers may enjoy the revenge or even perceive this practice as legitimate. Importantly, the more people conduct such billing adjustment malpractice, the lower the moral hurdle for the remaining customers to do likewise. Moreover, it may be difficult for distribution companies to pay investigators properly to reduce the incentive to accept such bribes because of lack of financial viability (another trap closes). It should also be noted that billing adjustment malpractice reduces the leverage that distribution companies perceive to gain through overbilling.

Another downside of estimated billing is that households and businesses have no incentive to save energy if they are estimated, because it will not impact their bill. This essentially means that because of estimated billing electricity usage is higher than what it would have been should all customers be metered. Consequently, more customers could be satisfied with the same electricity if

they were all metered which implies that load shedding could be reduced.

In other words, estimated billing indirectly leads to lower service quality resulting in customer frustration which may, in turn, contribute to behaviours that increase commercial losses for distribution companies.

The recent political move to outsource meter installation from distribution companies to Meter Asset Providers (MAP) is in principle a good idea. It appears very important however, that these are financially completely independent from distribution companies.

1.4 THE LOAD REJECTION TRAP

While the rejection of load by distribution companies may, to some degree, be explained by insufficient distribution capacity (see investment trap above), there may also be incentives to reject load. This may be counterintuitive at first because load-shedding implies that demand is higher than supply so one would expect distribution companies to be eager to deliver any load that they can get and that they can deliver. From that perspective it may, at first sight, seem bizarre, to reject load. If, however, a substantial part of the users on the distribution grid does not pay for the electricity used, it is not meaningful for discos to buy electricity much in excess of the amount they are actually paid for by consumers. If accepting a load rather than rejecting it would mean that a distribution company would deliver that load to a part of their grid that has a track record of not paying well, the distribution company would do itself a disfavour, because accepting the load may incur more additional costs than it would bring additional revenue. In other words, if the well-paying neighbourhoods are already covered by load, it can make economic sense for a distribution company to reject additional load rather than accepting it. It may be difficult for distribution companies to resist such economic incentives.

1.5 THE GDP TRAP

Poor electricity service quality decreases economic growth below what it could be with high service quality. Reduced economic growth implies reduced incomes for companies and households, which implies lower revenue collection efficiency for distribution companies because it implies lower ability of customers to pay their bills compared to a situation with high electricity service quality and consequently higher economic growth and higher incomes.

1.6 THE FDI TRAP

The power sector clearly needs investments to get out of some of these traps. While investment from the outside (foreign direct investment) may be considered a possible way out, this is merely a theoretical solution because investors are not likely to invest into a system that is financially not viable because such an investment would be considered a high risk. The high returns that are required to take high risks do not seem to be on the horizon in the power system either.

1.7 THE EXCLUSION FOR THEFT TRAP

To the understanding of the modellers in Nigeria (at least some types) of electricity theft are not a punishable crime by itself but are merely violations of the regulations or contracts between distribution companies and customers. If the distribution companies punish households discovered to have connected electricity illegally by excluding them for a while from registration or even charging an increased reconnection fee, the likely reaction, especially of poor households, is to simply reconnect illegally again. It could be worth thinking about ways to turn this around so that distribution companies could, instead, force-connect, force-install a meter and potentially penalize by charging increased tariffs.

1.8 THE 60-DAY TRAP

One policy that may backfire is the policy that if distribution companies do not manage to install an ordered meter within 60 days, customers will not have to pay for their electricity until they finally get the meter installed. On first sight, this seems to be a good idea to incentivize the distribution companies to install meters. However, if they can't do that due to financial constraints (buying and installing the meters) or HR constraints, this could backfire because if a large number of customers would order meters and distribution companies could not satisfy this demand in a timely manner, revenue collection would drop thereby further aggravating the lack of resource that caused the problem in the first place.

1.9 THE POOR-NEIGHBOURHOOD-POOR-SERVICE TRAP

On the one hand, it is certainly applaudable that Nigeria uses an inverted electricity pricing scheme where the poor pay less per kWh than the wealthy. However, this creates undesirable incentives for distribution companies: Since this way poor neighbourhoods not only pay less because they use less electricity but also pay less per kWh, there is a strong incentive for distribution companies to distribute load-shedding unevenly so that wealthy neighbourhoods get more hours of electricity than do poor ones. From an economic perspective of distribution companies this makes sense, and they may even feel that it is justifiable to provide a better service to those who pay better. However, from a poverty reduction perspective this should be avoided because poor people cannot substitute grid electricity by easily running generators as can the wealthy particularly because electricity from a generator is more expensive than grid electricity. For poor people electricity is a critical enabler to escape poverty: the chances of many new small businesses to be profitable increases with reliability of electricity service.

2. ON THE NEED TO DIFFERENTIATE DIFFERENT TYPES OF ELECTRICITY ACCESS

The definition of "access to electricity" and the method of gathering such data may lead to substantially differing results and may make it difficult to interpret data if the definition is not known. Should a household that owns a small-scale diesel/gasoline generator be considered to have access to electricity? Even if they are so poor that they can only afford to run it rarely? How about households that own batteries that are recharged elsewhere as they can charge their mobile phones that way, but does that constitute electricity access? How about a household that lives in an area where grid electricity is principally available, but the household is not connected to the electricity grid because the high connection cost is an impediment? How about a household that is illegally connected? How about a situation where the unregistered connection is caused by long delays of distribution companies connecting households but not by the unwillingness of the household to pay? Should that still be considered an illegal connection?

Instead of the diffuse indicator "electricity access" it should be considered if the following indicators could be more useful:

- Grid coverage
- Connection coverage
- Registration coverage
- Metering coverage

Grid coverage describes the proportion of households living in an area where they could be connected to the grid independent of whether they are connected or not. It basically means that there is a distribution power line close by.

Connection coverage describes the proportion of households that is connected to the grid, irrespective of whether these connections are registered or not.

Registration coverage describes the proportion of households that is registered (and connected to the grid).

Metering coverage describes the proportion of households that is metered (which implies that they are also connected and registered).

One advantage of the above measures is that they allow for calculating secondary measures, e.g.

Grid coverage – connection coverage = proportion of households not connected despite possibility

This is an important measure the reduction of which could be a political goal. The NDHS indicates that this proportion could be high, because when asked why they were not connected to the grid many households responded with "too high connection fee".

The connection coverage may actually have to be calculated indirectly, for example:

Connection coverage = registration coverage + proportion of households connected illegally

The latter may need to be estimated although aided by some type of clever type of anonymous sampling.

Furthermore:

Registration coverage – metering coverage = proportion of households with estimated billing

One could also measure people instead of households if that was feasible. Furthermore, it may be a good idea to measure separately local mini-grids that are not connected to the national grid using similar measures. Likewise, businesses could also be measured separately by similar measures.

3.On Transparency of Electricity Provision Service Quality

In order to replace rumours with knowledge and to use public pressure to drive improvements, it could be helpful to routinely measure and publish respective indicators such as:

- Average Service Availability Index (ASAI)
- System Average Interruption Duration Index (SAIDI)
- Customer Average Interruption Duration Index (CAIDI)
- System Average Interruption Frequency Index (SAIFI)
- Customer Average Interruption Frequency Index (CAIFI)
- Customer Total Average Interruption Duration Index (CTAIDI)

It is characteristic of the current system that none such data could be made available for this project.

If there was furthermore a requirement to announce scheduled load-shedding, this would reveal unscheduled load shedding. This could make potential unfairness in load-shedding transparent: there are economic incentives for distribution companies to have a lower black-out duration in neighbourhoods where revenue collection is high, and it must be difficult to resist such structural incentives, especially if such decisions are not transparent.

4. On the Problems that Will Occur Once All Current Problems Are Solved: The Need for Early Action on Metering Diffusion

If all of the major problems in the power sector were solved there would be a dramatic change from a supply-driven system to a demand-driven system. In any power system, realized demand has to be equal to realized supply, otherwise frequency and voltage go out of bounds. Currently, in Nigeria, potential demand vastly exceeds potential supply, and the two are balanced by load-shedding, i.e., by regulating realized demand to be far below potential demand. Power systems function very differently where potential supply exceeds demand: Very sophisticated methods of demand forecasting are used to adapt the supply to potential demand. If there is still an unanticipated undersupply, powerplants that can be powered up fast (e.g., modern gas or pumped storage powerplants) are used to fill the gap. The problem for Nigeria will be that demand forecasting requires historic time series of data demand. That data is not produced in the current system because few customers are metered and furthermore the demand that would

be felt by the grid if there was no load-shedding is still lower than the long-term demand due to permanent self-generation and behavioural adaption (lower use) to the current system. To get longer time series of metering data means that getting every customer metered as soon as possible is of paramount importance.

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ANNEXE 1: SDGS -

GLOBAL FACTS AND FIGURES UNDERPINNING THE NEED FOR POLICY INTEGRATION

1 NO POVERTY

GOAL 1: END POVERTY IN ALL ITS FORMS EVERYWHERE

FACTS AND FIGURES

- 836 million people still live in extreme poverty
- About one in five persons in developing regions lives on less than US$1.25 per day
- The overwhelming majority of people living on less than US$1.25 a day belong to two regions: Southern Asia and sub-Saharan Africa
- High poverty rates are often found in small, fragile and conflict-affected countries
- One in four children under age five in the world has inadequate height for his or her age
- Every day in 2014, 42,000 people had to abandon their homes to seek protection due to conflict

2 ZERO HUNGER

GOAL 2: END HUNGER, ACHIEVE FOOD SECURITY AND IMPROVED NUTRITION AND PROMOTE SUSTAINABLE AGRICULTURE

FACTS AND FIGURES

HUNGER

- Globally, one in nine people in the world today (795 million) are undernourished
- The vast majority of the world's hungry people live in developing countries, where 12.9 per cent of the population is undernourished.
- Asia is the continent with the most hungry people – two-thirds of the total. The percentage in southern Asia has fallen in recent years, but in western Asia it has increased slightly.
- Southern Asia faces the greatest hunger burden, with about 281 million undernourished people. In sub-Saharan Africa, projections for the 2014-2016 period indicate a rate of undernourishment of almost 23 per cent.
- Poor nutrition causes nearly half (45 per cent) of deaths in children under five – 3.1 million children each year.
- One in four of the world's children suffer stunted growth. In developing countries, the proportion can rise to one in three.
- 66 million primary school-age children attend classes hungry across the developing world, with 23 million in Africa alone.

FOOD SECURITY

- Agriculture is the single largest employer in the world, providing livelihoods for 40 per cent of today's global population. It is the largest source of income and jobs for poor rural households.
- 500 million small farms worldwide, most still rainfed, provide up to 80 per cent of food consumed in a large part of the de veloping world. Investing in smallholder women and men is an important way to increase food security and nutrition for the poorest, as well as food production for local and global markets.
- Since the 1900s, some 75 per cent of crop diversity has been lost from farmers' fields. Better use of agricultural biodiversity can contribute to more nutritious diets, enhanced livelihoods for farming communities and more resilient and sustainable farming systems.
- If women farmers had the same access to resources as men, the number of hungry in the world could be reduced by up to 150 million.
- 1.4 billion people have no access to electricity worldwide – most of whom live in rural areas of the developing world. Energy poverty in many regions is a fundamental barrier to reducing hunger and ensuring that the world can produce enough food to meet future demand.

3 GOOD HEALTH AND WELL-BEING

GOAL 3: ENSURE HEALTHY LIVES AND PROMOTE WELL-BEING FOR ALL AT ALL AGES

FACTS AND FIGURES

CHILD HEALTH

- 17,000 fewer children die each day than in 1990, but more than six million children still die before their fifth birthday each year
- Since 2000, measles vaccines have averted nearly 15.6 million deaths
- Despite determined global progress, an increasing proportion of child deaths are in sub-Saharan Africa and SouthernAsia.
- Four out of every five deaths of children under age five occur in these regions.
- Children born into poverty are almost twice as likely to die before the age of five as those from wealthier families.
- Children of educated mothers—even mothers with only primary schooling—are more likely to survive than children of mothers with no education.

MATERNAL HEALTH

- Maternal mortality has fallen by almost 50 per cent since 1990
- In Eastern Asia, Northern Africa and Southern Asia, maternal mortality has declined by around two-thirds
- But maternal mortality ratio – the proportion of mothers that do not survive childbirth compared to those who do – in developing regions is still 14 times higher than in the developed regions
- More women are receiving antenatal care. In developing regions, antenatal care increased from 65 per cent in 1990 to 83 per cent in 2012

- Only half of women in developing regions receive the recommended amount of health care they need
- Fewer teens are having children in most developing regions, but progress has slowed. The large increase in contraceptive use in the 1990s was not matched in the 2000s
- The need for family planning is slowly being met for more women, but demand is increasing at a rapid pace

HIV and AIDS, Malaria and other diseases

- At the end of 2014, there were 13.6 million people accessing antiretroviral therapy
- New HIV infections in 2013 were estimated at 2.1 million, which was 38 per cent lower than in 2001
- At the end of 2013, there were an estimated 35 million people living with HIV
- At the end of 2013, 240 000 children were newly infected with HIV
- New HIV infections among children have declined by 58 per cent since 2001
- Globally, adolescent girls and young women face gender-based inequalities, exclusion, discrimination and violence, which put them at increased risk of acquiring HIV
- HIV is the leading cause of death for women of reproductive age worldwide
- TB-related deaths in people living with HIV have fallen by 36 per cent since 2004
- There were 250 000 new HIV infections among adolescents in 2013, two thirds of which were among adolescent girls
- AIDS is now the leading cause of death among adolescents (aged 10–19) in Africa and the second most common cause of death among adolescents globally
- In many settings, adolescent girls' right to privacy and bodily autonomy is not respected, as many report that their first sexual experience was forced
- As of 2013, 2.1 million adolescents were living with HIV
- Over 6.2 million malaria deaths have been averted between 2000 and 2015, primarily of children under five years of age in sub-Saharan Africa. The global malaria incidence rate has fallen by an estimated 37 per cent and the mortality rates by 58 per cent.
- Between 2000 and 2013, tuberculosis prevention, diagnosis and treatment interventions saved an estimated 37 million lives. The tuberculosis mortality rate fell by 45 per cent and the prevalence rate by 41 per cent between 1990 and 2013

4 QUALITY EDUCATION

GOAL 4: ENSURE INCLUSIVE AND QUALITY EDUCATION FOR ALL AND PROMOTE LIFELONG LEARNING

FACTS AND FIGURES

- Enrolment in primary education in developing countries has reached 91 per cent but 57 million children remain out of school.
- More than half of children that have not enrolled in school live in sub-Saharan Africa.
- An estimated 50 per cent of out-of-school children of primary school age live in conflict-affected areas.
- 103 million youth worldwide lack basic literacy skills, and more than 60 per cent of them are women.

5 GENDER EQUALITY

GOAL 5: ACHIEVE GENDER EQUALITY AND EMPOWER ALL WOMEN AND GIRLS

FACTS AND FIGURES

- About two-thirds of countries in the developing regions have achieved gender parity in primary education.
  In Southern Asia, only 74 girls were enrolled in primary school for every 100 boys in 1990. By 2012, the enrolment ratios
- were the same for girls as for boys.
- In sub-Saharan Africa, Oceania and Western Asia, girls still face barriers to entering both primary and secondary school.
- Women in Northern Africa hold less than one in five paid jobs in the non-agricultural sector. The proportion of women in paid employment outside the agriculture sector has increased from 35 per cent in 1990 to 41 per cent in 2015.
  In 46 countries, women now hold more than 30 per cent of seats in the national parliament in at least one chamber.

6 CLEAN WATER AND SANITATION

GOAL 6: ENSURE ACCESS TO WATER AND SANITATION FOR ALL

FACTS AND FIGURES

- 2.6 billion people have gained access to improved drinking water sources since 1990, but 663 million people are still without
  At least 1.8 billion people globally use a source of drinking water that is fecally contaminated
- Between 1990 and 2015, the proportion of the global population using an improved drinking water source has increased from 76 per cent to 91 per cent.
- But water scarcity affects more than 40 per cent of the global population and is projected to rise.Over 1.7 billion people are currently living in river basins where water use exceeds recharge

- 2.4 billion people lack access to basic sanitation services, such as toilets or latrines
- More than 80 per cent of wastewater resulting from human activities is discharged into rivers or sea without any pollution removal
- Each day, nearly 1,000 children die due to preventable water and sanitation-related diarrhoeal diseases
- Hydropower is the most important and widely-used renewable source of energy and as of 2011, represented 16 per cent of total electricity production worldwide
- Approximately 70 per cent of all water abstracted from rivers, lakes and aquifers is used for irrigation.
- Floods and other water-related disasters account for 70 per cent of all deaths related to natural disasters

7 AFFORDABLE AND CLEAN ENERGY

GOAL 7: ENSURE ACCESS TO AFFORDABLE, RELIABLE, SUSTAINABLE AND MODERN ENERGY FOR ALL

FACTS AND FIGURES

- One in five people still lacks access to modern electricity
- 3 billion people rely on wood, coal, charcoal or animal waste for cooking and heating
- Energy is the dominant contributor to climate change, accounting for around 60 per cent of total global greenhouse gas emissions
- Reducing the carbon intensity of energy is a key objective in long-term climate goals.

8 DECENT WORK AND ECONOMIC GROWTH

GOAL 8: PROMOTE INCLUSIVE AND SUSTAINABLE ECONOMIC GROWTH, EMPLOYMENT AND DECENT WORK FOR ALL

FACTS AND FIGURES

- Global unemployment increased from 170 million in 2007 to nearly 202 million in 2012, of which about 75 million are young women and men.
- Nearly 2.2 billion people live below the US$2 poverty line and that poverty eradication is only possible through stable and well-paid jobs.
- 470 million jobs are needed globally for new entrants to the labour market between 2016 and 2030.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

GOAL 9: BUILD RESILIENT INFRASTRUCTURE, PROMOTE SUSTAINABLE INDUSTRIALIZATION AND FOSTER INNOVATION

FACTS AND FIGURES

- Basic infrastructure like roads, information and communication technologies, sanitation, electrical power and water re mains scarce in many developing countries
- About 2.6 billion people in the developing world are facing difficulties in accessing electricity full time
- 2.5 billion people worldwide lack access to basic sanitation, and almost 800 million people lack access to water, many hundreds of millions of them in sub-Saharan Africa and South Asia
- 1-1.5 billion people do not have access to reliable phone services
- Quality infrastructure is positively related to the achievement of social, economic and political goals
- Inadequate infrastructure leads to a lack of access to markets, jobs, information and training, creating a major barrier to doing business
- Undeveloped infrastructure limits access to health care and education
- For many African countries, particularly the lower-income countries, the existent constraints regarding infrastructure affect firm productivity by around 40 per cent
- Manufacturing is an important employer, accounting for around 470 million jobs worldwide in 2009 – or around 16 per cent of the world's workforce of 2.9 billion. In 2013, it is estimated that there were more than half a billion jobs in manufacturing
- Industrialization's job multiplication effect has a positive impact on society. Every one job in manufacturing creates 2.2 jobs in other sectors
- Small- and medium-sized enterprises that engage in industrial processing and manufacturing are the most critical for the early stages of industrialization and are typically the largest job creators. They make up over 90 per cent of business world wide and account for between 50-60 per cent of employment
- In countries where data are available, the number of people employed in renewable energy sectors is presently around 2.3 million. Given the present gaps in information, this is no doubt a very conservative figure. Because of strong rising interest in energy alternatives, the possible total employment for renewables by 2030 is 20 million jobs
- Least developed countries have immense potential for industrialization in food and beverages (agro-industry), and textiles and garments, with good prospects for sustained employment generation and higher productivity

  Middle-income countries can benefit from entering the basic and fabricated metals industries, which offer a range of products facing rapidly growing international demand

  In developing countries, barely 30 per cent of agricultural production undergoes industrial processing. In high-income countries, 98 per cent is processed. This suggests that there are great opportunities for developing countries in agribusiness

10 REDUCED INEQUALITIES

GOAL 10: REDUCE INEQUALITY WITHIN AND AMONG COUNTRIES

FACTS AND FIGURES

- On average—and taking into account population size—income inequality increased by 11 per cent in developing countries between 1990 and 2010
- A significant majority of households in developing countries—more than 75 per cent of the population—are living today in societies where income is more unequally distributed than it was in the 1990s
- Evidence shows that, beyond a certain threshold, inequality harms growth and poverty reduction, the quality of relations in the public and political spheres and individuals' sense of fulfilment and self-worth
- There is nothing inevitable about growing income inequality; several countries have managed to contain or reduce income inequality while achieving strong growth performance
- Income inequality cannot be effectively tackled unless the underlying inequality of opportunities is addressed
- In a global survey conducted by UN Development Programme, policymakers from around the world acknowledged that inequality in their countries is generally high and potentially a threat to long-term social and economic development
- Evidence from developing countries shows that children in the poorest 20 per cent of the populations are still up to three times more likely to die before their fifth birthday than children in the richest quintiles
- Social protection has been significantly extended globally, yet persons with disabilities are up to five times more likely than average to incur catastrophic health expenditures
- Despite overall declines in maternal mortality in the majority of developing countries, women in rural areas are still up to three times more likely to die while giving birth than women living in urban centres

11 SUSTAINABLE CITIES AND COMMUNITIES

GOAL 11: MAKE CITIES INCLUSIVE, SAFE, RESILIENT AND SUSTAINABLE

FACTS AND FIGURES

- Half of humanity – 3.5 billion people – lives in cities today
- By 2030, almost 60 per cent of the world's population will live in urban areas
- 95 per cent of urban expansion in the next decades will take place in developing world
- 828 million people live in slums today and the number keeps rising
- The world's cities occupy just 3 per cent of the Earth's land, but account for 60-80 per cent of energy consumption and 75 per cent of carbon emissions
- Rapid urbanization is exerting pressure on fresh water supplies, sewage, the living environment, and public health
- But the high density of cities can bring efficiency gains and technological innovation while reducing resource and energy consumption

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

GOAL 12: ENSURE SUSTAINABLE CONSUMPTION AND PRODUCTION PATTERNS

FACTS AND FIGURES

- Each year, an estimated one-third of all food produced – equivalent to 1.3 billion tonnes worth around US$1 trillion – ends up rotting in the bins of consumers and retailers, or spoiling due to poor transportation and harvesting practices
- If people worldwide switched to energy-efficient lightbulbs the world would save US$120 billion annually
- Should the global population reach 9.6 billion by 2050, the equivalent of almost three planets could be required to provide the natural resources needed to sustain current lifestyles

WATER

- Less than 3 per cent of the world's water is fresh (drinkable), of which 2.5 per cent is frozen in the Antarctica, Arctic and glaciers. Humanity must, therefore, rely on 0.5 per cent for all of man's ecosystem's and freshwater needs.
- Man is polluting water faster than nature can recycle and purify water in rivers and lakes.
- More than 1 billion people still do not have access to freshwater.
- Excessive use of water contributes to global water stress.
- Water is free from nature but the infrastructure needed to deliver it is expensive.

ENERGY

- Despite technological advances that have promoted energy efficiency gains, energy use in OECD countries will continue to grow another 35 per cent by 2020. Commercial and residential energy use is the second most rapidly growing area of global energy use after transport.
- In 2002 the motor vehicle stock in OECD countries was 550 million vehicles (75 per cent of which were personal cars). A 32 per cent increase in vehicle ownership is expected by 2020. At the same time, motor vehicle kilometres are projected to increase by 40 per cent, and global air travel is projected to triple in the same period.
- Households consume 29 per cent of global energy and consequently contribute to 21 per cent of resultant CO2 emissions. One-fifth of the world's final energy consumption in 2013 was from renewables.

FOOD

- While substantial environmental impacts from food occur in the production phase (agriculture, food processing), house holds influence these impacts through their dietary choices and habits. This consequently affects the environment through food-related energy consumption and waste generation.
- 1.3 billion tonnes of food is wasted every year while almost 1 billion people go undernourished and another 1 billion hungry.
- Overconsumption of food is detrimental to our health and the environment.
- 2 billion people globally are overweight or obese.
- Land degradation, declining soil fertility, unsustainable water use, overfishing and marine environment degradation are all lessening the ability of the natural resource base to supply food.
- The food sector accounts for around 30 per cent of the world's total energy consumption and accounts for around 22 per cent of total Greenhouse Gas emissions.

13 CLIMATE ACTION

GOAL 13: TAKE URGENT ACTION TO COMBAT CLIMATE CHANGE AND ITS IMPACTS

FACTS AND FIGURES

Thanks to the Intergovernmental Panel on Climate Change we know:

- From 1880 to 2012, the average global temperature increased by 0.85°C. To put this into perspective, for each 1 degree of
- temperature increase, grain yields decline by about 5 per cent. Maize, wheat and other major crops have experienced significant yield reductions at the global level of 40 megatonnes per year between 1981 and 2002 due to a warmer climate.
- Oceans have warmed, the amounts of snow and ice have diminished, and sea level has risen. From 1901 to 2010,
- the global average sea level rose by 19 cm as oceans expanded due to warming and ice melted. The Arctic's sea ice extent has shrunk in every successive decade since 1979, with 1.07 million km² of ice loss every decade
- Given current concentrations and on-going emissions of greenhouse gases, it is likely that by the end of this century, the increase in global temperature will exceed 1.5°C compared to 1850 to 1900 for all but one scenario. The world's oceans will warm and ice melt will continue. Average sea level rise is predicted as 24 – 30cm by 2065 and 40-63cm by 2100. Most aspects of climate change will persist for many centuries even if emissions are stopped
- Global emissions of carbon dioxide (CO2) have increased by almost 50 per cent since 1990
- Emissions grew more quickly between 2000 and 2010 than in each of the three previous decades
- It is still possible, using a wide array of technological measures and changes in behaviour, to limit the increase in global mean temperature to two degrees Celsius above pre-industrial levels
- Major institutional and technological change will give a better than even chance that global warming will not exceed this threshold

14 LIFE BELOW WATER

GOAL 14: CONSERVE AND SUSTAINABLY USE THE OCEANS, SEAS AND MARINE RESOURCES

FACTS AND FIGURES

- Oceans cover three-quarters of the Earth's surface, contain 97 per cent of the Earth's water, and represent 99 per cent of the living space on the planet by volume
- Over three billion people depend on marine and coastal biodiversity for their livelihoods
- Globally, the market value of marine and coastal resources and industries is estimated at US$3 trillion per year or about 5 per cent of global GDP
- Oceans contain nearly 200,000 identified species, but actual numbers may lie in the millions
- Oceans absorb about 30 per cent of carbon dioxide produced by humans, buffering the impacts of global warming
- Oceans serve as the world's largest source of protein, with more than 3 billion people depending on the oceans as their pri mary source of protein

- Marine fisheries directly or indirectly employ over 200 million people
- Subsidies for fishing are contributing to the rapid depletion of many fish species and are preventing efforts to save and re store global fisheries and related jobs, causing ocean fisheries to generate US$ 50 billion less per year than they could
- As much as 40 per cent of the world oceans are profoundly affected by human activities, including pollution, depleted fisheries, and loss of coastal habitats
- As much as 40 per cent of the world oceans are profoundly affected by human activities, including pollution, depleted fisheries, and loss of coastal habitats

15 LIFE ON LAND

GOAL 15: SUSTAINABLY MANAGE FORESTS, COMBAT DESERTIFICATION, HALT AND REVERSE LAND DEGRADATION, HALT BIODIVERSITY LOSS

FACTS AND FIGURES

FORESTS

- Around 1.6 billion people depend on forests for their livelihood. This includes some 70 million indigenous people
- Forests are home to more than 80 per cent of all terrestrial species of animals, plants and insects

DESERTIFICATION

- 2.6 billion people depend directly on agriculture, but 52 per cent of the land used for agriculture is moderately or severely affected by soil degradation
- As of 2008, land degradation affected 1.5 billion people globally
- Arable land loss is estimated at 30 to 35 times the historical rate
- Due to drought and desertification, each year 12 million hectares are lost (23 hectares per minute), where 20 million tons of grain could have been grown
- 74 per cent of the poor are directly affected by land degradation globally

BIODIVERSITY

- Of the 8,300 animal breeds known, 8 per cent are extinct and 22 per cent are at risk of extinction
- Of the over 80,000 tree species, less than 1 per cent have been studied for potential use
- Fish provide 20 per cent of animal protein to about 3 billion people. Only ten species provide about 30 per cent of marine capture fisheries and ten species provide about 50 per cent of aquaculture production
- Over 80 per cent of the human diet is provided by plants. Only three cereal crops – rice, maize and wheat – provide 60 per cent of energy intake
- As many as 80 per cent of people living in rural areas in developing countries rely on traditional plant-based medicines for basic

HEALTHCARE

- Micro-organisms and invertebrates are key to ecosystem services, but their contributions are still poorly known and rarely acknowledged

GOAL 16: PROMOTE JUST, PEACEFUL AND INCLUSIVE SOCIETIES

FACTS AND FIGURES

Goal 16 of the Sustainable Development Goals is dedicated to the promotion of peaceful and inclusive societies for sustainable development, the provision of access to justice for all, and building effective, accountable institutions at all levels.

- Among the institutions most affected by corruption are the judiciary and police
- Corruption, bribery, theft and tax evasion cost some US $1.26 trillion for developing countries per year; this amount of money could be used to lift those who are living on less than US$1.25 a day above US$1.25 for at least six years
- The rate of children leaving primary school in conflict affected countries reached 50 per cent in 2011, which accounts to 28.5 million children, showing the impact of unstable societies on one of the major goals of the post 2015 agenda: education.
- The rule of law and development have a significant interrelation and are mutually reinforcing, making it essential for sustainable development at the national and international level
- Significantly reduce all forms of violence and related death rates everywhere
- End abuse, exploitation, trafficking and all forms of violence against and torture of children
- Promote the rule of law at the national and international levels and ensure equal access to justice for all

GOAL 17: REVITALIZE THE GLOBAL PARTNERSHIP FOR SUSTAINABLE DEVELOPMENT

FACTS AND FIGURES

- Official development assistance stood at US$135.2 billion in 2014, the highest level ever recorded
- 79 per cent of imports from developing countries enter developed countries duty-free
- The debt burden on developing countries remains stable at about 3 per cent of export revenue
- The number of Internet users in Africa almost doubled in the past four years
- 30 per cent of the world's youth are digital natives, active online for at least five years
- But more four billion people do not use the Internet, and 90 per cent of them are from the developing world

Annex 2: Schematic Illustrations of the Special Sectors

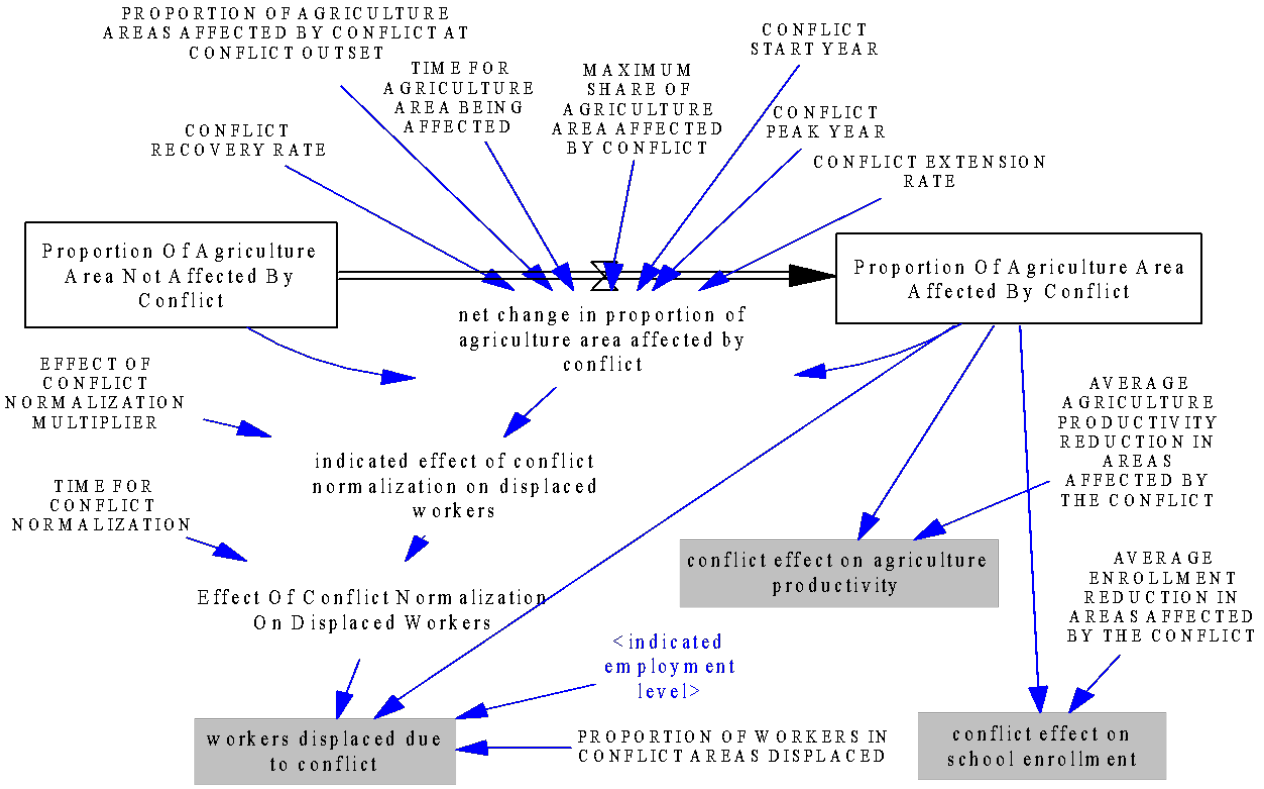

Figure A2.1: Special sector Conflict. policy and scenario variables, variables from other (sub-)sectors, variables with grey background used in other sectors

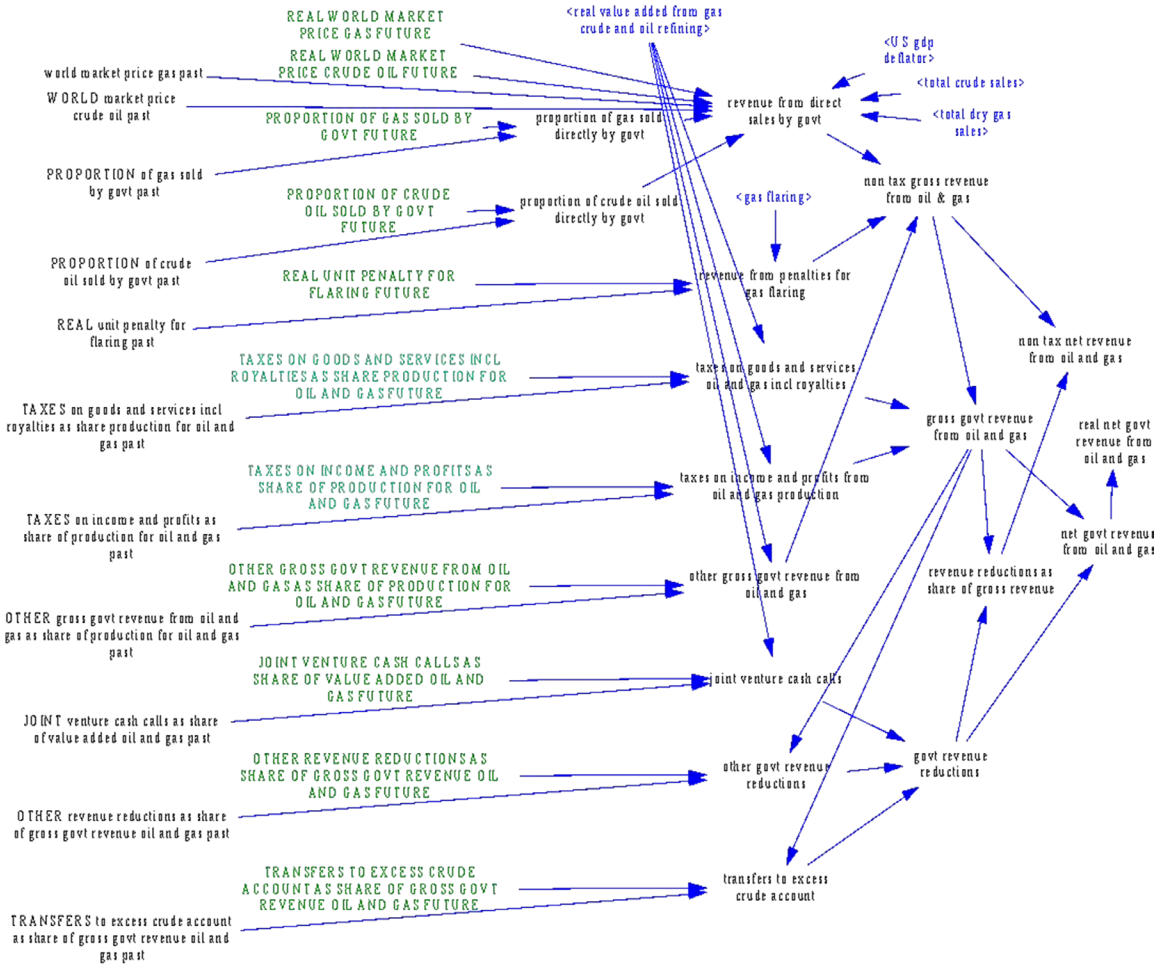

Figure A2.2: Subsector Govt.-revenue of special sector Oil and Gas policy and scenario variables, variables from other (sub-)sectors .

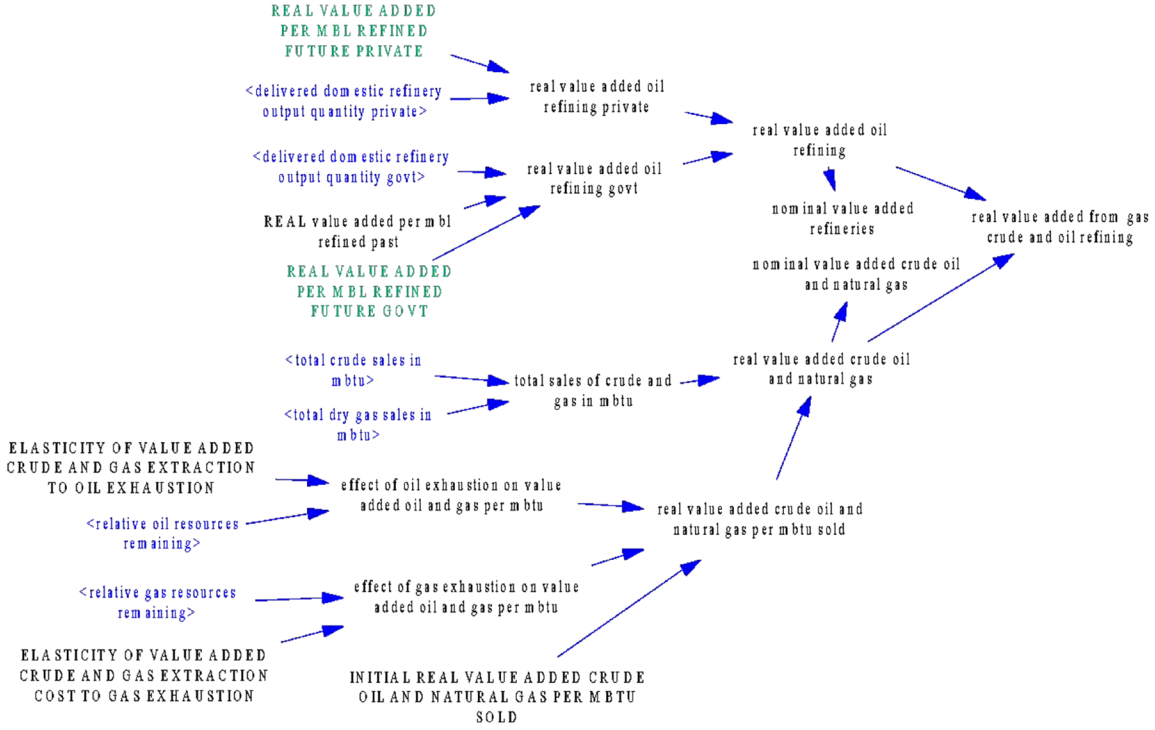

Figure A2.3: Subsector Value-Added of special sector Oil and Gas; policy and scenario variables, variables from other (sub-)sectors .

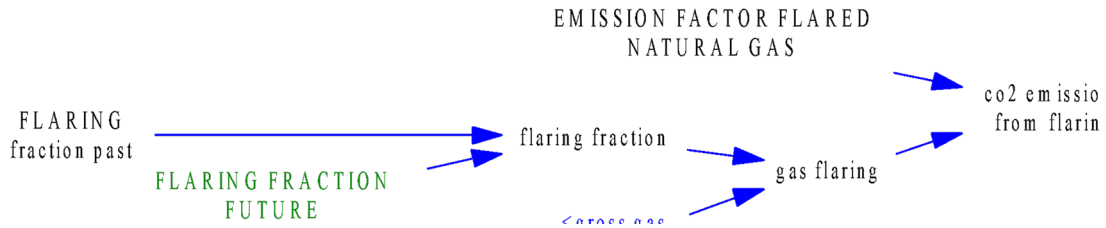

Figure A2.4: Subsector Flaring and resulting CO2-Emissions of special sector Oil and Gas; policy and scenario variables, variables from other (sub-)sectors .

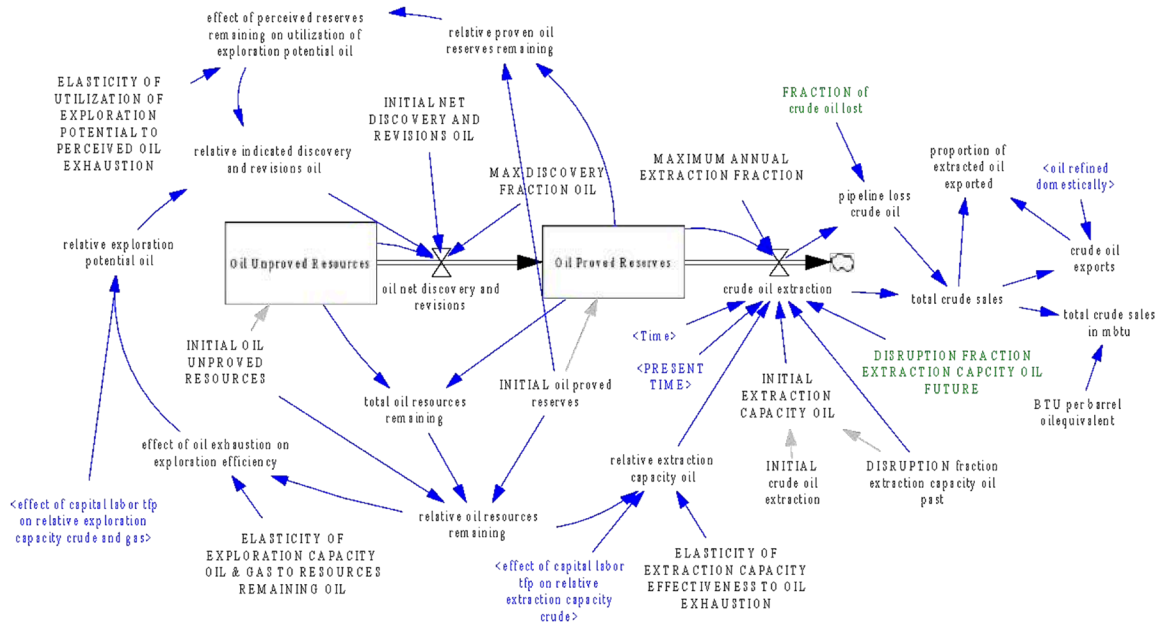

Figure A2.5: Subsector Crude Oil Extraction of special sector Oil and Gas; policy and scenario variables, variables from other (sub-)sectors .

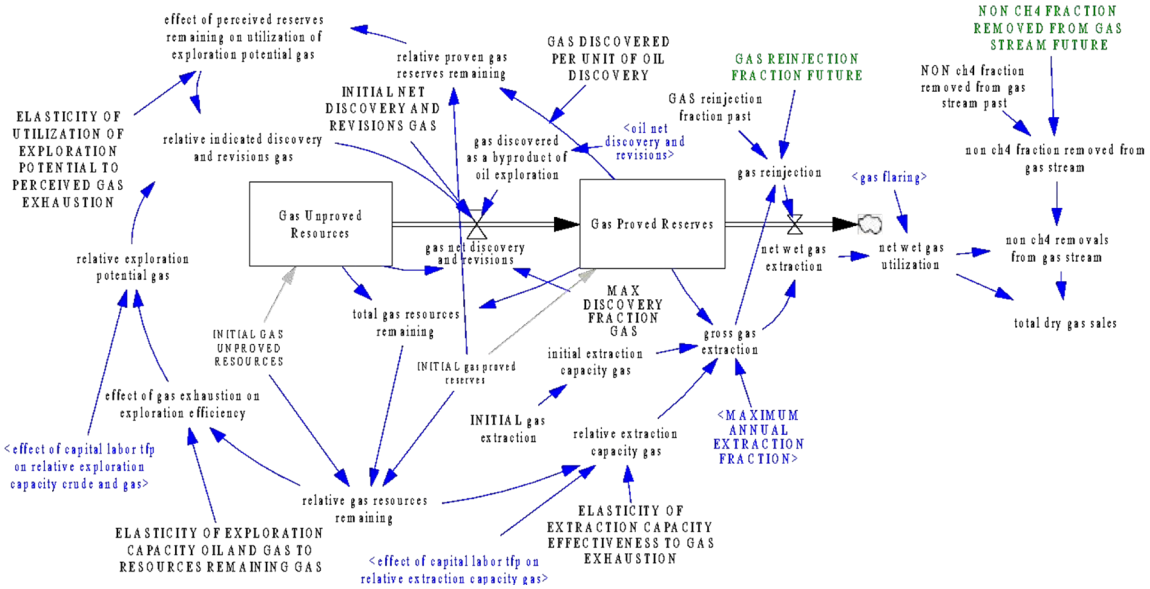

Figure A2.6: Subsector Natural Gas Extraction of special sector Oil and Gas; policy and scenario variables, variables from other (sub-)sectors .

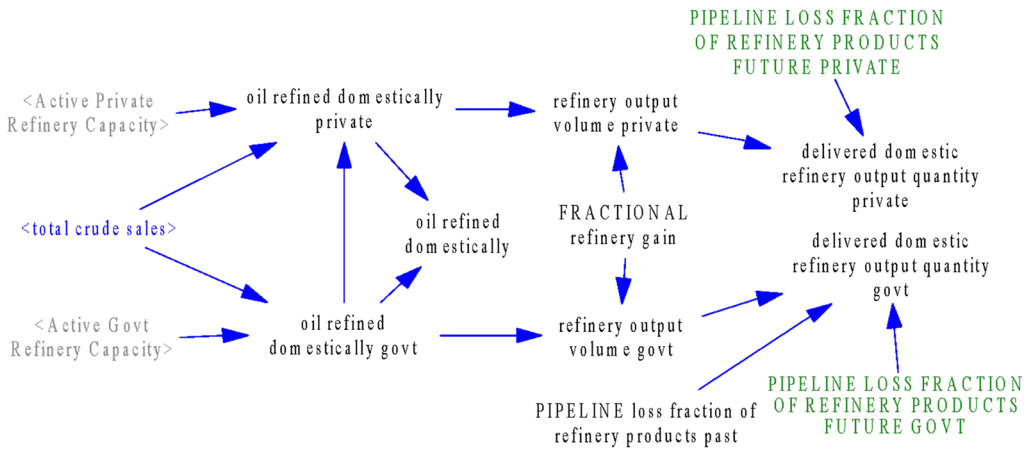

Figure A2.7: Subsector Domestic Oil Refining Output of special sector Oil and Gas; policy and scenario variables, variables from other (sub-)sectors .

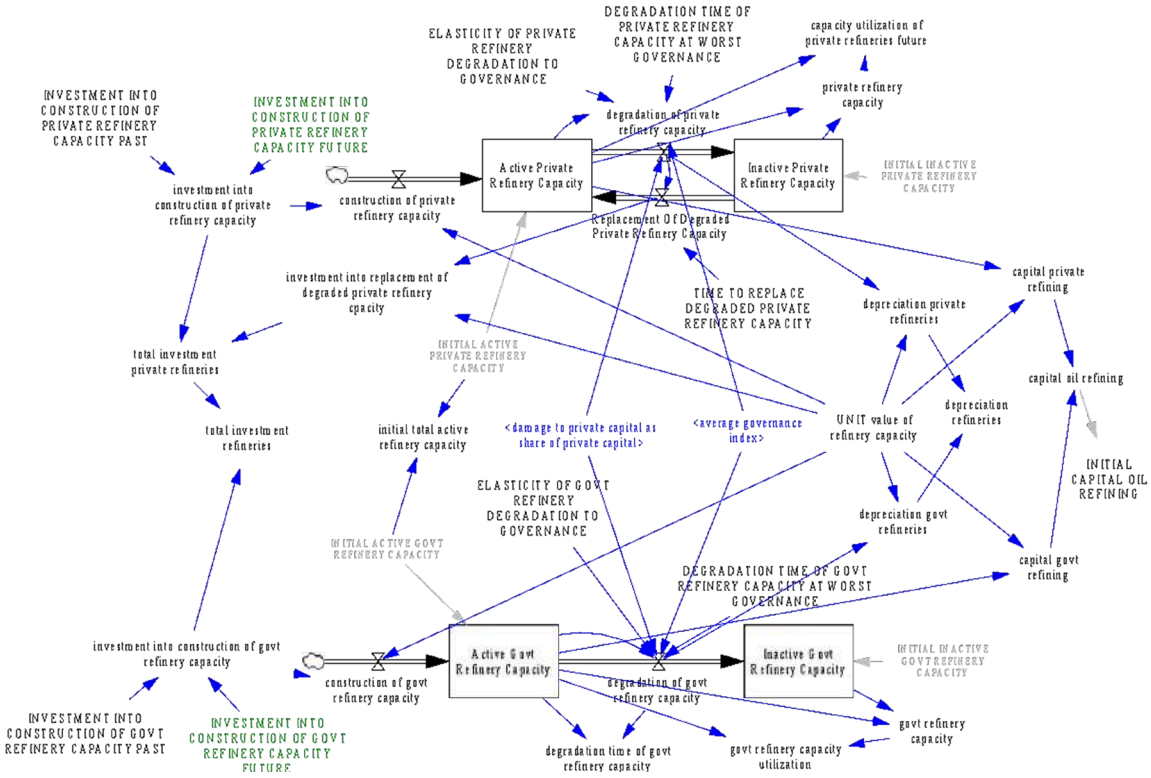

Figure A2.8: Subsector Domestic Oil Refining Capacity of special sector Oil and Gas; policy and scenario variables, variables from other (sub-)sectors .

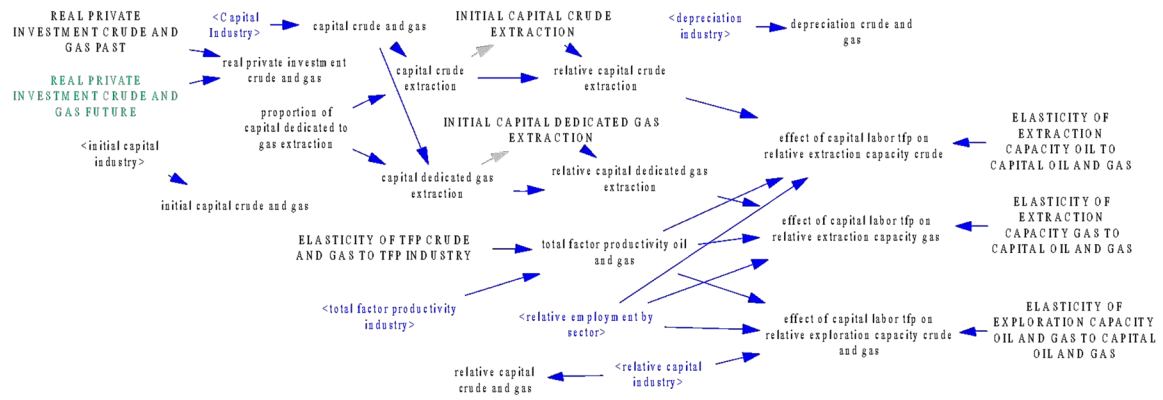

Figure A2.9: Subsector Investment, Extraction- and Exploration capacity of special sector Oil and Gas; policy policy and scenario variables, variables from other (sub-)sectors .

Note that some aspects such as how investments translate into extraction capital are not shown as they are represented in the industry sector

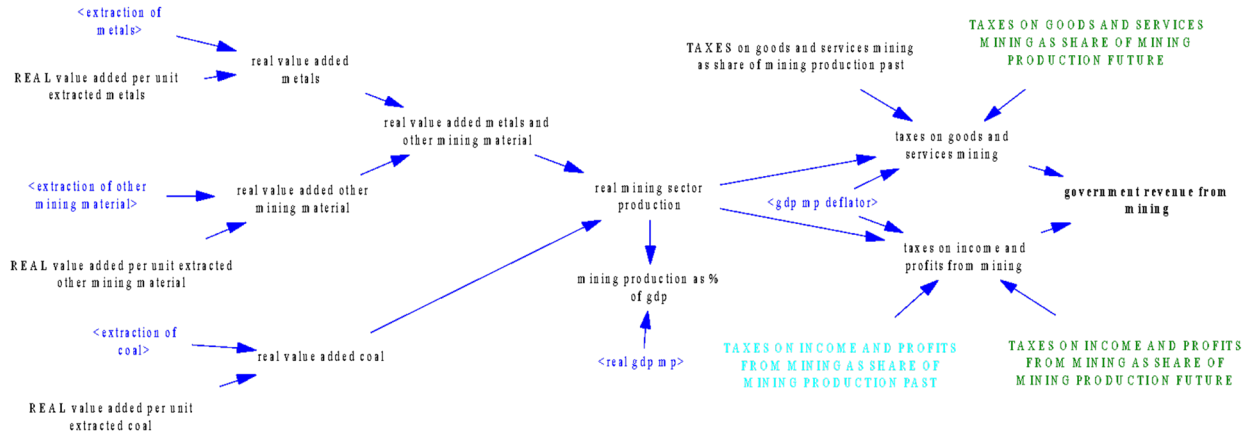

Figure A2.10: Subsector Value added & Govt revenue from the mining of special sector solid minerals mining; policy and scenario variables, variables from other (sub-)sectors .

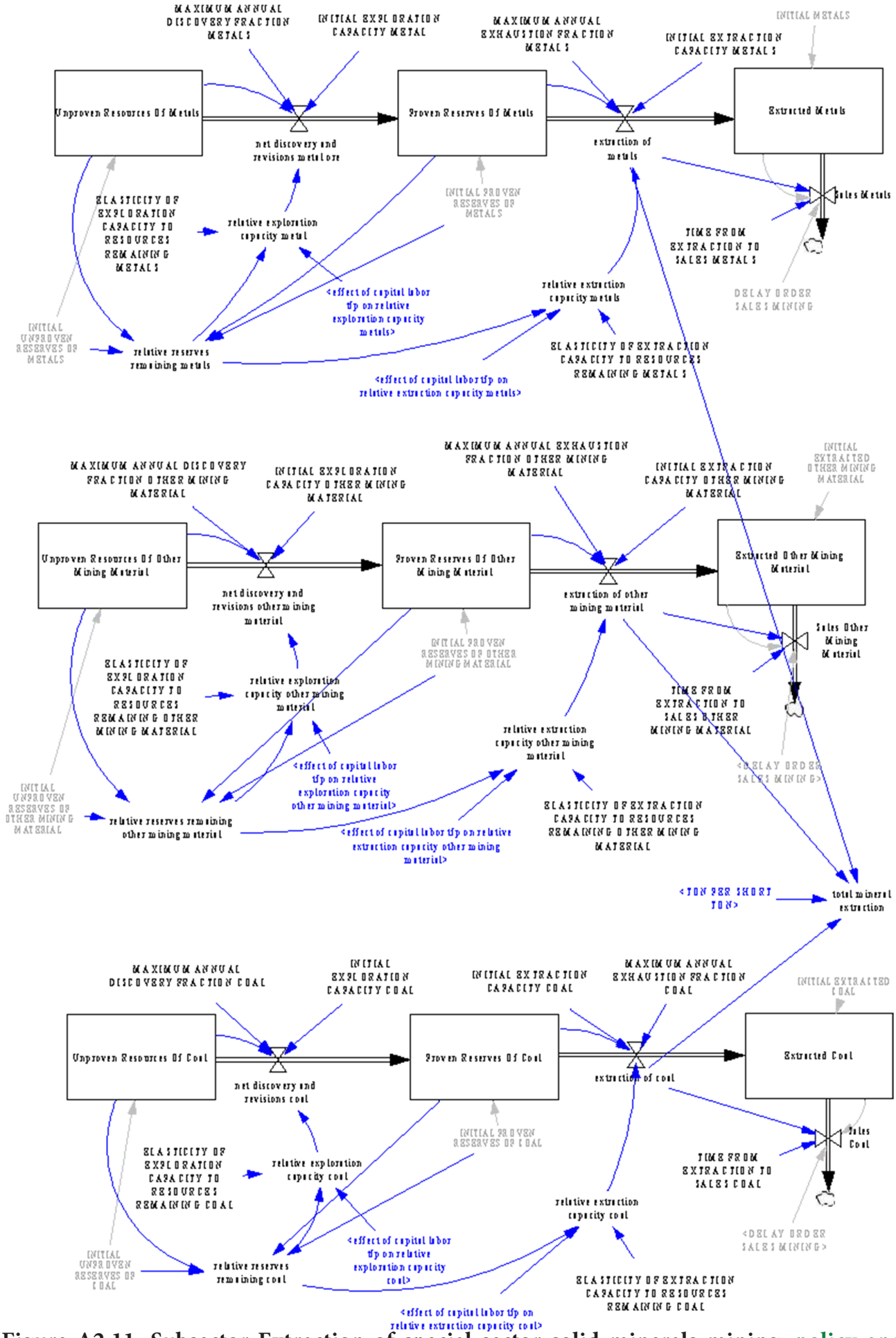

Figure A2.11: Subsector Extraction of special sector solid minerals mining; policy and scenario variables, variables from other (sub-)sectors .

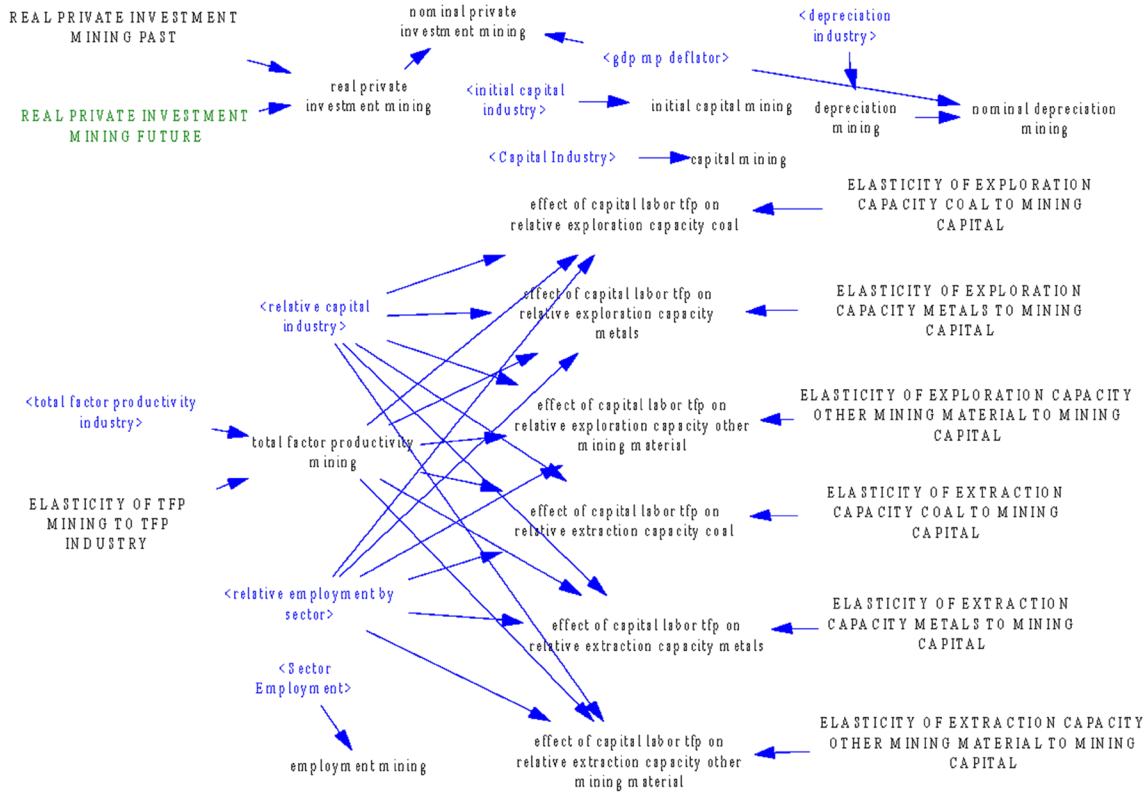

Figure A2.12: Subsector Investment, Extraction and Exploration capacity of special sector Solid Minerals Mining; policy and scenario variables, variables from other (sub-)sectors .

Note that some aspects such as how investments translate into extraction capital are not shown as they are represented in the industry sector.

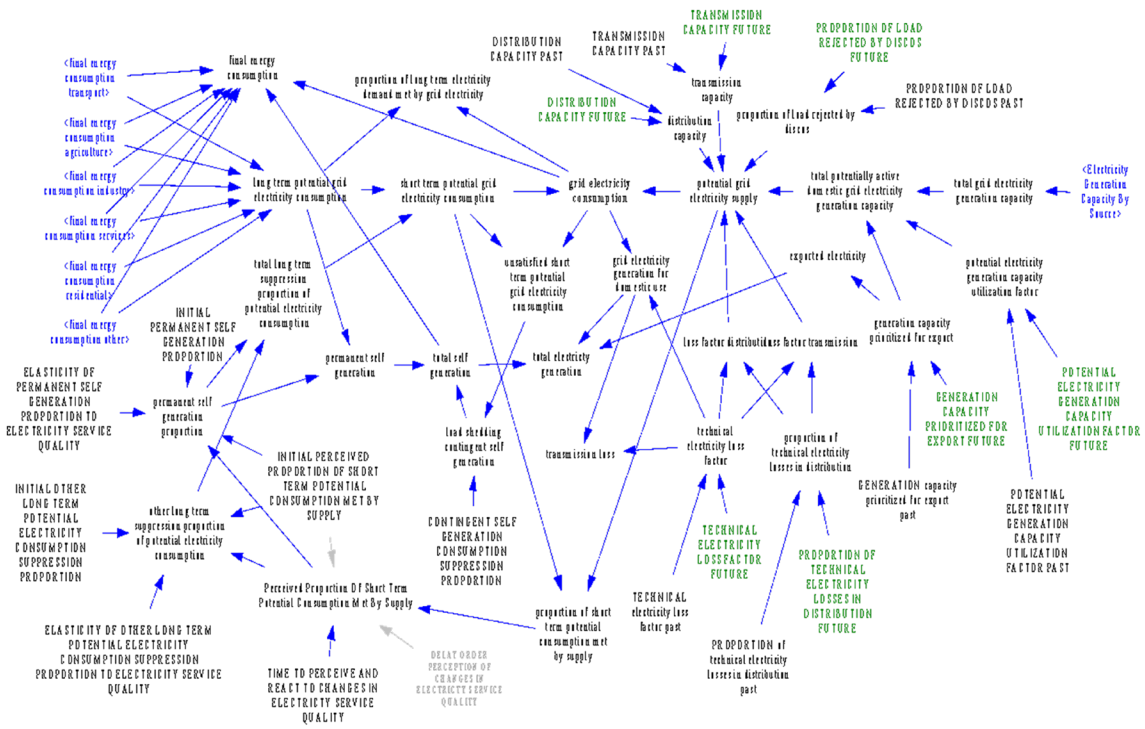

Figure A2.13: Subsector Electricity Consumption of special sector Power Sector Problems policy and scenario variables, variables from other (sub-)sectors .

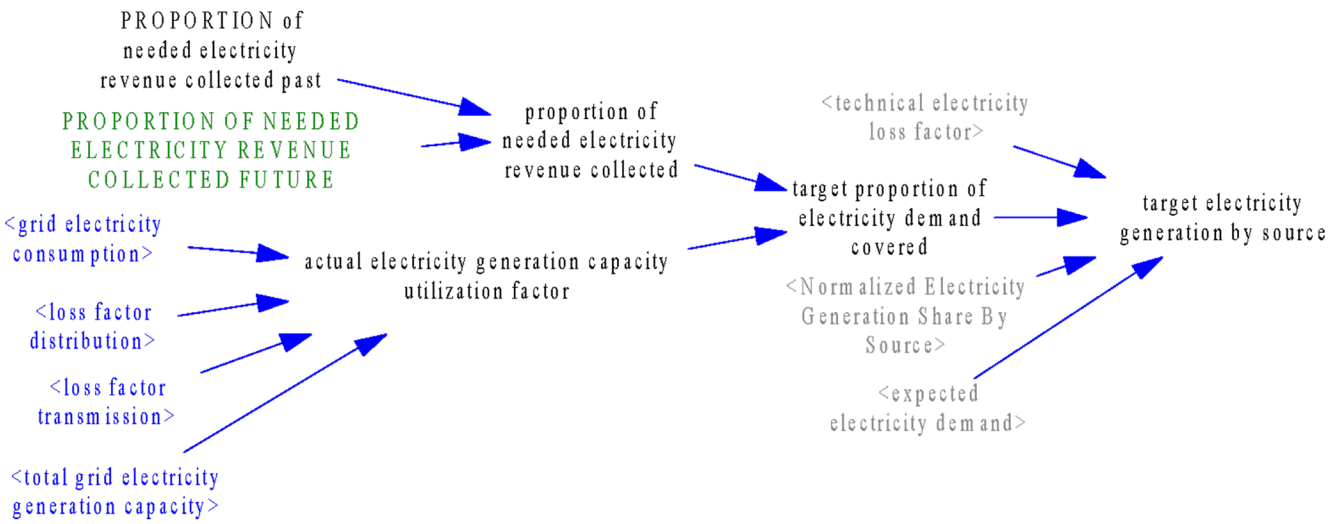

Figure A2.14: Subsector Target Electricity Generation of special sector Power Sector Problems. policy and scenario variables, variables from other (sub-)sectors .

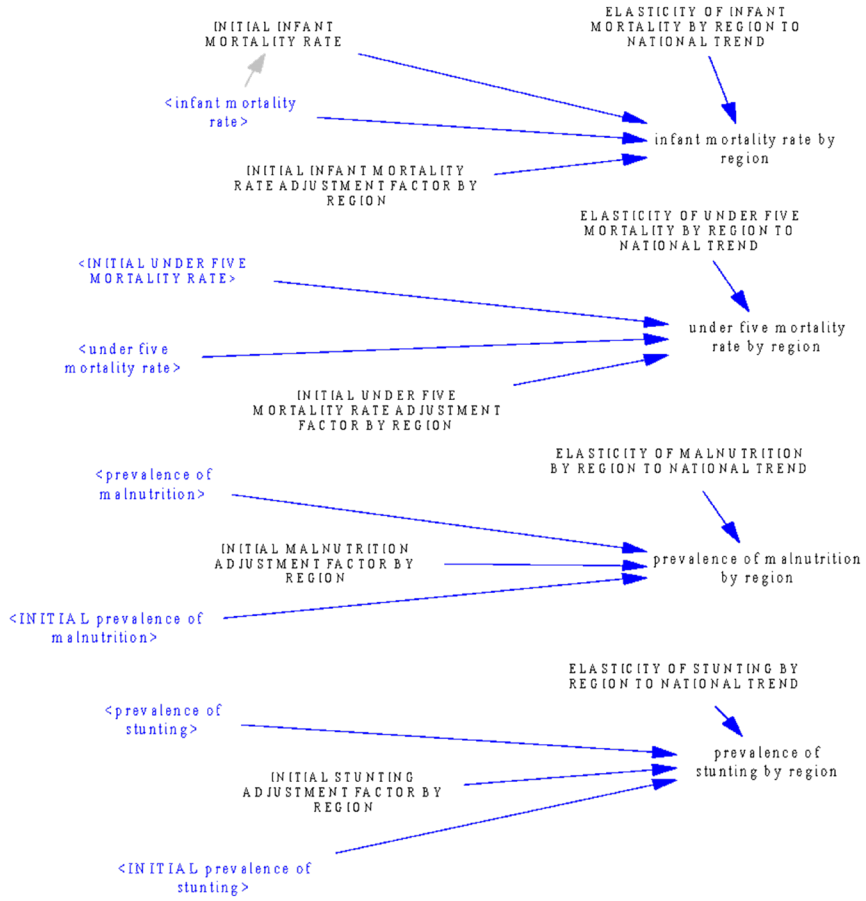

Figure A2.15: Special sector for Sub-national disaggregation of health issues; policy and scenario variables, variables from other (sub-)sectors .

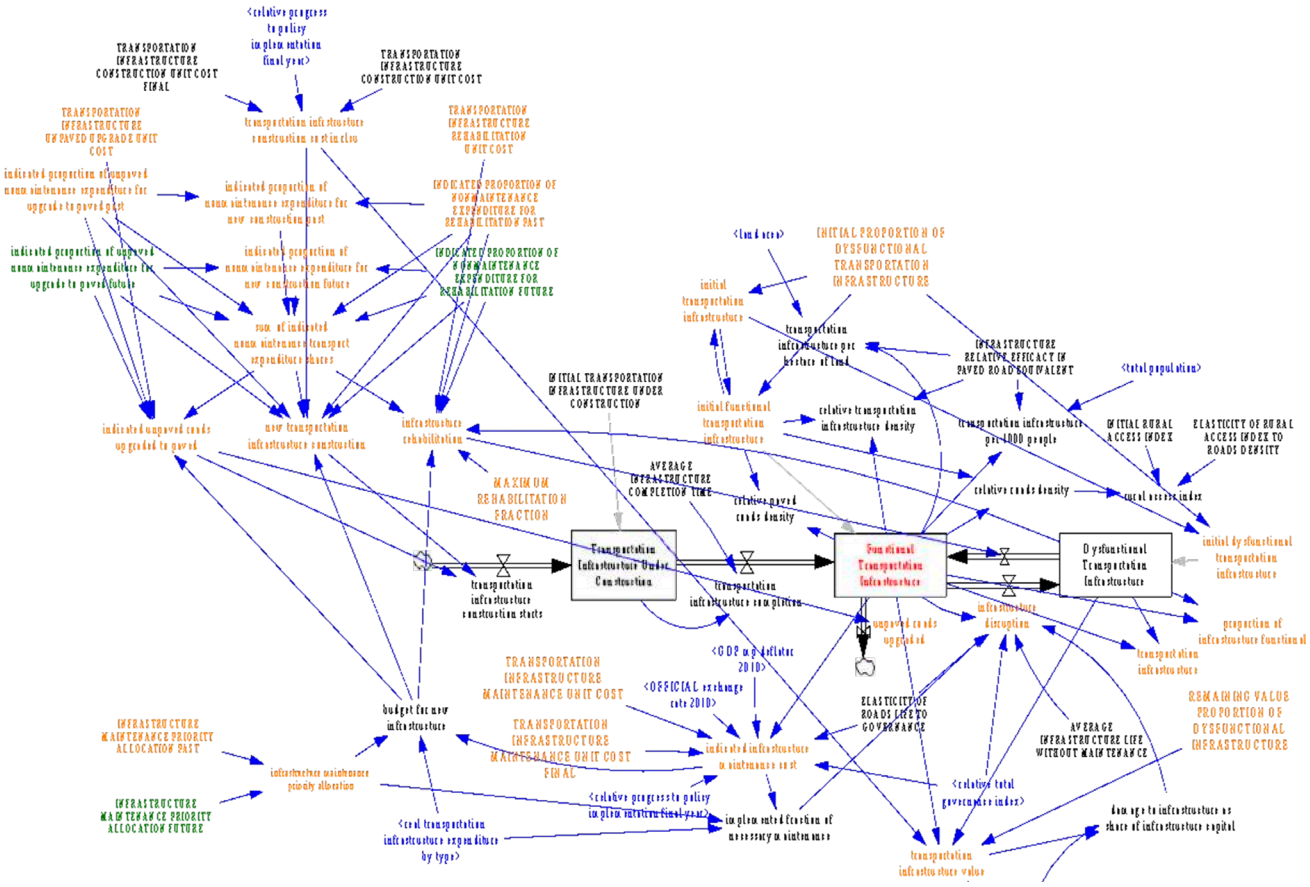

Figure A2.16: Adapted Sector Transportation Infrastructure. Newly added variables policy and scenario variables, variables from other (sub-)sectors .

Note that many of the structures are (subscripted) for paved, unpaved roads and rail.

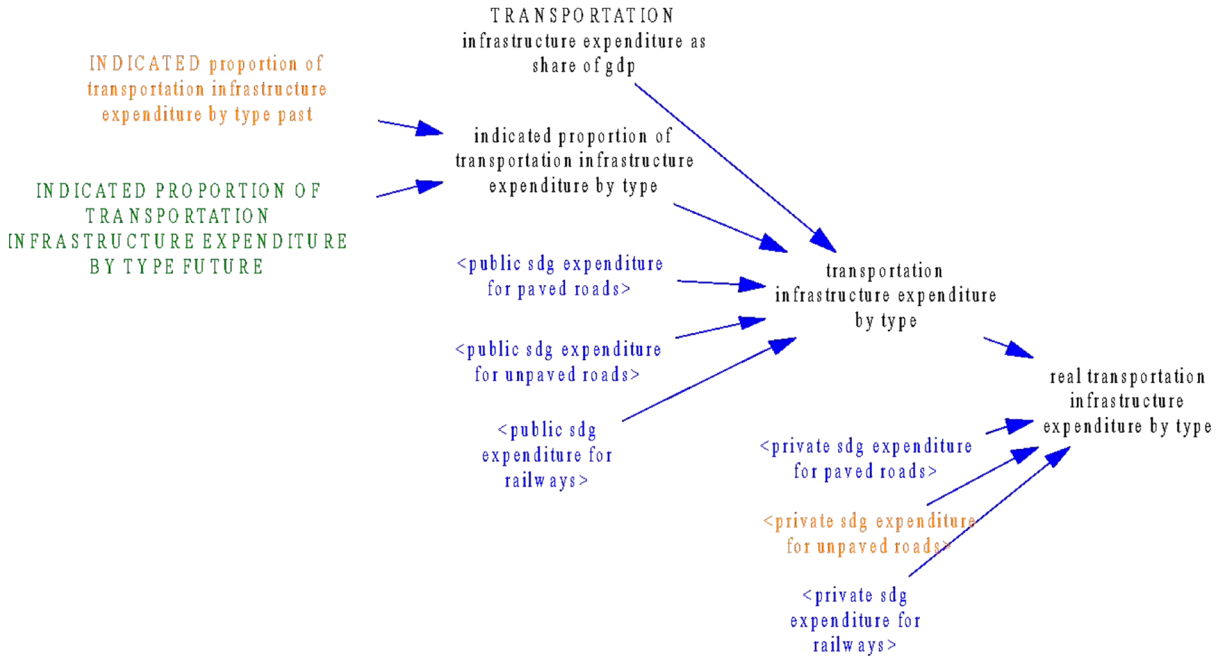

Figure A2.17: Adapted Subsector of Expenditure on Transportation Infrastructure Newly added variables, policy and scenario variables, variables from other (sub-)sectors .

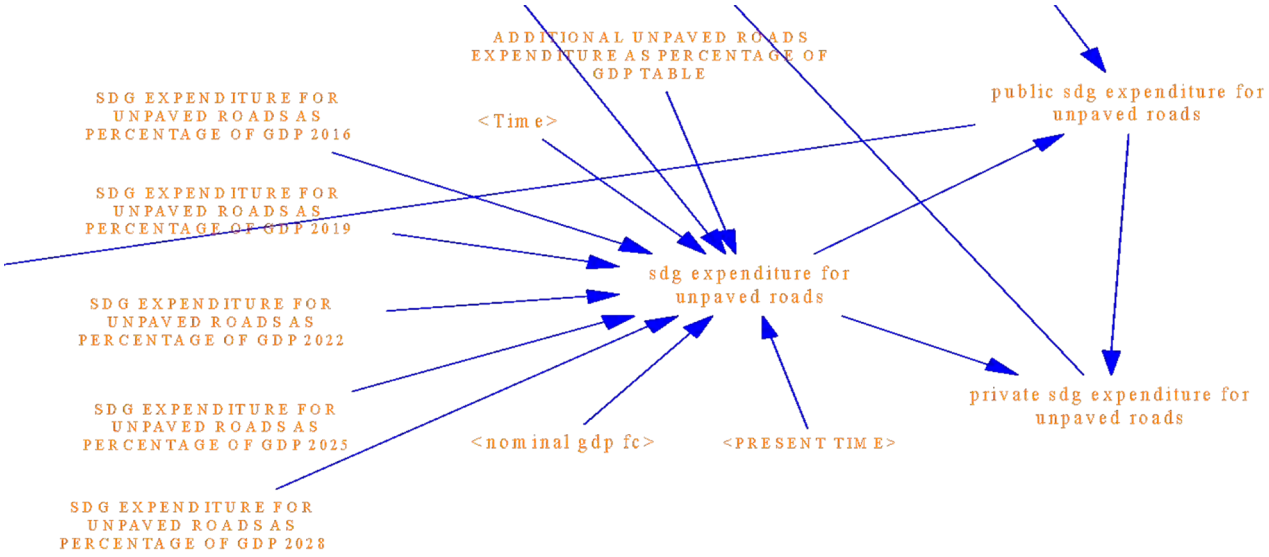

Figure A2.18: Adapted Subsector of Expenditure on Transportation Infrastructure b. Newly added variables in orange.

ANNEX 3:

SDGs and Targets Included in the iSDG Model.

*No value provided

**(units of provided data incompatible)

Dmnl: dimensionless (e.g. fraction, percentage)

rlcu: real local currency units (i.e. real naira)

a: year

t: tonnes (metric)

GOALS & TARGETS (AGENDA 2030)	AGENDA 2030 SDG-INDICATORS	VARIABLE NAME IN iSDG-NIGERIA	TARGET IN iSDG-NIGERIA	UNIT	SOURCE
1.1 By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than $1.25 a day	1.1.1 Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural)	Proportion Of Population Below Poverty Line	0	dmnl.	UN
1.2 By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions	1.2.1 Proportion of population living below the national poverty line, by sex and age	proportion of population below national poverty line	17.70%	dmnl.	UN

1.4 By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance	1.4.1 Proportion of population living in households with access to basic services	Average Access To Basic Health Care	100%	dmnl.	UN
1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters	1.5.1a,b Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population	mortality due to disasters five-year average, proportion of population affected by natural disasters five-year average	0,0	dmnl./a; dmnl.	UN
	1.5.2 Direct economic loss attributed to disasters in relation to global gross domestic product (GDP)	Economic damage due to natural disasters as share of GDP five-year average	0	dmnl.	
	additional fertilizer subsidies expenditure as percentage of GDP	((2015,0), (2016,0), (2030,0))		dmnl.	UN
	subsidized proportion of fertilizer cost	0.5		dmnl.	UN
	subsidized fertilizer proportion by nutrient [N]	0.5		dmnl.	UN
	subsidized fertilizer proportion by nutrient [P]	0.25		dmnl.	UN
	subsidized fertilizer proportion by nutrient [K]	0.25			

Agriculture Other	crop production value per ton [Cereals] - Units: real Naira/Ton	((2016, 45002.7), (2030, 45002.7))	((2016, 45002.7), (2030, 100000))		

2.1 By 2030, end hunger and ensure access by all people, in particular, the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round	2.1.1 Prevalence of undernourishment	prevalence of undernourishment	0	dmnl.	UN
2.2 By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons	2.2.1 Prevalence of stunting (height for age <-2 standard deviation from the median of the World Health Organization (WHO) Child Growth Standards) among children under 5 years of age	prevalence of stunting	0	dmnl.	UN
	2.2.2 Prevalence of malnutrition (weight for height >+2 or <-2 standard deviation from the median of the WHO Child Growth Standards) among children under 5 years of age, by type (wasting and overweight)	prevalence of malnutrition	0	dmnl.	UN

2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment	2.3.1 Volume of production per labour unit by classes of farming/pastoral/ forestry enterprise size	total agriculture production in tons per labour unit	27.950	t / (person·a)	UN
2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather,	2.4.1 Proportion of agricultural area under productive and sustainable agriculture	proportion of harvested area sustainably managed	100%	dmnl.	UN
drought, flooding and other disasters and that progressively improve land and soil quality					
1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters	1.5.1a,b Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population	mortality due to disasters five-year average, proportion of population affected by natural disasters five-year average	0,0	dmnl./a; dmnl.	UN
	1.5.2 Direct economic loss attributed to disasters in relation to global gross domestic product (GDP)	Economic damage due to natural disasters as share of GDP five-year average	0	dmnl.	

	additional fertilizer subsidies expenditure as percentage of GDP	((2015,0), (2016,0), (2030,0))		dmnl.	UN
	subsidized proportion of fertilizer cost	0.5		dmnl.	UN
	subsidized fertilizer proportion by nutrient [N]	0.5		dmnl.	UN
	subsidized fertilizer proportion by nutrient [P]	0.25		dmnl.	UN
	subsidized fertilizer proportion by nutrient [K]	0.25			
Agriculture Other	crop production value per ton [Cereals] - Units: real Naira/Ton	((2016, 45002.7), (2030, 45002.7))	((2016, 45002.7), (2030, 100000))		

3.1 By 2030, reduce the global maternal mortality ratio to less than 70 per 100,000 live births	3.1.1 Maternal mortality ratio	maternal mortality ratio	70	dmnl./100,000	UN
	3.1.2 Proportion of births attended by skilled health personnel	=average access to basic health care, since iSDG uses births attended by skilled personnel as a proxy for access to basic health care	100	dmnl.	UN
3.2 By 2030, end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births	3.2.1 Under-5 mortality rate	under five mortality rate	25	dmnl./1000	UN
	3.2.2 Neonatal mortality rate	neonatal mortality rate	12	dmnl./1000	UN
3.4 By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being	3.4.1 Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease	cardiovascular neoplasm diabetes and respiratory mortality	0.20%	dmnl./a	UN
3.6 By 2020, halve the number of global deaths and injuries from road traffic accidents	3.6.1 Death rate due to road traffic injuries	total mortality rates by cause [road]	0.015%	dmnl./a	UN

3.7 By 2030, ensure universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programmes	3.7.1 Proportion of women of reproductive age (aged 15–49 years) who have their need for family planning satisfied with modern methods	contraceptive prevalence rate	100%	dmnl.	UN
	3.7.2 Adolescent birth rate (aged 10–14 years; aged 15–19 years) per 1,000 women in that age group	adolescent birth rate	0	dmnl./a	UN
3.8 Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all	3.8.1 Coverage of essential health services (defined as the average coverage of essential services based on tracer interventions that include reproductive, maternal, newborn and child health, infectious diseases, non-communicable diseases and service capacity and access, among the general and the most disadvantaged population)	average access to basic health care	100	dmnl.	UN
	1.5.1a,b Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population	mortality due to disasters five-year average, proportion of population affected by natural disasters five-year average	0,0	dmnl./a; dmnl.	UN
	1.5.2 Direct economic loss attributed to disasters in relation to global gross domestic product (GDP)	Economic damage due to natural disasters as share of GDP five-year average	0	dmnl.	
	additional fertilizer subsidies expenditure as percentage of GDP	((2015,0), (2016,0), (2030,0))		dmnl.	UN

	subsidized proportion of fertilizer cost	0.5		dmnl.	UN
	subsidized fertilizer proportion by nutrient [N]	0.5		dmnl.	UN
	subsidized fertilizer proportion by nutrient [P]	0.25		dmnl.	UN
	subsidized fertilizer proportion by nutrient [K]	0.25			
Agriculture Other	crop production value per ton [Cereals] - Units: real Naira/Ton	((2016, 45002.7), (2030, 45002.7))	((2016, 45002.7), (2030, 100000))		

4.1 By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes	4.1.1 Proportion of children and young people (a) in grades 2/3; (b) at the end of primary; and (c) at the end of lower secondary achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex	proportion of population age 20 to 24 that has completed secondary school	100%	dmnl.	UN
4.3 By 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university	4.3.1 Participation rate of youth and adults in formal and non-formal education and training in the previous 12 months, by sex	proportion of population age 20 to 29 that has enrolled in tertiary education	100%	dmnl.	UN
4.5 By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples and children in vulnerable situations	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) for all education indicators on this list that can be disaggregated	adult literacy gender gap ratio	0	dmnl.	UN
4.6 By 2030, ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy	4.6.1 Proportion 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	average adult literacy rate	100%	dmnl.	UN

5.5 Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life	5.5.1 Proportion of seats held by women in (a) national parliaments and (b) local governments	Proportion Of Female Legislators Senior Officials And Managers	50%	dmnl.	UN
5.6 Ensure universal access to sexual and reproductive health and reproductive rights as agreed in accordance with the Programme of Action of the International Conference on Population and Development and the Beijing Platform for Action and the outcome documents of their review conferences	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	contraceptive prevalence rate	100%	dmnl.	UN
6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all	6.1.1 Proportion of population using safely managed drinking water services	average access to improved water source	100%	dmnl.	UN
	subsidized fertilizer proportion by nutrient [P]	0.25		dmnl.	UN
	subsidized fertilizer proportion by nutrient [K]	0.25			
Agriculture Other	crop production value per ton [Cereals] - Units: real Naira/Ton	((2016, 45002.7), (2030, 45002.7))	((2016, 45002.7), (2030, 100000))		

6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations	6.2.1 Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water	average Access to improved sanitation facility	100%	dmnl.	UN
6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity	6.4.1 Change in water-use efficiency over time	total water withdrawal per unit of GDP	0.0001	m2/rlcu	MI *
	6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	water resources vulnerability index	0.1	dmnl.	MI *
7.1 By 2030, ensure universal access to affordable, reliable and modern energy services	7.1.1 Proportion of population with access to electricity	Percentage of population with access to electricity	100%	dmnl.	UN
7.2 By 2030, increase substantially the share of renewable energy in the global energy mix	7.2.1 Renewable energy share in the total final energy consumption	renewable share in total final energy consumption	100%	dmnl.	UN
7.3 By 2030, double the global rate of improvement in energy efficiency	7.3.1 Energy intensity measured in terms of primary energy and GDP	energy intensity level of primary energy	5	MJ/US$$_{2011}$	UN
8.1 Sustain per capita economic growth in accordance with national circumstances and, in	8.1.1 Annual growth rate of real GDP per capita	real pc GDP growth rate	7%	dmnl/a	MI *
particular, at least 7 per cent gross domestic product growth per annum in the least developed countries				dmnl.	UN

8.2 Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors	8.2.1 Annual growth rate of real GDP per employed person	GDP per employed person growth rate	3%	dmnl/a	MI *
	1.5.1a,b Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population	mortality due to disasters five-year average, proportion of population affected by natural disasters five-year average	0,0	dmnl./a; dmnl.	UN
	1.5.2 Direct economic loss attributed to disasters in relation to global gross domestic product (GDP)	Economic damage due to natural disasters as share of GDP five-year average	0	dmnl.	
	additional fertilizer subsidies expenditure as percentage of GDP	((2015,0), (2016,0), (2030,0))		dmnl.	UN
	subsidized proportion of fertilizer cost	0.5		dmnl.	UN
	subsidized fertilizer proportion by nutrient [N]	0.5		dmnl.	UN
	subsidized fertilizer proportion by nutrient [P]	0.25		dmnl.	UN
	subsidized fertilizer proportion by nutrient [K]	0.25			
Agriculture Other	crop production value per ton [Cereals] - Units: real Naira/Ton	((2016, 45002.7), (2030, 45002.7))	((2016, 45002.7), (2030, 100000))		

8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-Year Framework of Programmes on Sustainable Consumption and Production, with developed countries taking the lead	8.4.1a Material footprint	material footprint	1,413,820,000	t/a	MI *
	8.4.1b Material footprint per capita	pc material footprint	0.47	t/person/a	MBNP
	8.4.1c Material footprint per GDP	material footprint per unit of output	0.28	kg/US$$_{2011}$$	MI *
	8.4.2a Domestic material consumption	domestic material consumption	1,238,360,000	t/a	MI *
	8.4.2b Domestic material consumption per capita	pc domestic material consumption	5	t/person/a	MI **
	8.4.2c Domestic material consumption per GDP	domestic material consumption per unit of output	0.25	kg/US$$_{2011}$$	MI *
8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value	8.5.2 Unemployment rate, by sex, age and persons with disabilities	unemployment rate	5%	dmnl.	UN
8.6 By 2020, substantially reduce the proportion of youth not in employment, education or training	8.6.1 Proportion of youth (aged 15–24 years) not in education, employment or training	share of youth not in education employment or training	19.2%	dmnl.	MI *
9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all	9.1.1 Proportion of the rural population who live within 2 km of an all-season road	rural access index	100%	dmnl.	MI *

9.2 Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries	9.2.1a Manufacturing value added as a proportion of GDP	industry production as share of GDP fc	43.08%	dmnl.	MI **
	9.2.1b Manufacturing value added per capita	pc industry production	199,644	r l c u / person	MI **
	9.2.2 Manufacturing employment as a proportion of total employment	industry employment as share of total employment	0.27	Dmnl	MBNP
5.6 Ensure universal access to sexual and reproductive health and reproductive rights as agreed in accordance with the Programme of Action of the International Conference on Population and Development and the Beijing Platform for Action and the outcome documents of their review conferences	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	c o n t r a c e p t i v e prevalence rate	100%	dmnl.	UN
6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all	6.1.1 Proportion of population using safely managed drinking water services	average access to improved water source	100%	dmnl.	UN
	subsidized fertilizer proportion by nutrient [P]	0.25		dmnl.	UN
	subsidized fertilizer proportion by nutrient [K]	0.25			
Agriculture Other	crop production value per ton [Cereals] - Units: real Naira/Ton	((2016, 45002.7), (2030, 45002.7))	((2016, 45002.7), (2030, 100000))		

9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities	9.4.1 CO2 emission per unit of value added	co2 emissions per unit of value added	0.2	kg/US$2011	MI *
10.1 By 2030, progressively achieve and sustain income growth of the bottom 40 per cent of the population at a rate higher than the national average	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	bottom 40 percent income growth to average income growth gap	-0.01	dmnl/a	MI *
10.2 By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status	10.2.1 Proportion of people living below 50 per cent of median income, by sex, age and persons with disabilities	proportion of population below half median income	0	dmnl.	MI *
10.4 Adopt policies, especially fiscal, wage and social protection policies, and progressively achieve greater equality	10.4.1 Labour share of GDP, comprising wages and social protection transfers	average labor share	50%	dmnl.	MI *

11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations	11.5.1a Number of deaths, missing persons attributed to disasters per 100,000 population	Mortality Due To Disasters Five Year Average	0	Dmnl	UN
	11.5.1b Number of directly affected persons attributed to disasters per 100,000 population	Proportion Of Population Affected By Natural Disasters Five Year Average	0	Dmnl	UN
	11.5.2 Direct economic loss in relation to global GDP, damage to critical infrastructure and number of disruptions to basic services, attributed to disasters	Economic Damage Due To Natural Disasters As Share Of GDP Five Year Average	0	Dmnl	UN
11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management	11.6.1 Proportion of urban solid waste regularly collected and with adequate final discharge out of total urban solid waste generated, by cities	proportion of urban waste collected and disposed	100%	dmnl	
	11.6.2 Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population weighted)	pm 25 mean annual exposure	0	Mcg/cm/a	MI *
8.2 Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors	8.2.1 Annual growth rate of real GDP per employed person	GDP per employed person growth rate	3%	dmnl/a	MI *

	1.5.1a,b Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population	mortality due to disasters five-year average, proportion of population affected by natural disasters five-year average	0,0	dmnl./a; dmnl.	UN
	1.5.2 Direct economic loss attributed to disasters in relation to global gross domestic product (GDP)	Economic damage due to natural disasters as share of GDP five-year average	0	dmnl.	
	additional fertilizer subsidies expenditure as percentage of GDP	((2015,0), (2016,0), (2030,0))		dmnl.	UN
	subsidized proportion of fertilizer cost	0.5		dmnl.	UN
	subsidized fertilizer proportion by nutrient [N]	0.5		dmnl.	UN
	subsidized fertilizer proportion by nutrient [P]	0.25		dmnl.	UN
	subsidized fertilizer proportion by nutrient [K]	0.25			
Agriculture Other	crop production value per ton [Cereals] - Units: real Naira/Ton	((2016, 45002.7), (2030, 45002.7))	((2016, 45002.7), (2030, 100000))		

12.2 By 2030, achieve the sustainable management and efficient use of natural resources	12.2.1a Material footprint	material footprint	1,413,820,000	t/a	MI *
	12.2.1b Material footprint per capita	pc material footprint	0.47	t/person/a	MBNP
	12.2.1c Material footprint per GDP	material footprint per unit of output	0.28	kg/US$$_{2011}$$	MI *
	12.2.2a Domestic material consumption	domestic material consumption	1,238,360,000	t/a	MI *
	12.2.2b Domestic material consumption per capita	pc domestic material consumption	5	t/person/a	MI **
	12.2.2c Domestic material consumption per GDP	domestic material consumption per unit of output	0.25	kg/US$$_{2011}$$	MI *
13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	13.1.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population	Mortality Due To Disasters Five Year Average, Proportion Of Population Affected By Natural Disasters Five Year Average	s.o	s.o	s.o
8.6 By 2020, substantially reduce the proportion of youth not in employment, education or training	8.6.1 Proportion of youth (aged 15–24 years) not in education, employment or training	share of youth not in education employment or training	19.2%	dmnl.	MI *
14.4 By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics	14.4.1 Proportion of fish stocks within biologically sustainable levels	proportion of fish stocks sustainably exploited	100%	dmnl.	MI *

14.5 By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information	14.5.1 Coverage of protected areas in relation to marine areas	proportion of territorial waters protected	9.50%	Dmnl	MI *
9.2 Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries	9.2.1a Manufacturing value added as a proportion of GDP	industry production as share of GDP fc	43.08%	dmnl.	MI **
	9.2.1b Manufacturing value added per capita	pc industry production	199,644	r l c u / person	MI **
	9.2.2 Manufacturing employment as a proportion of total employment	industry employment as share of total employment	0.27	Dmnl	MBNP
5.6 Ensure universal access to sexual and reproductive health and reproductive rights as agreed in accordance with the Programme of Action of the International Conference on Population and Development and the Beijing Platform for Action and the outcome documents of their review conferences	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	c o n t r a c e p t i v e prevalence rate	100%	dmnl.	UN

6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all	6.1.1 Proportion of population using safely managed drinking water services	average access to improved water source	100%	dmnl.	UN
	subsidized fertilizer proportion by nutrient [P]	0.25		dmnl.	UN
	subsidized fertilizer proportion by nutrient [K]	0.25			
Agriculture Other	crop production value per ton [Cereals] - Units: real Naira/Ton	((2016, 45002.7), (2030, 45002.7))	((2016, 45002.7), (2030, 100000))		

15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements	15.1.1 Forest area as a proportion of total land area	forest cover	25.36%	Dmnl	MB NP
	15.1.2 Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type	proportion of terrestrial area protected	30.120%	Dmnl	MB NP
15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species	15.5.1 Red List Index	Red List Index	15%	dmnl	MI *
16.1 Significantly reduce all forms of violence and related death rates everywhere	16.1.1 Number of victims of intentional homicide per 100,000 population, by sex and age	total mortality rates by cause [violence]	0.00003	dmnl/a	MI *
	16.5.2 Proportion of businesses that had at least one contact with a public official and that paid a bribe to a public official, or were asked for a bribe by those public officials during the previous 12 months	bribery incidence	0%	Dmnl	
	16.6.2 Proportion of population satisfied with their last experience of public services	normalized governance index	100%	Dmnl	

17.1 Strengthen domestic resource mobilization, including through international support to developing countries, to improve domestic capacity for tax and other revenue collection	17.1.1a Total government revenue as a proportion of GDP	Mortality Due To Disasters Five Year Average	11.06%	Dmnl	MI *
	17.1.1b Total government revenue as a proportion of GDP (direct taxes)	domestic revenue as share of GDP	20%	Dmnl	MI *
	17.1.1c Total government revenue as a proportion of GDP (indirect taxes)	indirect taxes as share of GDP	10%	Dmnl	MI *
	17.1.2 Proportion of domestic budget funded by domestic taxes	proportion of domestic revenue from domestic taxes	83%	Dmnl	MB NP
11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management	11.6.1 Proportion of urban solid waste regularly collected and with adequate final discharge out of total urban solid waste generated, by cities	proportion of urban waste collected and disposed	100%	dmnl	
	11.6.2 Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population weighted)	pm 25 mean annual exposure	0	Mcg/cm/a	MI *
8.2 Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors	8.2.1 Annual growth rate of real GDP per employed person	GDP per employed person growth rate	3%	dmnl/a	MI *

	1.5.1a,b Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population	mortality due to disasters five-year average, proportion of population affected by natural disasters five-year average	0,0	dmnl./a; dmnl.	UN
	1.5.2 Direct economic loss attributed to disasters in relation to global gross domestic product (GDP)	Economic damage due to natural disasters as share of GDP five-year average	0	dmnl.	
	additional fertilizer subsidies expenditure as percentage of GDP	((2015,0), (2016,0), (2030,0))		dmnl.	UN
	subsidized proportion of fertilizer cost	0.5		dmnl.	UN
	subsidized fertilizer proportion by nutrient [N]	0.5		dmnl.	UN
	subsidized fertilizer proportion by nutrient [P]	0.25		dmnl.	UN
	subsidized fertilizer proportion by nutrient [K]	0.25			
Agriculture Other	crop production value per ton [Cereals] - Units: real Naira/Ton	((2016, 45002.7), (2030, 45002.7))	((2016, 45002.7), (2030, 100000))		

17.3 Mobilize additional financial resources for developing countries from multiple sources	17.3.1 Foreign direct investment (FDI), official development assistance and South-South cooperation as a proportion of total domestic budget	grants as share of domestic revenue	105	Dmnl	MI *
117.4 Assist developing countries in attaining long-term debt sustainability through coordinated policies aimed at fostering debt financing, debt relief and debt restructuring, as appropriate, and address the external debt of highly indebted poor countries to reduce debt distress	17.4.1 Debt service as a proportion of exports of goods and services	interest on public debt as share of export	10.75%	dmnl	MB NP

Annex 4

4.1 QUANTITATIVE SCENARIO DEFINITION

THE TABLE BELOW SHOWS THE SCENARIO DEFINITIONS. VARIABLES THAT HAVE PARENTHESES ARE TO BE READ IN THE FOLLOWING MANNER:
e.g. additional sustainable agriculture training expenditure as percentage of GDP ((2015,0),(2020,0.02),(2030,0.02));

meaning that in 2015 there was no such [additional] expenditure then it linearly ramps up to 0.02% of GDP by 2020 and then stays stable at that level until 2030.

Intervention area	Variable name	No-ERGP-scenario	Changes Optimistic-ERGP-scenario compared to No-ERGP-scenario	Changes of ERGP+SDG-scenario compared to Optimistic-ERGP-scenario
Agriculture Expenditure	additional sustainable agriculture training expenditure as percentage of GDP	((2015,0), (2016,0), (2030,0))	((2015,0), (2020,0.02), (2030,0.02))	
	additional agriculture expenditure as percentage of GDP table	((2015,0), (2016,0), (2030,0))	((2016,0), (2020,0.0238), (2030,0.0238))	
	additional agriculture water efficiency expenditure as share of GDP	((2015,0), (2016,0), (2030,0))		
	proportion of water efficient equipment in substitution of existing equipment	0		
	additional fertilizer subsidies expenditure as percentage of GDP	((2015,0), (2016,0), (2030,0))		

	subsidized proportion of fertilizer cost	0.5		
	subsidized fertilizer proportion by nutrient [N]	0.5		
	subsidized fertilizer proportion by nutrient [P]	0.25		
	subsidized fertilizer proportion by nutrient [K]	0.25		
Agriculture Other	crop production value per ton [Cereals] - Units: real Naira/Ton	((2016, 45002.7), (2030, 45002.7))	((2016, 45002.7), (2030, 100000))	

	crop production value per ton [non-cereals]- Units: Real Naira/Ton	((2016, 82355), (2030, 82355))	((2016,82355), (2030,120000))	
	livestock value added per ton – Units: Real Naira / Ton	((2016, 428651.3), (2016, 428651.3))	((2016, 428651.3), (2016, 600000))	
	Crop intensity index future	((2016, 1.26776), (2030, 1.26776))	((2016, 1.26776), (2030,1.5))	
	Domestic to us fertilizer price ratio	((2016,1.2), (2030,1.2))	((2016,1.2), (2030,0.65))	
	Manure crop application proportion	0.5		
	Share of cereal land	0.312184477		
	Other agriculture input costs per ton of production [Cereals] – Units: RealNaira / (ton*Year)	306.6666667		

	Other agriculture input costs per ton of production [Rest] – Units: RealNaira / (ton*Year)	306.6666667		
Climate Change (CC) Adaptation Expenditure	Additional adaptation expenditure as percentage of GDP	((2015,0), (2016,0), (2030,0))	((2015,0), (2020, 0.000343), (2030, 0.000343))	((2015,0), (2016,0.08), (2030,0.08))
CC - Mitigation	Cement production non energy emission per ton	((2016,0.5), (2030,0.5))	((2016,0.5), (2050,0.45))	
	Flaring fraction future	((2016,0.12), (2030,0.12))	((2016,0.12), (2030,0))	
	Average enrollment reduction in areas affected by the conflict [primary]	0.9		
	Average enrollment reduction in areas affected by the conflict [secondary]	0.25		
	Average enrollment reduction in areas affected by the conflict [tertiary]	0.25		
	Conflict start year	2009		
	Conflict peak year	2019		
	Conflict extension rate (%/year)	0.5		
Conflict Reduction	Conflict recovery rate	0	-0.1	

	Maximum Share Of Agriculture Area Affected By Conflict	0.25		
Foreign Financing	Domestic financing share [of total financing]	0.8	0.2	
Fiscal Pressure Distribution	Relative fiscal pressure by percentile	1	0.1	2
	Relative fiscal pressure by percentile	1	0.1	10
	Relative fiscal pressure by percentile	1	0.2	20
	Relative fiscal pressure by percentile	1	0.3	34
	Relative fiscal pressure by percentile	1	0.3	34
Education Expenditure	Additional education expenditure as percentage of GDP	((2015,0), (2016,0), (2030,0))	((2015,0), (2020,0.2), (2030,0.2))	((2015,0), (2016,1), (2030,1))
	Indicated target percentage of education expenditure by level [pre-primary]	9		6
	Indicated target percentage of education expenditure by level [primary]	43		28

	Indicated target percentage of education expenditure by level [secondary]	28		28
	Indicated target percentage of education expenditure by level [tertiary]	20		38
Energy Efficiency Expenditure	Additional industry energy efficiency expenditure as percentage of GDP	((2015,0), (2016,0), (2030,0))	((2015,0), (2030,0.0025))	
	Additional households energy efficiency expenditure as percentage of GDP	((2015,0), (2016,0), (2030,0))	((2015,0), (2030,0.00125))	
	Additional vehicles expenditure as percentage of GDP	((2015,0), (2016,0), (2030,0))		
	Proportion of SDG expenditure for vehicle efficiency for passenger cars	0.6		
	Unit cost of improved vehicle efficiency final [passenger] Units: Usd10/vehicle	65		
	Unit cost of improved vehicle efficiency final [commercial] Units: Usd10/vehicle	550		

Environmental Protection Expenditure	Additional terrestrial protected areas expenditure as percentage of GDP	((2015,0), (2016,0), (2030,0))	((2015,0), (2016,0), (2030,0))	((2015,0), (2016,0), (2030, 0.0001))
	Additional marine protected areas expenditure as percentage of GDP	((2015,0), (2016,0), (2030,0))		((2015,0), (2016,0.00005), (2030,0.0005))
	Additional reforestation expenditure as percentage of GDP	((2015,0), (2016,0), (2030,0))	((2016,-1.74469E-05), (2017,-2.22723E-06), (2018,1.04612E-05), (2020,2.71417E-05), (2025,3.86638E-05), (2030,2.66295E-05))	((2015,0), (2016,0), (2030,0.3))
	Terrestrial areas protection unit cost final	270		
	Reforestation unit cost final	1000		
	Marine areas protection unit cost final	3750		
Exchange Rate	Official exchange rate - Units: Nomial Naira/USD	((2016,253.781), (2020, 357.6233828), (2025, 697.1946217), (2030, 1372.5))	((2016,253.781), (2020,271.4077728), (2025,372.2762871), (2030,518.3158457))	
	Public share of additional expenditure table	((2015,1), (2020,1), (2025,1), (2030,1))	((2015,1), (2020,0.5), (2025,0.5), (2030,0.5))	
	Consumption share of government expenditure future	((2016,0.599508), (2030,0.599508))	((2016,0.599508), (2025,0.4), (2030,0.04))	
	Government salaries and wages as share of consumption future	((2016, 0.727415), (2030, 0.727415))	((2016, 0.727415455), (2020,0.4), (2030,0.4))	
	Administrative and other expenditure as share of GDP future	((2016, 0.062793), (2030, 0.062793))	((2016, 0.062793), (2020,0.05), (2030,0.05))	

	Average salary in the public sector future (real Naira/ person/a)	((2016, 473783), (2030, 473783))	((2016,473783), (2030,600000))	
Interest Rate Foreign	Interest rate on foreign debt table (dmnl/a)	((2016, 0.159743), (2018,0.09), (2030,0.2))	((2016, 0.159743), (2018,0.07), (2025,0.05), (2030,0.1))	
	Private current transfers as share of GDP – Units: Dmnl	-0.062		
	Private factor income as share of GDP – Units: Dmnl	-0.023		
	Private capital and financial account as share of GDP - Units: Dmnl	0.104		
	Forestry production (Units: RealNaira/year)	1.72E+11		
Gender	Target Education Gender bias [primary]	1.02	1	
	Target Education Gender bias [secondary]	0.91	1	
	Target Education Gender bias [tertiary]	0.85	1	
	SDG target ratio employment gender gap to education gender gap	n.a.	1	
	SDG target effect of social and market framework on gender gap in employment	n.a.	0	

	Additional effect of social and market framework on gender gap in top employment	0.2	0	
	Employment to top employment gender gap ratio	0.25	0	
Governance	SDG control of corruption target	-1.083716273	0	
	SDG government effectiveness target	-0.96267271	0.25	
	SDG regulatory quality target	-0.850521445	0.5	
	SDG rule of law target	-0.961073756	0.75	
	SDG voice and accountability target	-0.366597325	1	
	SDG political stability and absence of violence target	-1.925442815	0	
	Disruption fraction extraction capcity oil future	((2016,0.2), (2030,0.2))	((2016,0.2), (2030,0.05))	
	Pipeline loss fraction of refinery products future govt	((2016,0.5286), (2030,0.5286))	((2016,0.5286), (2020,0.05),(2030,0.05))	
	Pipeline loss fraction of refinery products future private	((2020,0.3), (2030,0.3))	((2020,0.05), (2030,0.05))	
Health Expenditure	Additional health expenditure as percentage of GDP	((2015,0), (2016,0), (2030,0))	((2015,0), (2020,0.1), (2030,0.23))	((2015,0), (2016,1), (2030,1))
Family Planning Expenditure	Family planning unit cost final-Units: US$11/(person*a)	10		

Inflation	GDP fc deflator growth rate future – Units: Dmnl/Year	((2016, 0.1433), (2030, 0.1433))	((2016,0.07), (2030,0.07))	
	Investment into construction of govt refinery capacity future	((2016,0), (2030,0))		
	Labor Participation Rate - Units: Dmnl	0.651		
	Final target material consumption efficiency improvement	0		
Migration	Final target net migration per thousand people Units: Dmnl/Year	-0.331	0.25	
	Proportion of gas sold by govt future	((2016,0.275), (2030,0.275))		
Oil Revenue	Real unit penalty for flaring future	((2016, 3.04e+06), (2030,3.04e+06))	((2016,2.9e+08), (2030,2.9e+08))	
	Taxes on goods and services incl royalties as share production for oil and gas future	((2016,0.058), (2030,0.058))	((2016,0.1), (2030,0.1))	
	Transfers to excess crude account as share of gross govt revenue oil and gas future	((2016,0.05), (2030,0.05))		
	Joint venture cash calls as share of value added oil and gas future	((2016,0.09), (2030,0.09))		
	Other gross govt revenue from oil and gas as share of production for oil and gas future	((2016,0.002), (2030,0.002))		

	Proportion of crude oil sold by govt future	((2016,0.23), (2030,0.23))		
	Taxes on income and profits as share of production for oil and gas future	((2016,0.134), (2030,0.134))	((2016,0.3), (2030,0.3))	
	Net material trade fraction – units: dmnl	-0.181		
	Electricity generation efficiency by source [nuclear]	0.33		
	Electricity generation efficiency by source [oil]	0.35		
	Electricity generation efficiency by source [coal]	0.35		
	Electricity generation efficiency by source [bio]	0.35		
	Electricity generation efficiency by source [gas]	0.45		
	Distribution capacity future	((2016,6.288), (2030,6.288))		
	Potential electricity generation capacity utilization factor future	((2016,0.35), (2030,0.35))		
	Proportion of load rejected by discos future	((2016,0.2), (2030,0.2))		

	Proportion of needed electricity revenue collected future	((2016,0.65), (2030,0.65))		
	Proportion of technical electricity losses in distribution future	((2016,0.63), (2030,0.63))		
	Technical electricity loss factor future	((2016,0.2), (2030,0.2))		
	Transmission capacity future	((2016,5.9), (2018,7.124), (2030,7.124))		
Private Investment Extraction	Real private investment mining future[ind 3]	((2016,8e+07), (2030,8e+07))	((2016,8e+07), (2030,1e+08))	
	Real private investment mining future[ind 4]	((2016,1e+07), (2030,1e+07))	((2016,8e+07), (2030,1.25e+07))	
	Investment into construction of private refinery capacity future	((2016,0),(2021,0),(2022,2.4e+12),(2023,0),(2030,0))		
	Real private investment crude and gas future	((2016,4.5e+10), (2030,4.5e+10))	((2016,1.2e+11), (2030,1.2e+11))	
Renewable Energy Expenditure	Additional small scale photovoltaic capacity expenditure as percentage of GDP	((2015,0),(2016,0), (2030,0))	((2015,0),(2016,0.3), (2019,0.3), (2020,0), (2030,0))	
	Additional large scale photovoltaic capacity expenditure as percentage of GDP	((2015,0),(2016,0), (2030,0))		
	Additional small scale hydropower capacity expenditure as percentage of GDP	((2015,0),(2016,0), (2030,0))	((2015,0),(2016,1.86), (2017,0),(2030,0))	

	Additional large scale hydropower capacity expenditure as percentage of GDP	((2015,0),(2016,0),(2030,0))		
	Small-scale renewable capacity unit construction cost [solar]	3145	2310	
	Small-scale renewable capacity unit construction cost final [solar]	2130	1558	
	Small-scale renewable capacity unit construction cost [hydro] - Units: US$10/KW	2075	1867	
	Small-scale renewable capacity unit construction cost final [hydro] - Units: US$10/KW	2940	1845	
Subsidies Transfers Expenditure	Additional subsidies and transfers expenditure as percentage of GDP	((2015,0),(2016,0),(2030,0))	((2015,0),(2020,3.4), (2030,3.4))	((2015,0),(2016,0),(2030,0))
Subsidies Transfers Distribution	Subsidies and transfers distribution curve	((1,1),(100,1))	((1,0.3),(20,0.3), (21,0.3),(40,0.3), (41,0.2),(60,0.2), (61,0.1),(80,0.1), (81,0.1),(100,0.1))	((1,0.63),(20,0.63), (21,0.37),(40,0.37), (41,0),(100,0))
Taxation Revenue	Additional taxes on income and profits as percentage of GDP table	((2015,0),(2016,0),(2030,0))	((2016,0), (2030,14.38))	((2016,0), (2030,16.9))
	Additional taxes on international trade as share of GDP	((2015,0),(2016,0),(2030,0))	((2016,0), (2030,0.006464688))	((2016,0), (2030,0))

	Additional taxes on goods and services as percentage of GDP table	((2015,0),(2016,0),(2030,0))	((2016,0), (2030,5.18))	((2016,0), (2030,9.2))
	Non-gas or oil other domestic revenue as share of GDP future	((2016, 0.021927708), (2030, 0.021927708))	((2016,0.021927708),(2030,0.026027708))	
	Indirect taxes minus subsidies as share of GDP	0		
	Taxes on goods and services mining as share of mining production future	((2016,0.0339),(2030,0.0339))		
	Taxes on income and profits from mining as share of mining production future	((2016,0.01), (2030,0.01))		
	Other revenue reductions as share of gross govt revenue oil and gas future	((2016,0.09), (2030,0.09))		
	Gas reinjection fraction future	((2016,0.2), (2030,0.2))		
	Fractional refinery gain	0		
	Non-CH4 fraction removed from gas stream future	((2016,0.17), (2030,0.17))		
	Real value added per mbl refined future govt	((2016,1.2e+10),(2030,1.2e+10))		
	Real value added per mbl refined future private	((2016,1.2e+10),(2030,1.2e+10))		

Transport Expenditure	Additional paved roads expenditure as percentage of GDP	((2015,0),(2016,0),(2030,0))	((2016,0.109862572),(2017,0.020476517),(2018,0.020535208),(2020,0.020478103),(2025,0.020811318),(2030,0.02116409))	((2015,0),(2016,2),(2030,2))
	Additional unpaved roads expenditure as percentage of GDP	((2015,0),(2016,0),(2030,0))	((2016,0.005868255),(2017,0.080316583),(2018,0.071962092),(2020,0.058630953),(2025,0.035794958),(2030,0.023260607))	((2015,0),(2016,0.07),(2030,0.07))
	Additional railways expenditure as percentage of GDP	((2015,0),(2016,0),(2030,0))	((2016,-0.035297835),(2017, 1.012213965),(2018,0.897060801),(2020,0.712434357),(2025,0.390771554),(2030,0.210611491))	((2015,0),(2016,0.01),(2030,0.01))
Transport Other	Indicated proportion of unpaved nonmaintenance expenditure for upgrade to paved future[unpaved]	((2016,1)(2030,1))		((2016,0),(2030,0))
	Indicated proportion of nonmaintenance expenditure for rehabilitation future[paved]	((2016,0.5), (2030,0.5))	((2016,0.528522708),(2030,0.528522708))	((2016,1),(2018,1),(2019,0),(2030,0))
	Indicated proportion of nonmaintenance expenditure for rehabilitation future[unpaved]	((2015,0), (2016,0),(2030,0))		((2016,1),(2030,1))

	Indicated proportion of nonmaintenance expenditure for rehabilitation future[rail]	((2015,0), (2016,0), (2030,0))	((2016, 0.002637901), (2030, 0.002637901))	((2016,1), (2023,1), (2024,0), (2030,0))
	Infrastructure maintenance priority allocation future [paved]	((2016,0.75), (2030,0.75))	((2016,1), (2017, 0.160187474), (2030,0.203222135))	((2016,0.35), (2030,0.35))
	Infrastructure maintenance priority allocation future[unpaved]	((2016,0.2), (2030,0.2))	((2016,0.06), (2030,0.01))	((2016,1), (2030,1))
	Infrastructure maintenance priority allocation future[rail]	((2016,0.2), (2030,0.2))	((2016,0.06), (2030,0.01))	((2016,1), (2030,1))
	Infrastructure maintenance priority allocation future[rail]	((2015,0), (2016,0), (2030,0))	((2016,1), (2017, 0.010853426), (2030, 0.028945245))	((2016,0.3), (2030,0.2))
	Indicated proportion of transportation infrastructure expenditure by type future[paved]	((2016, 0.612146831495224), (2030, 0.612146831495224))	((2016,0.609828435), (2017,0.114538314), (2018,0.11487328), (2020,0.115526733), (2025,0.117064281), (2030,0.118467324))	((2016,0), (2030,0))
	Indicated proportion of transportation infrastructure expenditure by type future[unpaved]	((2016, 0.174436947130752), (2030, 0.174436947130752))	((2016,0.122607567), (2017,0.054650045), (2018,0.054352238), (2020,0.053767771), (2025,0.052371405), (2030,0.051066002))	((2016,0), (2030,0))
	Indicated proportion of transportation infrastructure expenditure by type future[rail]	((2016, 0.213416221374025), (2030, 0.213416221374025))	((2016,0.267563997), (2017,0.830811641), (2018,0.830774483), (2020,0.830705557), (2025,0.830564314), (2030,0.830466674))	((2016,1), (2030,1))

	Transportation infrastructure construction unit cost [paved], Unit: Usd10/km	916236		
	Transportation infrastructure construction unit cost [unpaved], Unit: Usd10/km	123816.6		
	Transportation infrastructure construction unit cost [rail], Unit: Usd10/km	6509239.682	7818200.944	
	Transportation infrastructure construction unit cost final [paved], Unit: Usd10/km	916236		
	Transportation infrastructure construction unit cost final [unpaved], Unit: Usd10/km	123816.6		
	Transportation infrastructure construction unit cost final [rail], Unit: Usd10/km	6509239.682	7818200.944	
	Transportation infrastructure maintenance unit cost[paved]	5551.24		
	Transportation infrastructure maintenance unit cost[unpaved]	3464.45		

	Transportation infrastructure maintenance unit cost[rail]	14102.3		
	Transportation infrastructure maintenance unit cost final[paved]	5551.24		
	Transportation infrastructure maintenance unit cost final[unpaved]	3464.45		
	Transportation infrastructure maintenance unit cost final[rail]	14102.3		
Urbanization	Proportion of population living in urban areas future	((2016,0.3848), (2030,0.42))	((2016,0.3848), (2030,0.39))	
Waste Management Expenditure	Additional waste management expenditure as percentage of GDP	((2015,0), (2016,0), (2030,0))	((2015,0), (2020,0.000366), (2030,0.000366))	((2015,0), (2016,0.02), (2030,0.02))
	Waste collection unit cost (final) Usd10/ton	35		
	Waste disposal unit cost final Usd10/ton	25		
Water Sanitation Expenditure	Additional water expenditure as percentage of GDP	((2015,0), (2016,0), (2030,0))	((2015,0), (2020,0.005), (2030,0.02))	
	Additional sanitation expenditure as percentage of GDP	((2015,0),(2016,0), (2030,0))	((2015,0), (2020,0.002) (2030,0.008))	((2015,0), (2020,0.07), (2030,0.08))
	Proportion of SDG expenditure for water for urban areas	0.5		

	Proportion of SDG expenditure for sanitation for urban areas	0.5		
	Improved water source unit cost [rural]	18		
	Improved water source unit cost [urban]	30		
	Improved water source unit cost final [rural]	62		
	Improved water source unit cost final [urban]	102		
	Improved sanitation facility unit cost [USD10/person]	30		
	Improved sanitation facility unit cost [USD10/person]	43		
	Improved sanitation facility unit cost final [USD10/person]	57		
	Improved sanitation facility unit cost final [USD10/person]	135		
	Additional grants as share of GDP	((2015,0), (2016,0), (2030,0))		

ANNEX 5:
SUMMARY SENSITIVITY ANALYSES

A5.1: ERGP-COSTED-POLICIES-ONLY-SCENARIO

The graphs below show a comparison of the Optimistic-ERGP-scenario and the ERGP-costed-policies-only-scenario, which implies that the difference is due to the optimistic assumptions on future developments of aspects that are not under direct government control. In other words, the difference is because of a more pessimistic assumption in this regard.

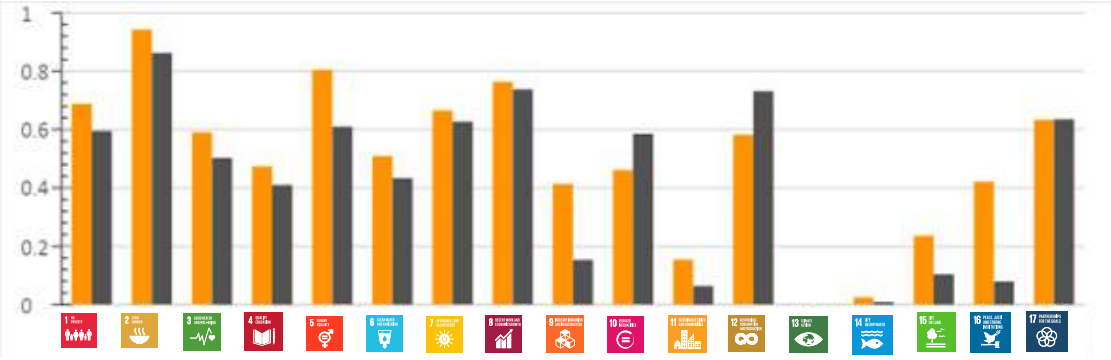

Figure A5.1: Sensitivity analysis of optimistic scenario assumptions of aspects not under direct government control Optimistic-ERGP-scenario (orange), ERGP-costed-policies-only-scenario (dark green)

It can be seen in Figure A5.1 that for most SDGs, the performance is lower in the ERGP-costed-policies-only-scenario. The fact that the difference between the scenarios for SDGs 1,2,3,4,6,7 and 8 is not very large indicates that the performance increase is mostly due to expenditure and taxation policies. Conversely, the fact that the performance of Goals 5, and especially 9 and 16, is substantially lower implies that for these goals the performance increase of the Optimistic-ERGP-scenario hinges strongly on assumed developments not directly under governmental control. For Goal 5 (gender equality) this is not surprising because the drivers are not detailed policies but assumed developments in education, employment, the effect of social and market framework as well as the situation for top-employment. It is actually a very good sign that gender equality also improves quite a bit without these assumptions. For Goal 16, governance changes are mostly the result of assumed changes in the various areas of governance without detailing how these changes can be brought about. For the performance of Goal 9, the most important determinant is the assumed reduction of flaring of associated natural gas and is missing from the ERGP-costed-policies-only-scenario followed by a reduction of the importance of the industrial sector both for GDP and employment. The relatively strong reduction of performance for Goal 15 is because changed governance has such a strong influence on conservation.

Interestingly there are two Goals (12 and 10) for which the performance is higher in the ERGP-costed-policies-only-scenario. For Goal 12 that is mostly due to reduced economic growth which implies reduced resource use, which this Goal is measuring. For Goal. 10, all incomes are higher in the ERGP-costed-policies-only-scenario (mainly because of differing assumptions on the development of the exchange rate) but the increase is stronger for the poor. This means that equality is worse.

A5.2: SDG-COSTED-POLICIES-ONLY-SCENARIO

Figure A5.2 shows that for Goals 1, 3, 4, 6, 7, 8, 10, 11, 13, and 17, there is not much difference between the scenarios. This means that the performance in these areas in the ERGP+SDG-scenario comes mostly from the costed policy interventions, and relies relatively little on the optimistic assumptions with respect to favourable developments that are hardly controlled by the government. The situation is different for Goals 5, 9, 14, 15 and 16, which are much more reliant on these assumptions. For Goals 5 and 16, described above, that is not surprising as these are to a substantial degree based on assumed developments in terms of their constituting indicators anyway. For Goal 9, it is again the flaring of natural gas that explains the difference. For Goals 14 and 15, the stronger difference again points at the importance of governance for conservation through protected areas as well as reducing deforestation. Similarly, for Goal 12, the lower economic growth implies lower resource use which means increased performance of Goal 12.

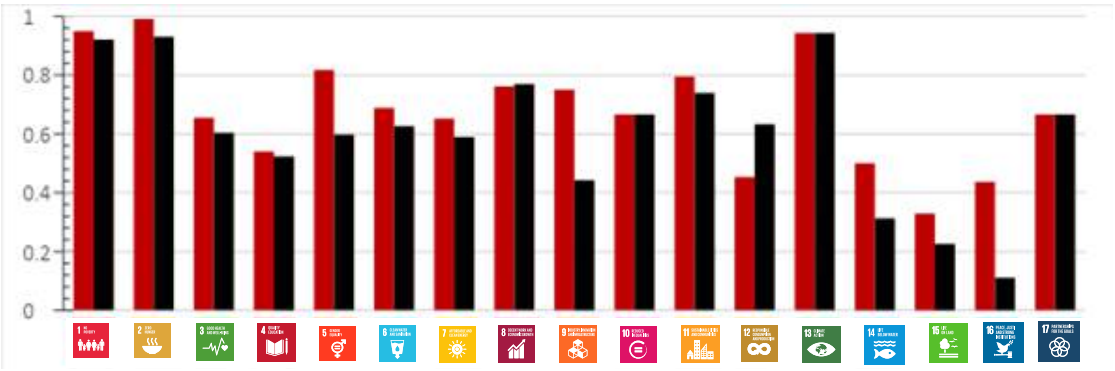

Figure A5.2: Sensitivity analysis with respect to optimistic scenario assumptions of aspects not under direct government control ERGP+SDG-scenario (dark red)**, SDG-costed-policies-only-scenario (black)**

When comparing Figure A5.2 with Figure A5.1, it can be seen that the difference of the two scenarios depicted in each graph is on average smaller in Figure 5.2. This implies that the ERGP+SDG-scenario is more robust; that is, it depends less on the above-mentioned assumptions on future developments of variables that are not under direct government control.

Annex 6

6.1 POLICY TEAM MEMBERS

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